ENVIRONMENTAL IMPACT ASSESSMENT PROJECT REPORT FOR THE PROPOSED VILLA FRANCA 66/11KV SUBSTATION IN NAIROBI CITY

FEBRUARY 2013

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FINAL PROJECT REPORT

Environmental and Social Impact Assessment Project Report
CERTIFICATION:

Client: Kenya Power and Lighting Company Limited

Assignment: To carry out an Environmental Impact Assessment of the Proposed Villa Franca 66/11 KV Substation.

Project Cost: KES 215million

Report Prepared by:

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### LIST OF ABBREVIATIONS

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<tr>
<td>BOD</td>
<td>Biological Oxygen Demand</td>
</tr>
<tr>
<td>BS</td>
<td>British Standard</td>
</tr>
<tr>
<td>CBD</td>
<td>Convention on Biological Diversity</td>
</tr>
<tr>
<td>CO₂</td>
<td>Carbon dioxide</td>
</tr>
<tr>
<td>CSR</td>
<td>Corporate Social Responsibility</td>
</tr>
<tr>
<td>DAO</td>
<td>District Agricultural Officer</td>
</tr>
<tr>
<td>DO</td>
<td>District Officer</td>
</tr>
<tr>
<td>DC</td>
<td>District Commissioner</td>
</tr>
<tr>
<td>EA</td>
<td>Environmental Audit</td>
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<tr>
<td>EHS</td>
<td>Environment Health and Safety</td>
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<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
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<tr>
<td>ERC</td>
<td>Energy Regulatory Commission</td>
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<tr>
<td>ESIA</td>
<td>Environmental &amp; Social Impact Assessment</td>
</tr>
<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
</tr>
<tr>
<td>EMCA</td>
<td>Environmental Management and Coordination Act, 1999</td>
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<tr>
<td>EMP</td>
<td>Environment Management Plan</td>
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<tr>
<td>ESMP</td>
<td>Environmental and Social Management Plan</td>
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<tr>
<td>ESMP</td>
<td>Environmental and Social Monitoring Plan</td>
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<tr>
<td>GHGs</td>
<td>Green House Gases</td>
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<tr>
<td>Ha</td>
<td>Hectare</td>
</tr>
<tr>
<td>HEP</td>
<td>Hydro Electric Power</td>
</tr>
<tr>
<td>HOD</td>
<td>Head Of Department</td>
</tr>
<tr>
<td>HVF</td>
<td>Heavy Vehicle Fuel</td>
</tr>
<tr>
<td>IDO</td>
<td>Industrial Diesel Oil</td>
</tr>
<tr>
<td>KenGen</td>
<td>Kenya Energy Generating Company</td>
</tr>
<tr>
<td>KPC</td>
<td>Kenya Pipeline Corporation</td>
</tr>
<tr>
<td>KETRAC O</td>
<td>Kenya Electricity Transmission Company</td>
</tr>
<tr>
<td>KV</td>
<td>Kilo Volt</td>
</tr>
<tr>
<td>MVA</td>
<td>Mega Volt Amps</td>
</tr>
<tr>
<td>KW</td>
<td>Kilo Watt</td>
</tr>
<tr>
<td>KWS</td>
<td>Kenya Wildlife Service</td>
</tr>
<tr>
<td>L.R</td>
<td>Land Registration</td>
</tr>
<tr>
<td>MOA</td>
<td>Ministry of Agriculture</td>
</tr>
<tr>
<td>MSDS</td>
<td>Material Safety Data Sheet</td>
</tr>
<tr>
<td>NEMA</td>
<td>National Environment Management Authority</td>
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<tr>
<td>NFPA</td>
<td>National Fire Protection Association</td>
</tr>
<tr>
<td>NOx</td>
<td>Oxides of Nitrogen</td>
</tr>
<tr>
<td>OSHA</td>
<td>Occupational Health and Safety Act</td>
</tr>
<tr>
<td>PM</td>
<td>Particulate Matter</td>
</tr>
<tr>
<td>PPE</td>
<td>Personal Protective Equipment</td>
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<tr>
<td>SEM</td>
<td>Sustainable Environmental Management</td>
</tr>
<tr>
<td>SOx</td>
<td>Oxides of Sulphur</td>
</tr>
<tr>
<td>SHE</td>
<td>Safety Health and Environment</td>
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<tr>
<td>STD</td>
<td>Sexually Transmitted Diseases</td>
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EXECUTIVE SUMMARY

Background

The KPLC is a key player in the energy sector with the mandate to purchase Bulk Electricity, generate in off-grid areas, transmit, distribute and retail electricity in Kenya. As at May 2011, the number of customers was 1,720,868; circuit length for Transmission and Distribution power lines was 43,347 Kilometers; installed Capacity was 1599.9 MW and system peak demand was 1191.3 MW - recorded on 10th May, 2011. The National Population electricity access was 29% as at May 2011 and KPLC targets to increase connectivity to 40% by the year 2020.

Key important players that work hand in hand with the KPLC towards achieving the projected connectivity include Kenya Energy Generating Company (KenGen), Kenya Electricity Transmission Company (KETRACO), Rural Electrification Authority (REA), Geothermal Development Company (GDC) and Independent Power Producers (IPPs).

Electricity demand has grown at annual rate of 5.3% in the past five years and is expected to accelerate to over 10% per year due to implementation of vision 2030 projects. In Power studies by the energy sector stakeholders has revealed need for capacity enhancement.

The construction of Villa Franca Substation is in line with the KPLC’s 5 year corporate strategic plan and is in line with achieving the Country’s economic growth aspirations of Vision 2030.

The KPLC intends to construct and commission the proposed Villa Franca 66/11 kV Sub Station in Mombasa Road, Embakasi District to boost and stabilize electricity supply in the said area which is characterized by several industrial establishments and the lower part of Nairobi Central Business District. Currently, Kenya suffers from unreliable and unstable power grid infrastructure that is unable to keep pace with a demand for electricity at 5.3% annually. Power outages are common occurrence hence if the Villa Franca is not constructed the problem will certainly result in unreliable power supply for major upcoming light and heavy industries, residential flats and other clients in the catchment areas.

Project Background

Currently, national access to electricity is estimated at 29%. The Government of Kenya, as part of the 2030 Vision aims, to raise access to electricity to 40% by 2020. This increased level of electrification will result in increased demand for electricity which will require major expansion in power generation and transmission infrastructure in the country.

The interconnected system has an installed capacity of 1,375 MW comprising: 757 MW of hydro; 198 MW of geothermal; 0.4 MW of wind; 279 MW of thermal; 26 MW of co-generation; and 60 MW provided by emergency diesel generators. This power is transmitted countrywide through the transmission network, which comprises of 1,323 kilometres (km) of 66 kV transmission line, 2,122 km of 132 kV transmission line and 632 km of 66 kV transmission line. Kenya is currently interconnected with Uganda through a 132 kV double circuit transmission line rated at 2x86 MVA.

The existing transmission system capacity is constrained particularly during peak hours when system voltages in parts of Nairobi, West Kenya and Mount Kenya drop below acceptable levels, causing occasional load shedding despite the availability of generation capacity.
To address these constraints, Kenya Power & Lighting Company (KPLC) has identified the need for a number of substations across the country which is now at various stages of development.

The Nairobi north sub region accounts for sizeable percent of the country's demand for electricity in Nairobi region. The distribution network around region will therefore require major expansion and reinforcement in order to deliver power to the main load centres.

The proposed substation is expected to be funded by the government of Kenya through Kenya Power through funding raised through right issue. To ensure that the above project is implemented in an environmentally and socially sound and sustainable manner, KPLC has engaged the services of environmental experts registered by NEMA to conduct an environmental and Social Impact Assessment ESIA for the proposed project. The ESIA will be conducted as per the Environmental Management and Coordination Act 1999, and the subsequent Kenya Gazette Supplement No. 56 of 1st June 2003.

It should be noted at this stage that the exact location of the proposed substations has been determined after the completion of the technical studies for the project. These technical studies took into consideration, as appropriate, information that will come to light through the undertaking of the ESIA studies and way-leave negotiations with potentially affected parties.

**Project objectives**

The main objective is to construct a new 66/11kV substation. Specific objectives include:

- Designing and constructing of a 66/11kV Substation in compliance with electric generation regulatory authorities (ERC, Ministry of energy)
- Ensure sustainability of the project by complying with national laws especially those touching on environment

**Project Justification**

The project is justifiable in that it will stabilize power supply, improve on distribution line security hence cushioning against losses occasioned by power failures and blackouts and enhanced public safety. This will facilitate investments hitherto constrained by lack of electric power. It is important to note that this has been occasioned by the ongoing infrastructural development within the Nairobi County which will require high voltage power. Furthermore, the use of concrete poles for overhead sub-transmission lines and underground distribution network for some lines will be beneficial to the environment because it will greatly reduce deforestation and illegal logging for electric wooden poles. Although wood structures are relatively cheap compared to concrete pole structures the performance of wooden poles has proved poor due to their short life time and subsequent poor reliability and very high operational and maintenance costs.

**Study Methodology**

This study was carried out through desk and field investigations. The experts conducted extensive literature review pertaining to this project. During the field investigation, reconnaissance survey was conducted to gather information on biophysical and socio-economic aspects of the area and its environs.

In order to address these issues the study team adopted a participatory approach where the client and the immediate surrounding communities were consulted in addition to reviews and references to sources of information including legal statutes, design and relevant project documents. Among the key activities undertaken during the assessment are:
(i) Interviews and consultations with the immediate neighbouring land users. A questionnaire was circulated to the people in the neighbourhood to obtain their honest opinion regarding the project (samples have been annexed to this report),

(ii) Review of documents with necessary information on the proposed project details, the site planning and implementation plan as well as the desired nature building,

(iii) Physical inspections of the proposed site and photography,

(iv) Ambient air quality, noise levels and soil quality baseline measurements and analysis

(v) Evaluation of the activities around the site and the environmental setting of the wider area, through review of existing information, literature and physical observations,

(vi) Reporting, review and submissions.

The Environmental considerations evaluated for the proposed development include: Ecological considerations (biological diversity, sustainable use of ecological resources and ecosystem maintenance), social considerations (economic impacts, social cohesion or disruption, effects on human health, immigration or emigration, communication and effects on culture and objects of cultural value), Landscape considerations (views opened up or closed, visual impacts, compatibility with surrounding areas and amenity opened up or closed) and land use considerations (water sources, effects of proposal on surrounding land use potentials and possibility of multiple uses).

**Project Description**

The proposed Villa Franca substation is in the newly created Embakasi district which covers part of the Nairobi city. The project site is specifically located along Mombasa road immediately after General Motors. The proposed site is bordered to the south by new upcoming high-rise building requiring lots of power, to the north is the busy Mombasa road, to East is mainly characterized by several industrial facilities including Gapco printing Co ltd; Polythene Company, ASL and Buyline industries to the far east. To the west the proposed site has a permanent stone wall and is border by International Church Centre and the upcoming Imara Daima railway station and General Motors to the far west.

The design of the proposed substation will create a number of separate terraces at different levels as may be required by the topography of the area the platform will be divided up into several different including:

- Control building and substation access roads
- Transformer/reactor plinth
- Busbar sections
- Substation yards

The majority of the substation structures will be made up of tubular aluminum conductors, with earth wires. The power lines entering and leaving will be of different heights depending on the voltage they will be carrying. The various stages of the substation construction phases include the following:

- Construction of the substation access road to the substation
- Removal of vegetation within substation footprint
- Terracing and levelling of the site
- Installation of foundations for infrastructure such as transformers, control room and radio tower
- Compaction and filling with gravel of the areas between the foundations
- Creation of formal drainage and storm water control measures
- Delivery and installation of transformers, towers, busbar and associated infrastructure
• Construction of control room and administrative infrastructure
• Redirecting of existing 66 kV lines to enter and leave the substation
• Connection of the new infrastructure to the proposed 66 kV network
• Construction of perimeter fencing and lighting

Project cost
The project cost is one hundred and fifty million shillings only (Kshs. 230million).

Baseline information / description of project area environment

Project Location
The proposed Villa Franca substation is in the newly created Embakasi district which covers part of the Nairobi city. The project site is specifically located along Mombasa road immediately after General motors. The proposed site is bordered to the south by new upcoming high-rise buildings requiring lots of power, to the north is the busy Mombasa road, to East is mainly characterized by several industrial facilities including Gapco printing Co ltd; Polythene Company, ASL and Buyline industries to the far east. To the west the proposed site has a permanent stone and is border by International Church Centre. The site is well secured from the public because it is located within a highly industrialized zone with very minimal or completely no interaction with the public because the proposed site is well fenced off and is manned in 24hour basis on a daily basis.

Topography
The area has shallow clay stratum with near to surface underground rock which may offer the best foundation support for the proposed structures.

Key nearby physical features include the Nairobi about 100 metres from the project site, no significant trees or wildlife. Some distant physical features include Karura forest in the northern part Nairobi city, Ngong River to the south, and the Ngong hills stand towards the west of Nairobi, Mount Kenya towards the north and Mount Kilimanjaro towards the south-east. As Nairobi is adjacent to the Rift Valley, minor earth tremors occasionally occur.

Geology and Soils
The rocks in the Nairobi area mainly comprise a succession of lavas and Pyroclastics of the Cainozoic age and overlying the foundation of folded Precambrian schist's and gneisses of the Mozambique belt. The crystalline rocks are rarely exposed but occasionally fragments are found as agglomerates derived from former Ngong volcano. The soils of the Nairobi area are products of weathering of mainly volcanic rocks. Weathering has produced red soils that reach more than 50 feet (15m) in thickness. A number of subdivisions are recognized in the Nairobi area according to drainage, climatic regions and slopes, and other categories have been introduced for lithosols and regosols.

Climatic conditions
At 1,795 metres (5,889 ft) above sea level, Nairobi enjoys a moderate climate. Under the Köppen climate classification, Nairobi has a Subtropical highland climate. The altitude makes for some chilly evenings, especially in the June/July season when the temperature can drop to 10 °C (50 °F). The sunniest and warmest part of the year is from December to March, when temperatures average the mid-twenties during the day. The mean maximum temperature for this period is 24 °C (75 °F).
There are two rainy seasons but rainfall can be moderate. The cloudiest part of the year is just after the first rainy season, when, until September, conditions are usually overcast with drizzle. As Nairobi is situated close to the equator, the differences between the seasons are minimal. The seasons are referred to as the wet season and dry season. The timing of sunrise and sunset varies little throughout the year, due to Nairobi's close proximity to the equator.

Legal and Regulatory Framework

Kenya has over 77 statutes which relate to environmental concerns. Most of these statutes are sector specific, covering issues such as land use, occupational health and safety, water quality, wildlife, public health; soil erosion, air quality etc. Previously, environmental management activities were implemented through a variety of instruments such as policy statements, permits and licenses and sectorial laws.

There was however need for stronger enforcement machinery to achieve better standards in environmental management. The enactment of the environmental Management and Coordination Act in 1999 provided for the establishment of an appropriate legal and institutional framework for the management and protection of the environment.

Laws of particular concern to this project are:

- The Environment Management and Coordination Act, 1999
- Public Health Act (Cap. 242)
- Land Planning Act (Cap. 303)
- Physical Planning Act, 1996
- Local Government Act (Rev. 1998)
- Water Act, 2002
- Energy Act of 2006
- The Standards Act Cap 496
- Penal Code Act (Cap.63)
- The Wildlife Conservation and Management Act, Cap 376
- The Lakes and Rivers Act Chapter 409
- The Forestry Services Act, 2005
- Occupational Safety and Health Act, 2007
- Work Injury and Benefits Act, 2007
- Occupiers Liability Act (Cap. 34)
- The Radiation Protection Act (Cap 243 Laws of Kenya)
- The Traffic Act Chapter 295 Laws of Kenya
- The Public Roads and Roads of Access Act (Cap 22 Laws of Kenya)
- The Way leaves Act Cap 292
- The Agriculture Act, Cap 318 of 1980 (revised 1986)
- Antiquities and Monuments Act, 1983 (Cap 215)
- The Registration of Titles Act Cap 281
- The Land Titles Act Cap 282
- The Land Acquisition Act Chapter 295 Laws of Kenya
- The Civil Aviation Act Cap 394
- World Bank /IFC Environment and Social Safeguards Policies
- Environment Assessment (Operational Policy, OP/BP 4.01)

Project Potential Impacts and Mitigation Measures

Both positive and negative impacts that are associated with the proposed 2X23MVA 66/11 kV of the substation in Villa Franca during the construction phase, operation phase and decommissioning phase were identified. The following positive and negative impacts are associated with the proposed project.

Positive Impacts

The following are positive impacts associated with the proposed 2X23 MVA 66/11 kV of the distribution substation in Villa Franca:
• Reliable supply of electrical energy.
• Improved electricity supply in support of the Vision 2030 of the Government of Kenya.
• Direct and indirect skilled and no-skilled employment opportunities.
• Gains in the local and national economy and increase in revenue.
• Provision of market for supply of building materials.
• Informal sectors benefits.
• Optimal use of land.
• Improvement in security as a result of lighting.
• Improvement in social infrastructures.
• Acceleration of the investment process in the region.

Negative Impacts
Against the background of the above positive impacts, there will be negative impacts emanating from the construction and subsequent operation activities of the facility. The negative impacts will include:

**Air Emissions:** Dust will be generated during construction. This will affect construction staff as well as the neighbours. The impact will be direct, temporary and minor.

**Noise Pollution and increased vibration:** The proposed civil works and operation of the facility will bring about an increase in cumulative noise levels. Noise pollution from the proposed development during construction noise will be generated from the construction machines and construction workers during day time. Considering the existing background noise level, the operations activity during daytime is not expected to seriously affect the noise level in areas adjacent to the project site.

**Fire Hazards:** Potential adverse impacts related to fire hazards remain a main feature of this project. The substation will deal with combustible products like the transformer oil and the risks associated with fire hazards form a significant adverse impact on the human health and environment.

**Soil Erosion:** There is a likelihood of localized soil erosion during the civil works which entail compacting, earth excavations and moving works. However, these impacts will be largely localized to the project area and will only occur during the construction phase.

**Oil Spills:** The refilling and emptying of the transformer oil can lead to accidental oil spills. There is a possibility of oil leaking from the transformers can lead to oil spills. This may lead to potential contamination of surface and groundwater as well as soil.

**Increased transformer oil Consumption:** The proposed 2X23 MVA 66/11 kV distribution substation shall consume large amount of transformer oil in the process of step up and step down of the electric voltage for use. Since transformer oil is produced mainly through nonrenewable resources, this will have adverse impacts on these nonrenewable resources base and their sustainability.

**Liquid Waste Generation:** Since the substation’s transformers will use transformer oil to step up and step down of the electric voltage for use, sludge and other effluents will be generated. Waste oil is also an output of the project that poses potential environmental hazard in case of poor handling and disposal methods. This may affect the environment through water and soil contamination. The liquid waste to be generated is hazardous hence may cause long-term injurious effects to the environment. The waste would consist primarily of spent lubricants and transformer oil.
Increase in Traffic flow: During the construction phase, heavy vehicles moving in and out of the project site are likely to increase traffic along the main road near the project site and could cause congestion. Deliveries of transformer oil by road during project operation will also increase the amount of traffic flow in the project area.

Strain in local resources: The proposed development is likely to strain the resources available like water in the area in the short term mostly during the construction phase. This is as a result of increased population in the project without commensurate services and facilities.

Occupational Health and Safety: There will be potential risk of occupational hazards that could lead to occupational accidents and during construction and operation of the project. Adverse impacts on the workers health and safety is likely to occur especially through workers interaction with the equipments and machines during construction and operation of the substation. Accidents, injuries and diseases are likely to occur during project construction and operations and this could potentially harm the health of the employees.

Solid waste generation: Solid waste materials during construction and solid waste during operation are likely to be encountered. The waste will include soil, construction materials and office papers.

Visual Intrusion: The proposed project will change the natural appearance of the project area landscape.

Proposed Mitigation Measures

Air Emissions Mitigation Measures
- During construction, any stockpiles of earth should be enclosed / covered / watered during dry or windy conditions to reduce dust emissions;
- Construction trucks removing soil from the site, delivering sand and cement to the site should be covered to prevent material dust into the surrounding areas;
- During construction, where water is available, sprinkle the construction area with water to keep dust levels down.
- Masks should be provided to all personnel in areas prone to dust emissions throughout the period of construction.
- Drivers of construction vehicles must be supervised so that they do not leave vehicles idling, and they limit their speeds so that dust levels are lowered.
- Maintain all machinery and equipment in good working order to ensure minimum emissions including carbon monoxide, NO\textsubscript{x}, SO\textsubscript{x} and suspended particulate matter;
- No burning of any waste materials whatsoever should be permitted within the site both during construction and operation;
- Use of low sulphur fuel for SO\textsubscript{x} where available or installing desulphurization equipment;

Dust Emission Mitigation Measures
- Fugitive emissions from site work to be eliminated or minimized by applying water on a need to need basis to unpaved surfaces and exposed construction areas during the dry season;
- Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard.

Noise Abatement Measures
It is recommended.

All construction equipments and machinery to be used must be tested to verify if they are compliant with Kenya and the internationally acceptable standards of noise. Tested noise levels should be recorded as baseline and used for future monitoring.

Noise emitting equipment should be properly maintained.

All workers in the project site must be equipped with suitable and adequate Personal Protective Equipment (PPE) for hearing protection.

**Soil Erosion Mitigation Measures**

- Excavations of the site will be confined only on the sections of the substation where structures and equipment shall be located.
- Excavated earth will be held away from the drains and on locations of the site not susceptible to surface runoff of storm water,
- The earth removed for external disposal will require to be deposited on sites without the risk of being washed down during rains and where it will not compromise other land use activities in those areas,
- Caution will be required during construction at times of heavy rains.
- Re-vegetate exposed areas around the site so as to mitigate erosion of soil by storm water runoff.
- The final site grade should facilitate drainage and avoid flooding and pooling. A site drainage plan should be developed to protect against erosion.
- Protecting stockpiles through the use of silt fencing and reduced slope angles should be used to minimize soil erosion during construction.
- Installation of drainage ditches, construction of runoff and retention ponds is necessary. Minimization of disturbances and scarification of the surface should be observed to reduce erosion impacts.
- All slopes and working surfaces should be returned to a stable condition.
- Topsoil on the final site would be graded and planted as appropriate.

**Oil Spill Mitigation Measures**

- To prevent oil spills and environmental contamination, the substation should be designed with spill prevention and detection systems to protect the environment especially where the transformers will be located.
- Need to design appropriate protection devices against accidental discharge of transformer oil substances.
- Storage and liquid impoundment areas for fuels, raw and in-process material solvents, wastes and finished products should be designed with secondary containment to prevent spills and the contamination of soil, ground and surface water.
- The substation design should provide adequate storage areas for the transformer oil.
- Frequent inspection and maintenance of the transformers should be done to minimize spilling.
- A written substation response plan should be prepared and retained on the site and the workers should be trained to follow specific procedures in the event of a spill.
- Constructing and maintaining facilities should be done so as to enable the easy removal of rainwater from the secondary containment structures and proper removal of oil from the surface of the accumulated storm water.
- The substation operator should ensure the proper containment or collection and disposal for the used transformer oil. In the Environmental Management Plan (EMP), disposal of used oil will be the responsibility of the project operator.
All waste oils from maintenance of transformers and other associated equipments should be segregated and disposed properly by a reputable/registered waste handler in accordance with the waste disposal plan.

**Solid waste generation**
- The solid waste would consist primarily of packaging materials for lubricants, used oil filters and used rags.
- Contractor should develop a solid waste disposal plan which includes the provision of receptacles at strategic points within the site, recycling programmes for recyclable wastes.
- Solid wastes must be segregated and labelled to separate hazardous from non-hazardous waste. The substation should be provided with an inbuilt solid waste collection bin with compartments for recyclable materials, biodegradable materials and hazardous materials.
- The most appropriate options in waste management are identification of the waste types, segregation into the various categories and establish suitable mechanisms of collection, storage, transfer and final disposal. The ultimate destination for each of the waste categories should also be known.
- The contractor and project operator should engage a refuse handling company to remove the wastes from the site to the recommended waste management site.
- Warning signs against littering and dumping wastes in wrong places within the project site should be erected.
- Earth excavated from the construction site should be used as land fill in quarries or other excavated sites within or outside the project site. It is suggested that the contractors identify suitable land fill sites.
- Solid waste audit should be an integral section of the annual environmental audit of premises upon commissioning.

**Hazardous waste**
- The amount of hazardous waste generated will be very low and possibly originate from maintenance sources.
- Hazards on the site should be clearly marked and the entire workforce trained to recognize the hazards and familiarize themselves with procedures to be followed before entering hazardous areas.

**Fire Prevention Measures**
- The project site must have in place appropriate and adequate fire fighting equipments of recommended standards and in key strategic points.
- A fire alarm system should be installed in the substation.
- A fire evacuation plan must be posted in various points of the project site including procedures to take when a fire is reported. All workers must be trained on fire management and fire drills undertaken regularly.
- A fire assembly point must be identified and labeled accordingly.

**Public and Workers Health and Safety Mitigation Measures**
- All workers entering the construction site must be equipped with Personal Protective Equipment (PPE) such as ear muffs, safety footwear, overalls, gloves, dust masks, among others. The PPE’s should be those that meet the international standards.
• Personal protection gear must be provided and its use made compulsory to all. The entire workforce of the substation should be trained in the use and care of protective gear and in all relevant safety measures.
• Restricted ‘ENTRY’ signs should be installed to keep away unauthorized persons from access to restricted areas.
• Machines and Equipments must be operated only by qualified staff and a responsible person should be on site at all times to ensure adherence to safety requirements.
• The contractor and operator must develop a workplace Safety and Health Policy Manual which should be communicated to all persons at the site.
• The contractor and operator should develop a Substation Response Plan for handling any emergencies arising thereof during the construction.
• During construction, temporary washrooms should be constructed with soak-pits that can be easily exhausted.
• A well-equipped first aid kit and a person who has been trained in first aid should always be available at the site.

Visual Impact
• Structures at the site should be designed in such a way that they will improve the beauty of the surroundings.
• Restore site area through backfilling, landscaping and planting of trees, shrubs and grass on the open spaces to re-introduce visual barriers,
• Landscaping and planting of trees at the site would also serve to mitigate any perceived negative visual impacts

Economic and Social Impact
• The Proponent should continually participate in community development activities where possible as part of their corporate social responsibility.
• Casual labourers should be sourced from the local community to boost them economically and create employment for the youth.
• Minimization of increased Water Demand: The proponent of the proposed 2X 23MVA 66/11 kV substation in Villa Franca shall ensure that water is used efficiently at the site by sensitizing construction staff to avoid irresponsible water use during construction.

Public Consultation
Consultations were also undertaken as part of the EIA in order to obtain the views of immediate community, interested groups and affected groups within the site’s immediate area of influence. The consultation was done with the immediate neighbourhood of the proposed site and involved use of a semi-structured public participation form. In general the project is acceptable and no objections were raised concerning the proposed 2X23MVA 66/11 kV distribution substation.

Conclusions and Recommendations
From the study it is evident that the construction and operation of the proposed 2X23 MVA 66/11 kV transmission substation will bring positive effects in the project area including improved supply of electricity, creation of employment opportunities, gains in the local and national economy, provision of
market for supply of building materials, Informal sectors benefits, Increase in revenue, Improvement in the quality of life for the workers, Optimal use of land and Improved security. However, although the project will come with various positive impacts, negative impacts will also be experienced hence the need to also look at them.

The proposed Villa Franca Substation site has low environmental sensitivity from a botanical, archaeological and Avi-fauna perspective. Social impacts are expected to be of low significance with a good chance of mitigation, largely due to the fact that the proposed activity is in line with the existing land uses within the area. Visual impacts of the construction are expected to be minimal due to the fact that the proposed substation will not interfere with the general landscape of the proposed project site, and the viewing audience is minimal due to the peri-urban of the site. The height of the new structures is similar to that of those already existing at the other substation.

No objections to the proposed construction and operation of the substation were received during the public consultation process.

An Environmental Management Plan (EMP) outline has been developed to ensure sustainability of the site activities from construction through operation to decommissioning. The plan provides a general outlay of the activities, associated impacts, mitigation action plans and appropriate monitorable indicators. Implementation timeframes and responsibilities are defined, and where practicable, the cost estimates for recommended measures are also provided.

A monitoring plan has also been developed and highlights some of the environmental performance indicators that should be monitored. Monitoring creates possibilities to call to attention changes and problems in environmental quality. It involves the continuous or periodic review of operational and maintenance activities to determine the effectiveness of recommended mitigation measures. Consequently, trends in environmental degradation or improvement can be established, and previously unforeseen impacts can be identified or pre-empted.

It is strongly recommended that a concerted effort is made by the site management in particular, to implement the Environmental Management and Monitoring Plan provided herein. Following the commissioning of the 2X23MVA 66/11 kV distribution substation, statutory Environmental and Safety Audits must be carried out in compliance with the national legal requirements, and the environmental performance of the site operations should be evaluated against the recommended measures and targets laid out in this report.

Considering the proposed location, construction, management, mitigation and monitoring plan that will be put in place, the project is considered important, strategic and beneficial and may be allowed to proceed.
CHAPTER ONE: INTRODUCTION AND PROJECT BRIEF

1.1 Project Background

The KPLC is a key player in the energy sector with the mandate to purchase Bulk Electricity, generate in off-grid areas, transmit, distribute and retail electricity in Kenya. As at May 2011, the number of customers was 1,720,868; circuit length for Transmission and Distribution power lines was 43,347 Kilometers; installed Capacity was 1599.9 MW and system peak demand was 1191.3 MW - recorded on 10th May, 2011. The National Population electricity access was 32% as at December 2012 and KPLC targets to increase connectivity to 40% by the year 2020.

Key important players that work hand in hand with the KPLC towards achieving the projected connectivity include Kenya Energy Generating Company (KenGen), Kenya Electricity Transmission Company (KETRACO), Rural Electrification Authority (REA), Geothermal Development Company (GDC) and Independent Power Producers (IPPs).

Electricity demand has grown at annual rate of 5.3% in the past five years and is expected to accelerate to over 10% per year due to implementation of vision 2030 projects. In Power studies by the energy sector stakeholders has revealed need for capacity enhancement.

The construction of Villa Franca Substation is in line with the KPLC’s 5 year corporate strategic plan and is in line with achieving the Country’s economic growth aspirations of Vision 2030.

The KPLC intends to construct and commission the proposed Villa Franca 66/11 kV Sub Station in Villa Franca, Embakasi District to boost and stabilize electricity supply in the said area and the lower part of Nairobi Central Business District. Currently, Kenya suffers from unreliable and unstable power grid infrastructure that is unable to keep pace with a demand for electricity at 5.3% annually. Power outages are common occurrence hence if the Villa Franca is not constructed the problem will certainly result in unreliable power supply for major upcoming light industries and other clients in catchment areas.

The proposed Sub-station will have one overhead 66 kV medium voltage incoming feeders which will be connected from the Embakasi transmission substation. The Substation will also have fourteen 6 kV outgoing feeders which will be connected to the existing grid. Two additional 11 KV outgoing feeders will also be installed for capacity bank. Half of the outgoing feeders will leave the Substation as underground cables while the other half will be overhead cables.

Two 23MVA transformers will be installed and a control room housing protection equipment will be constructed.

Construction of a substation to serve the part of Nairobi Metropolitan will significantly reduce the current high losses and poor supply quality by overstrained 66kV lines in the region. Furthermore, construction of a 66/11 Substation with a 66kV bus-bar provides will provide additional flexibility as it will be possible to add more 66kV lines in future if required.

The proposed distribution line is expected to be funded through Government of Kenya through right issue funds. To ensure that the above project is implemented in an environmentally and socially sound and sustainable manner, KP has engaged the services of environmental experts registered by NEMA to conduct an environmental and Social Impact Assessment ESIA for the proposed project. The ESIA will...
be conducted as per the Environmental Management and Coordination Act 1999, and the subsequent Kenya Gazette Supplement No. 56 of 1st June 2003.

The EIA was conducted to assess any potential impacts (both negative and Positive) that may arise from the construction, operation and decommissioning of the proposed Villa Franca Substation. The goal of the EIA is to enhance sustainability of vital ecosystem, to improve or restore ecosystem health and biodiversity. Environmental sustainability in relation to the proposed project will be enhanced by designing and implementing the Substation in an environmentally sound manner to ensure the ecosystems ability to meet the needs of future generations is not compromised. The overall benefits of the proposed Primary Sub Station are expected to outweigh the potential negative impacts. The aim of the EIA is to enable National Environment Management Authority (NEMA), the Public, Local and the relevant government Authorities and the Proponent to consider the potential environmental consequences of the proposal, and to make recommendations to reduce the environmental consequences where necessary. This EIA in essence provides the basis for sound ongoing Environmental Management.

1.2 Scope and Objectives of the Study

The National Environment Management Authority (NEMA) Policy on all new projects, programs or activities requires that an Environmental Impact Assessment is carried out at the planning stages of any proposed undertaking that is out of character with the host environment to ensure that Potential environmental and social impacts are taken into consideration during the design, construction, operation and decommissioning of the facility.

1.2.1 Scope

The main objective of this assessment was to identify significant potential impacts of the project to environmental and social aspects, and 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 phases of its implementation.

The assessment was undertaken in full compliance with the Environmental Management and Coordination Act 1999 and also the Environmental Impact Assessment and Audit Regulations, 2003. In addition, appropriate sectoral legal provisions relevant to such projects have also been referred to for the necessary considerations during the construction, commissioning, operation and decommissioning of the proposed substation associated.

Specific objectives of the study included the following:

- Present an outline of the project background,
- Establish the environmental baseline conditions of the project area and review all available information and data related to the project,
- Identify key areas for environmental, health and safety concerns as well as the anticipated impacts associated with the proposed project implementation and commissioning,
- Establish a comprehensive environmental management plan covering the construction, operation and decommissioning phases of the project,
Preparation of a comprehensive Project Report in accordance with the local environmental legislation and submission to NEMA for further instructions and/or approval.

The ESIA scope largely covered the following areas:

**Baseline Conditions:**
- Environmental setting (climate, topography, geology, hydrology, ecology, water resources sensitive areas, baseline noise levels, air quality and soil quality analysis.
- Socio-economic activities in the surrounding areas (land use, human settlements, economic activities, institutional aspects, water demand and use, health and safety, public amenities, etc.),
- Infrastructural issues (roads, water supplies, drainage systems, electricity distribution system, etc.).

**Legal and policy framework:**
- Focusing on the relevant national environmental laws, regulations and by-laws and other laws and policies focusing on allied activities relative to the proposed project.

Interactive approach was adopted for the immediate neighbourhood in discussing relevant issues including among others:
- Land use aspects,
- Neighborhood issues,
- Project acceptability,
- Social, cultural and economic aspects,
- Environmental Impacts
  - Physical impacts,
  - Biological impacts,
  - Legal Compliance.

**1.2.2 Terms of Reference (ToR) for the ESIA Process**

The ESIA Experts were assigned the task of carrying out Environmental and Social Impact Assessment of the proposed Villa Franca substation. The scope covered various activities related to; construction works of the proposed development which included all works of civil, mechanical, electrical or other nature necessary to construct, commission and decommissioning of the substation project. The output of this work is a comprehensive Environmental and Social Impact Assessment Study Report which will aid NEMA in deciding whether to approve or disapprove installation and operation of the substation Project as well as meeting the requirements of the World Bank Environmental and Social Safeguard Policies.

The ESIA experts conducted the study guided by the following terms of reference:
- Establish the suitability of the proposed location to construct the 66/11kV Substation.
- A concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project.
- A description of the technology, procedures and processes to be used, in the implementation of the project.
• A description of materials to be used in the construction and implementation of the project, the products, by-products and waste to be generated by the project.
• A description of the potentially affected environment.
• A description of environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated.
• Analysis of alternatives including project site, design and technologies.
• Development of an Environmental Management Plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment, including the cost, timeframe and responsibility to implement the measures.
• Provide an action plan for the prevention and management of the foreseeable accidents and hazardous activities in the course of project construction, operation and decommissioning.
• Propose measures to prevent health hazards and to ensure safety in the working environment for the employees and the neighbouring community.
• An identification of gaps in knowledge and uncertainties which were encountered in compiling the information.
• An economic and social analysis of the project.

1.3 ESIA Approach and Methodology
The approach chosen in undertaking this study was careful to take into account EMCA, 1999 requirements as well as the Environmental Impact Assessment and Audit Regulations, 2003. It involved largely an understanding of the project background, the preliminary designs and the implementation plan. The approach and methodology applied during the study enabled collection of both primary and secondary data. Qualitative and quantitative methods of data collection were employed. Secondary data was obtained through literature reviews while primary data was obtained through physical observations, photography, interviews and stakeholders’ consultation.

The initial stage of this assessment was project screening. Screening of the project sought to ascertain whether or not this project falls within a category that requires EIA prior to commencement. Other considerations made during this stage included a preliminary assessment of the environmental sensitivity of the areas within the proposed site through assessment of project maps. This screening indicated that the proposed power substation is among the listed projects under Schedule 2 of EMCA, 1999 thus requires an EIA study.

Project scoping was the next stage which was done to delineate project issues that required detailed analysis. This step involved collection of primary and secondary data through field visits and literature review respectively.

Key activities undertaken during the assessment included the following:
• Physical inspections of the proposed project area
• Literature review of relevant documents
• Stakeholder consultations with the line ministries and project affected persons
• Report writing

Desk study/literature review
A critical literature review of secondary data was done to establish the following:
• Relevant legislations and institutional framework governing the proposed project
• Licenses and permits requirements and conditions;
• Baseline information of the project area
• Types of waste likely to be generated.

Public Consultations
Section 17 of the Environmental (Impact Assessment and Audit) Regulations of 2003, requires that all ESIA Studies undertake Public Consultation (PC) as part of the study. The aim of the PC is to ensure that all stakeholders interested in a proposed project such as project beneficiaries and the general public in the vicinity of the proposed project be identified and their opinion considered during project planning, design, construction, operation and decommissioning phase. Consequently, public consultations were carried out in the project area in a bid to inform the public and other interested parties on the proposed project and obtain their views on the same. The consultations also presented an opportunity for the community to raise issues and concerns pertaining to the project.

Public consultations were conducted thorough administering of questionnaires to few neighbors of the project while key stakeholder forum organized at district headquarters in the DC’s board room. Key stakeholders views on the project were solicited through interviews and discussions with the heads of various line ministries at the district.

In addition, baseline information was obtained through physical investigation of the site and the surrounding areas, informal interviews with a random sample of people from the surrounding community, use of public participation forms, photography, and discussions with other stakeholders.

The key activities undertaken during the assessment were:

• Continuous discussions with the stakeholders and accessing other sources of information on the proposed project details, the site planning and implementation plan,
• Physical inspection of the proposed site, photography, and interviews with people in the immediate neighbourhood. Public participation forms were used to record their opinion regarding the project.
• Evaluation of the activities around the site and the environmental setting of the wider area. This was achieved through existing information, literature and physical observations,
• Review of available documentation,
• Reporting and submission.

Below is an outline of the basic ESIA steps that were followed during this assessment:
Step 1: Project Concepts

The project details, scope, design, implementation, tests, commissioning were first analyzed.

Step 2: Terms of Reference (ToR)

The terms of Reference were developed guided by EMCA 1999 and The Environmental Impact Assessment/ Audit regulations 2003. Any new developments out of character with their surrounding must have an EIA undertaken; for review, Approval and Licensing by NEMA.

Step 3: Project Screening
Details about baseline conditions and potential environmental and social impacts were collected through desktop study, stakeholder consultations, site visits, photography, and inductive methods.

**Step 4: Identification of Potential Environmental and Social Impacts**
The Potential Environmental impacts were identified, Classified and magnitude determined.

**Step 5: Impact Assessment and Consultations**
The Environmental and Social Impacts were analyzed, assessed and discussed in details involving consultations with the Proponent and other stakeholders.

**Step 6: Formulation of Mitigation measures**
Mitigation measures to ameliorate or minimize the potential Environmental and Socio-economic impacts were formulated for the entire project life.

**Step 7: Development of an Environmental & Social Management and Monitoring Plan:**
An E&SMMMP for the project life was developed indicating parameters to be monitored, persons responsible, timing and costs involved.

Specific issues covered in the project report include but are not limited to:
- Name of the proponent, address and contact person
- Title of the project
- Objectives and scope of the project
- Nature of the project;
- Location of the proposed project, including the physical area that may be affected by the project’s activities;
- Types of activities that will be undertaken during the project construction, operation and decommissioning phases;
- Design of the project;
- Proposed Project budget;
- Materials to be used, products and by-products, including waste to be generated by the project and the method(s) of their disposal;
- Potential environmental impacts of the project;
- Economic and social impacts to the local community and the nation in general;
- Views of the public/potentially affected people about the project; and
- An Environmental and Social Management Plan (E&SMP) for the entire project cycle to include mitigation measures to be taken during and after implementation of the project and an action plan for the prevention and management of foreseeable accidents during the project cycle.
- An Environmental and Social Monitoring Plan (ESMP)
Study Team
This ESIA study was conducted by a team of experts that comprised the following professionals.

Table 1-1: Team of Experts

<table>
<thead>
<tr>
<th>NAME</th>
<th>POSITION</th>
<th>AREA OF SPECIALITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wilfred Koech</td>
<td>Lead Expert, NEMA Reg. No. 0259</td>
<td>Environmental Health Expert</td>
</tr>
<tr>
<td>Roseline Njeru</td>
<td>Associate Expert Reg. No. 1862</td>
<td>Socio – Economist</td>
</tr>
<tr>
<td>Eng. Eliud Limo</td>
<td>Senior Transmission Engineer</td>
<td>Electrical Engineer</td>
</tr>
<tr>
<td>Pius Ngari</td>
<td>Associate Expert Reg. No. 1862</td>
<td>Environmental Studies</td>
</tr>
<tr>
<td>Simon Mwangangi</td>
<td>Lead Expert, NEMA Reg. No. 2046</td>
<td>Natural Resources scientist</td>
</tr>
<tr>
<td>Jacob Akinala</td>
<td>Lead Expert, NEMA Reg. No. 0729</td>
<td>Occupational Health and Safety</td>
</tr>
<tr>
<td>Samuel Abaya</td>
<td>Lead Expert, NEMA Reg. 1223</td>
<td>Social Economist</td>
</tr>
<tr>
<td>James Gitau</td>
<td>Technical safety Engineer</td>
<td>Electrical engineer</td>
</tr>
<tr>
<td>Joseph Magarer</td>
<td>1st Assistant Engineer</td>
<td>Geotechnical studies specialist</td>
</tr>
<tr>
<td>George Oselu</td>
<td>Forester</td>
<td>Forestry and biodiversity specialist</td>
</tr>
</tbody>
</table>

Figure 1-1: Summary of ESIA procedure
2 CHAPTER TWO: DESCRIPTION OF PROPOSED DEVELOPMENT PROJECT

2.1 Introduction
This chapter provides an overview of the proposed substation as currently designed. The description borrows largely from documentation availed by the Kenya Power.

2.2 Location of the Project
The proposed Villa Franca substation is in the newly created Embakasi district which covers part of the Nairobi city. The project site is specifically located along Mombasa road immediately after General motors. The proposed site is bordered to the south by new upcoming high-rise buildings requiring lots of power, to the north is the busy Mombasa road, to East is mainly characterized by several industrial facilities including Gapco printing Co ltd; Polythene Company, ASL and Buyline industries to the far east. To the west the proposed site has a permanent stone and is border by International Christian Centre. The site is well secured from the public because it is located within a highly industrialized zone with very minimal or completely no interaction with the public because the proposed site is well fenced off and is manned in 24hour basis on a daily basis.

Figure 2-1 Map showing the proposed substation site
Figure 2-2: Temporary sentry houses for Guards at the Middle of the plot and along the concrete fence on the Eastern part border of the proposed site.

Figure 2-3: Pictorial illustrations of the different sections of the proposed substation site.

Figure 2-4: Busy Mombasa road with several vehicles bordering the plot to the North.
2.3 Project objectives
Kenya power desires to construct a 66/11 kV substation which will comprise of one 23MVA transformer to step down power for distribution within Nairobi County. Specific objectives of the project include; boosting the existing load to stabilize power supply and ensure quality power for the customers not to mention meeting the increasing power demand.

The main objective is to construct a new 66/11 kV Substation. This is to upgrade the existing power network. Specific objectives include:
- Designing and constructing of a 66/11 kV substation in compliance with electric generation regulatory authorities (ERC, Ministry of energy)
- Ensure sustainability of the project by complying with national laws especially those touching on environment.

2.4 Project Justification
Power Load studies have shown need for capacity enhancement to ensure stable and quality power supply amid increasing power demand. The Villa Franca substation project is justifiable in that it will stabilize power supply, improve on distribution line security hence cushioning against losses occasioned by power failures and blackouts. There is also need to reduce technical losses associated with long transmission distances. The sections of Nairobi within Embakasi, Imara Daima, Industrial area, General motors and Villa Franca are supplied with power from Embakasi Substation located in Embakasi district about 5kms from the proposed site.

The Substation needs to be as close as possible to the area it will serve to minimize on technical losses associated with long distances of transmission. The company got has a relatively big parcel of land; it is located in Embakasi sub-location, Off Mombasa road and Tecla Lorupe junction, it can be accessed through New Imara Daima estate drive and it is on this plot that the proposed Villa Franca Substation will be constructed. The commissioning of the Substation will guarantee stable and quality supply of electricity to Nairobi County and its environs and specifically industrial area.

2.5 Project Need
The existing 11kV electrification network in East lands in Nairobi City area is highly constrained in terms of capacity and is therefore unable to supply additional electrification load growth in entire region of Nairobi city. It is therefore imperative for KPLC to establish a new 66/11kV network of power-lines and substations on the East-lands in Nairobi County to strengthen the existing electrification network and cater for the projected electrification load in the future.

In addition, the development of the Villa Franca substation 66kV is part of the larger Nairobi County electrification project in which Kenya Power has proposed constructing substations to form a closed circuit (ring) of lines on the different areas. As such, the development of the new substation at Villa Franca is imperative in enabling KPLC to establish the required closed circuit system of powerlines within Nairobi City and its environs.

2.6 Project Desirability
The proposed Villa Franca substation will provide an additional supply of electricity to Nairobi County. A large number of households in this area currently faces frequent power outages and are reliant upon candles for lighting purposes. A dedicated, additional supply of electricity will enable many previously
poorly serviced households to receive quality electricity. Should the proposed developments not be undertaken, the risk for electrical faults and associated power outages, which are currently occurring in the area on a relatively frequent basis, will increase significantly. In addition, the ability to supply new customers would be severely limited in that it is anticipated that the demand for electricity in the study area will soon exceed the capacity of KPLC’s existing 66kV electrical system. This will consequently have a significant negative impact on existing and proposed new developments in the area, including industries, recreational, residential houses and education.

2.7 Description of the Project

2.7.1 Existing Vegetation

The proposed site is currently bare. Only a small section is currently being utilized by the proponent as concrete poles storage area. The area is characterized by the following tree and vegetation species; acacia totalis, Lantana Camara, star and couch grass. The area is mainly industrial zone with small portion of residential and there is no an agricultural activity on the areas.

The vegetation that will be cleared on the proposed site is mainly scattered short shrubs such as lantana camara, marigold and grass. Physical/ manual clearing is recommended for this project.

This presents a description of the project in terms of size, access and proposed layout.

Figure 2-5: Couch grass and Acacia Totalis found on the Villa Franca proposed site along Mombasa Road

Figure 2-6: Some of the vegetation of Lantana Camara and Acacia found on the proposed site
2.7.2 Technical aspects of a substation

A sub-station is a vital component electricity generation, transmission and distribution system. The main role of a substation is to transform voltages from high to low and vice versa, using transformers and other heavy-duty electrical switchgear. The project is a step down substation i.e. 66kV to 11kV. After stepping down, electricity is fed to distribution lines running to specific geographic areas to supply customers.

The proposed 66/11 kV substation will have the following components; two 23MVA transformers and their associated bays, in-coming & out-going feeders, switch gears, bus bars, steel structures, cabling units, lightning arrestors, a parking bay, control panels and a guard house.

The substation will be fed from the existing Embakasi 132/66 kV substation. The substation will also be fed from the industrial area 66kV substation. Two 23MVA transformers will be installed to step down power at the substation. The main purpose will be to boost the electrical power supply within the neighbourhood. The windings of such large transformer are immersed in transformer oil. It is a highly refined mineral oil that is stable at high temperatures and has excellent electrical insulating properties. Its functions are to insulate, suppress corona and arcing, and to serve as a coolant. Also, because it provides part of the electrical insulation between internal live parts, it must remain stable at high temperatures over an extended period.

The substation will be constructed on approximately 70m by 70m size of land.

Associated facilities include; a small office and a control room to house the high voltage monitoring and control instrumentation and equipment. The sub-station will also be equipped with KPLC’s own internal micro-wave telecommunications facilities. When operational, the sub-station will be manned on a 24-hour basis. A sentry house will also be constructed for the watchman.

The substation site installations will include:
- Reactors
- Transformers (Current and Voltage/Potential Transformer)
- Disconnect Switches
- Bushings
- Surge arresters
- Standoff Insulators and
- Earthing switches
- An open area for electrical equipment such as the air-cooled reactors, typically about 4.5m high, and switchgear, typically about 5m high.
- An auxiliary services building which will be built in the same style as the National Grid switchgear building.
- Fire deluge pump house and tank.
- Lighting
- Fencing
- Air break switches
- Voltage regulators
- Lightning Arresters
- Control house
- Cutoff switches
• Distribution busbars
• Metal clad switch gear
• Battery room among other components and facilities

2.7.2.1 Main sub-station switchgear
Power is brought to the sub-station on 66 kV transmission lines that end on a large steel structure called a terminal tower. Power is then transferred into the main electrical switchgear inside the sub-station perimeter.

2.7.2.2 Transformers
KPLC is planning to install two EHV transformers at the Villa Franca Sub-station. Their main purpose will be to boost the electrical power feed in the planned 66 kV line. The windings of such large transformers are immersed in transformer oil. It is a highly refined mineral oil that is stable at high temperatures and has excellent electrical insulating properties. Its functions are to insulate, suppress corona and arcing, and to serve as a coolant. Also, because it provides part of the electrical insulation between internal live parts, it must remain stable at high temperatures over an extended period.

Formerly, polychlorinated biphenyl (PCB) was used as it was not a fire hazard in indoor power transformers and it is highly stable. However, PCB by-products are unstable and toxic, and also accumulate in the environment. These products are, therefore, no longer permitted and will not be used at the proposed Villa Franca Sub-station.

Great care is taken in the construction and operation of sub-stations and transformers, in particular, to ensure that there is no uncontrolled release of transformer oil into the environment. It is proposed that transformer plinths are surrounded by bund walls and potential spillages are drained into sumps as shown in Figures 2-2.

![Figure 2-7: A typical Transformer and bund wall and oil holding dam](image-url)
2.7.2.3 Buildings
When operational, the sub-station is not manned on a 24-hour basis. Extensive buildings and service facilities are, therefore, not needed. The main facilities to be provided include a small office, workshop areas and storage space and a control room to house the high voltage monitoring and control instrumentation and equipment. The sub-station will also be equipped with KPLC’s own internal microwave telecommunications facilities.

2.7.2.4 Telecommunication mast
A telecommunication mast will not be required at the Villa Franca substation because it will utilize the Embakasi substation mast. The masts are microwave lattice mast, between 30 and 50 m high and will form an integral part of the sub-station.

2.7.2.5 Substation Design and Layout

The layout of the substation is very important since there should be a Security of Supply. In an ideal substation all circuits and equipment would be duplicated such that following a fault, or during maintenance, a connection remains available. Practically this is not feasible since the cost of implementing such a design is very high. Methods have been adopted to achieve a compromise between complete security of supply and capital investment.

The proposed substation layout consists, essentially the arrangement of a number of switchgear components in an ordered pattern governed by their function and rules of spatial separation. The spatial separation will include; Earth clearance this is the clearance between live parts and earthed structures, walls, screens and ground, Phase clearance this is the clearance between live parts of different phases and Isolating distance this is the clearance between the terminals of an isolator and the connections thereto (Refer to figure 2-8).
Figure 2-8: Schematic diagram of the proposed Villa Franca Substation layout
2.7.2.6 Size
The proposed Villa Franca 66/11 kV Substation will be approximately 40m x 50m in extent. Kenya Power have indicated that an acre site (70m by70m) is required to accommodate the proposed substation, a turning area for the low bed vehicle which transports the transformer to the site, and the incoming and outgoing lines.

2.7.2.7 Electrical Infrastructure
The proposed substation is to have an incoming 66kV, 6 equipped 11kV feeder bays and 4 spare bays for future purposes. The substation will be designed to accommodate a future 66kV feeder bay, additional transformer and two additional MV feeder bays. The design will incorporate allowances for the use of a mobile transformer for emergency conditions.

A standard “brick type” control room will be constructed inside the boundary of the substation yard for the protection of the line and substation equipment, as per KPLC’s standard control room layout.

In addition to the control room, the substation will also have steelwork A-frame busbar structures of approximately 12m – 13m in height for the 11kV feeder lines, and column and beam steelwork busbar structures of approximately 12m – 13m in height for the 66kV line.

In terms of lightning protection for the substation, overhead screening will be provided by protective cones afforded by A-frame peak and lightning mast peaks. Equipment within the substation yard will be shielded by the steelwork (columns, beams and A-frames) structures and overhead steel wires. All steel work will be connected to an earthmat to prevent potentially high voltages from arising.

2.7.3 Access
It is proposed that the Villa Franca 66/11 kV Substation have one access road, which will be designed according to KPLC’s standards, taking into account the Ministry of Road’s requirements. The length of the access road will be approximately 50m, while the width of the road will be determined by need, such as equipment size, whereby the maximum allowable width is 5m. The access road will also need to be able to sustain the vehicle load associated specifically with the transportation of the transformer to the site. A line of sight will need to be maintained on either side of the access road during operation.

It is proposed that the access road be constructed off the outer-ring Road to the substation site. Since there an existing track currently running from the road to the site from the lower uninterrupted part it can be upgraded for the proposed development.

It is worth to note that access can be connected to the tarmacked but busy Mombasa road accessing the site from northern part but it will be tricky due to the terrain and high cost which will be required to create access road. The best road will be through Tecla Lorupe road which connects to Imara Daima Drive a marrum road running towards international church centre which about 300m to Kenya power plot. The marrum road runs from East to west on the lower southern site of the proposed site. This will be very good access since it will not require any major works because it is still in good condition. See figure 2-9 below for illustration of the straight unused access road.
2.7.4 Fencing and Security

The entire perimeter of the substation will be fenced to KPLC’s standard fencing i.e. either 2.4m steel palisade fencing or 2.4m steel post mesh fencing. A gate will be constructed at the entrance to the site which will be locked at all times. The substation will be lit at night, and a photocell will be used to automatically switch on the lights at a set time each evening. The substation will also be guarded 24/7 by at least two security guards at any given time. Furthermore it is worth noting that since the site is situated within the industrial zone which is high protected access to the site by public will be completely curtailed. The site has a stone wall in the West and East and a chain link in the North and South with security guards manning.

Existing Concreate Wall to the West and East respectively
Chain link fence to the South and North Respectively of the proposed site

2.7.5 Project Activities

Design and construction of the substation will be undertaken by a contractor selected through a competitive bidding process. Construction will be supervised by KPLC to ensure works are undertaken in accordance to specifications. This is to ensure quality work is achieved.

It is anticipated that the proposed site will undergo alteration during construction to install the 23MVA for the 66/11 kV distribution substation and associated structures. Safety requirements and precautions, established local and international environmental protection regulations alongside company policy shall guide the contractor during construction phase.

Construction activities will involve the following:

- Holding of the site will be done with iron sheet and a stone perimeter wall will be constructed
- The Contractor shall perform any site investigations in good time as may be necessary for the progress of design and construction on a sound engineering basis.
- Ground breaking and removal of vegetation
- Leveling the ground.
- Civil works on site including construction of access road, digging foundations and concrete works
- Delivery of civil work construction materials, transformer, tools, electrical equipment to project site.
- Compaction and filling with gravel of the areas to form foundations
- Storm water drainage construction
- Construction of bund walls to hold in case of accidental leakage
- Installation of transformers and erecting of the steel poles to support the incoming and outgoing feeders.
- Post construction clean–up, restoration and landscaping of site
- Connection of power from the existing 66kV line to the substation
- Load testing
- Remedy of defects after functional tests

During construction, the contractor shall observe safety and shall erect warning signs to warn on any potential hazards, ensure proper and efficient use of Personal Protective equipment (PPE) for all on site and observe safe work procedures.
Operational phase

- Training of the proponents operating and maintenance personnel
- During operational phase the proponents personnel will mainly do switching
- Periodical maintenance works

Throughout the project life, the proponent and contractor shall adhere to all requirements of National Environmental Management Authority (NEMA) and any other applicable legislation regarding environmental and socio-economic impacts.

Soil Excavation

Excavation of the top soil shall be done to pave way for the construction of the substation. Soil excavation process shall be done with utmost care to ensure that the excavated soil is not improperly heaped or not carried away by any surface flows to any nearby surface waters causing siltation. The excavated soil will be used to backfill and any remainder shall be disposed appropriately in accordance with the environmental management plan. Company safety and environmental policy and other established local environmental protection regulations/standards shall guide the contractor. This will include safety wear at all times and the contractor will appoint a safety officer on site during all construction activities.

Construction Supervision

Throughout the construction phase, close supervision shall be carried out by the proponent to ensure:

- Workers use personal protective equipment (such as hand gloves, helmets, safety shoes ear muffs, overalls and dust coats) at all times.
- Motorized equipment are checked to ensure that they are in good working condition, safe to use and produce minimal noise levels and reduced smoke emission.
- Provision of first aid kit and firefighting equipment (portable cylinders) and placement at strategic positions for access
- Proper disposal of waste material and toilet facilities are provided for construction workers
- Emergency response procedures are in place and all workers are trained in effecting them.
- Any work involving deep excavations, elevated heights and lifting heavy loads, poses a number of risks to personnel. The Contractor shall develop a Safety Plan before commencement of each phase of the construction. This will ensure that personnel are equipped with the correct protective clothing and equipment and are ready to work safely while also safeguarding the environment.

Operation Phase:

During operation phase of the project, no unauthorized person shall access the substation. This is in line with company policy to ensure safety of staff and the public. Routine maintenance is to be done under supervision by authorized staff.

Area of Impact

The substation will be constructed on the proponents land. Approximately, the area under the substation will be 70m by 70m.

Project’s Decommissioning Activities

At the decommissioning/demolition phase, the following activities will take place:
- Removal of transformer and associated switching equipments
- Removal of electrical fittings, bus bars and steel poles/structures
- Demolish and carefully handle components that contain oil like the transformer
- Ensure proper handling of the demolished materials and have an authorized and guided transportation and disposal away from human settlement, water bodies and wildlife conservation area
- Demolish and remove all the concrete works

During this phase, the proponent shall restore the host environment close to its original state.

The proponent shall submit a decommissioning plan to NEMA in good time prior to decommissioning. The decommissioning plan should include a restoration plan.

The host environment should be rehabilitated and restored to its former state through:

- Approved and appropriate landscaping methodology.
- Planting of indigenous vegetation.
- Removal of any soils that may have been impacted by oils or fuels for offsite (away from the project area) remediation.

2.7.6 Input Materials

Construction of the substation is expected to use quality construction materials and procedures to ensure quality work and occupational and public safety and the environment. The following inputs will be required for construction:

- Raw construction materials e.g. sand, cement, natural building stone blocks, hard core, gravel, concrete among others.
- Timber (e.g. doors and frames, fixed furniture, etc.),
- Paints, solvents, white wash, etc.,
- Labour force (of both skilled and unskilled workers).
- Two 23 MVA transformers.
- Bus bars, Switch gears, Circuit breakers and Capacitors
- Lightning arrestors and Steel structure members
- Water

2.7.7 Temporary storage of hazardous substances

The hazardous substances referred to comprise fuels, oils and lubricants that will be stored and dispensed at the construction camp. Specifications for the storage and dispensing of fuels, oils and lubricants include the following:

Specifically designated areas

- All storage of fuels, oils and lubricants shall be stored above ground and under cover.
- All designated areas will be bunded.
- Each designated area will be equipped with adequate fire protection equipment appropriate for the nature of the fuels, oils and lubricants that are stored and dispensed.
- All areas shall be properly signed in all applicable languages.
• All employees must be properly trained in the storage and dispensing of specific fuels, oils and lubricants.
• A specific procedure for emergency situations, including accidental spills, will be formulated and available on site at all times.

2.8 Use of services and resources during construction

2.8.1.1 Water
Water will be required for potable use and in the construction of the foundations for the sub-station. The water will be sourced from Nairobi Water and Sewerage Company.

2.8.1.2 Sewerage
A negligible sewerage flow is anticipated for the duration of the construction period. On site, use will be made of toilets that will be serviced periodically. For operations, a similarly negligible amount of sewerage will be generated. Septic tanks and soak-ways will be provided. But it is important to note the sewerage line is passing on the Southern part of the plot and will enable the company to connect directly through permission from the Nairobi Water and Sewerage Company.

2.8.1.3 Roads
Existing roads will be utilized as far as possible during the construction and operational periods. The use of roads on private property is subject to the provisions of an EMP (Chapter 11) that will include individual landowner specifications, which will be determined during discussions with landowners during the land acquisition negotiation process. The Villa Franca Sub-station will be served by a gravel access road and internal gravelled traffic areas for access to the EHV equipment. The flow of traffic to the site during the construction period will be relatively high and during operations there will be virtually very low traffic considering substation will be operational and require minimal maintenance.

2.8.1.4 Storm water
The area is covered at the surface by dark clay soils that can be up to 10m thick in places. The surficial soils are expandable volcanic clays referred to as black cotton soil. Below the soils is a series of sediments termed the Upper Athi Series that consists mainly of sandy sediments, with some minor clays and boulders which are sensitive to water and wind erosions.

Great care has to be taken in making sure that storm water drainage is carefully designed on all roads as well as the runoff from the sub-station terraces. Storm water will have to be diverted into the veldt at low energy levels to make sure that significant erosion problems are avoided in and around the site.

2.8.1.5 Solid waste disposal
All solid waste will be collected at a central location at the construction site and will be stored temporarily until removal to an appropriately permitted landfill site. Waste streams should be kept separate to facilitate recycling.
2.8.1.6 Electricity

Electricity will be essential for the proposed project both during construction and operation. Kenya Power will provide electricity for construction and operations from its existing electrical network in the area.

2.9 Cost of Proposed Project

The proposed substation shall be 5kms from city center and is situated within Mombasa road but is access through Tecla Lorupe road and is projected to cost a total sum of **Kshs. 215 million** to install the substation and associated structures.

2.10 Site and Land Ownership

The proposed site is classified as light industrial area and it is adjacent to mixes commercial and residential Zone. The company has so gotten an approval for change of user from light industrial to electrical substation from City Council of Nairobi. The land parcel L.R. No. 209/12119 situated in Imara Daima along Mombasa road belonged to Kenya power and it is currently underutilize with less than one third of the land which about 9acres or 3.805Ha being used as concrete poles storage area as shown in the figure below. Kenya power will apply for change of use from industrial to electrical infrastructure from the City Council of Nairobi which has been granted see annexes.
2.11 Target Group for the ESIA Report

The ESIA Report will be used by different stakeholders that are involved at different phases of the project. The report presents vital information on policies and procedures to be adhered to, implementation modalities, analysis of potential environmental and social impacts and suggested mitigation measures at various stages of the project. The information will be useful in planning, implementation, management and maintenance of the substation.

The report will be useful to the following stakeholders:

- Relevant government ministries and agencies
- Affected and Interested persons;
- Engineers to be involved in supervision of the construction works.
- Contractors to be engaged in the construction works for the 23MVA substation;
- Staff that will be involved in the management and operation of the 23MVA 66/11 kV substation.
- Government regulatory agencies such as National Environment and Management Authority (NEMA) and Energy Regulatory Commission (ERC).
3 CHAPTER THREE: BASELINE INFORMATION OF THE STUDY AREA

3.1 Introduction
This chapter describes the study area (Nairobi City) broadly in terms of physical features, size, administrative and political features, physiographic and natural conditions. The information provided is from the development plan for the larger Nairobi City. The city has been divided into six namely; Kamukunji; Starehe; Kasarani, Embakasi; Langata; Dagoreti; Westlands and Njiru districts.

3.2 Location
Nairobi is the Capital City of Kenya. The city borders Eastern Province to the east and Central Province to the west and south and Rift Valley Province to the Northwest. Nairobi owes its birth and growth to the construction of Kenya-Uganda Railway. Following its establishment in 1899 as a railway depot, Nairobi soon became a communications centre and the headquarters of the provincial administration. Recently the Government of Kenya declared Nairobi a Metropolitan City so as to comprise of the nearby towns such as Thika, Machakos, Kitengela, Athi River, Kikuyu, Limuru, Ongata-Rongai and Ngong.

Nairobi is located at approximately 1° 9’S, 1° 28’S and 36° 4’E, 37° 10’E at the south-eastern end of Kenya’s agricultural heartland. It occupies an area of about 696km$^2$ and the altitude varies between 1,600 and 1,850 metres above sea level.

The proposed project location is on Plot belonging to Kenya Power along Mombasa road, Villa Franca area, Embakasi District in the county of Nairobi.

3.3 Topography
The area has shallow clay stratum with near to surface underground rock which may offer the best foundation support for the proposed structures.

Key nearby physical features include the Nairobi about 100 metres from the project site, no significant trees or wildlife. Some distant physical features include Karura forest in the northern part Nairobi city, Ngong River to the south, and the Ngong hills stand towards the west of Nairobi, Mount Kenya towards the north and Mount Kilimanjaro towards the south-east. As Nairobi is adjacent to the Rift Valley, minor earth tremors occasionally occur.

3.4 Climate

3.4.1 Average Daily Temperatures
The average daily temperature throughout the year (See table below) varies slightly from month to month with average temperatures of around 17 degrees Celsius during the months of July and August to about 20 degrees Celsius in March. But, the daily range is much higher, with the differences between maximum and minimum temperatures each day around 10 degrees in May and up to 15 degrees in February. Between the months of June to September, southeast winds prevail in the coastal parts of Kenya and last up to several days without a break. The clouds cause day temperatures to remain low and most times the maximum temperature stay below 18 degrees Celsius. The minimum temperatures
also remain low during cloudy nights, usually hovering around 8 degrees Celsius and sometimes even reaching 6 degrees Celsius. Clear skies in January and February also bring colder nights. The highest temperature ever reached in Nairobi was 32.8 degrees Celsius and the lowest was 3.9 degrees Celsius.

### Table 3-1: Average Daily Temperature in Nairobi City

<table>
<thead>
<tr>
<th>Months</th>
<th>Mean Maximum (°C)</th>
<th>Mean Minimum (°C)</th>
<th>Mean Range (°C)</th>
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<tbody>
<tr>
<td>January</td>
<td>26.8</td>
<td>13.1</td>
<td>13.7</td>
</tr>
<tr>
<td>February</td>
<td>28.0</td>
<td>13.4</td>
<td>14.6</td>
</tr>
<tr>
<td>March</td>
<td>27.4</td>
<td>14.4</td>
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</tr>
<tr>
<td>April</td>
<td>24.6</td>
<td>14.3</td>
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<tr>
<td>May</td>
<td>24.1</td>
<td>14.2</td>
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<tr>
<td>June</td>
<td>23.1</td>
<td>12.6</td>
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<tr>
<td>July</td>
<td>22.3</td>
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<td>22.7</td>
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<td>September</td>
<td>25.3</td>
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<tr>
<td>October</td>
<td>26.2</td>
<td>13.7</td>
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<tr>
<td>November</td>
<td>23.6</td>
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<tr>
<td>December</td>
<td>25.1</td>
<td>13.8</td>
<td>11.6</td>
</tr>
<tr>
<td>Year</td>
<td>24.9</td>
<td>13.3</td>
<td>11.6</td>
</tr>
</tbody>
</table>

#### 3.4.2 Average Humidity Values

Because of Nairobi’s location just south of the equator in combination with humid air pumped in from the Indian Ocean, the humidity values for each day are generally on the higher end (See table below)

### Table 3-2: Mean Relative Humidity Values (%)

<table>
<thead>
<tr>
<th></th>
<th>Jan</th>
<th>Feb</th>
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<th>May</th>
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<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.00 A.M</td>
<td>79</td>
<td>74</td>
<td>82</td>
<td>86</td>
<td>85</td>
<td>85</td>
<td>83</td>
<td>85</td>
<td>82</td>
<td>80</td>
<td>36</td>
<td>83</td>
</tr>
<tr>
<td>3.00 P.M</td>
<td>23</td>
<td>37</td>
<td>43</td>
<td>53</td>
<td>55</td>
<td>59</td>
<td>53</td>
<td>53</td>
<td>50</td>
<td>47</td>
<td>57</td>
<td>54</td>
</tr>
</tbody>
</table>

This is not to say that values are always high, since the easterly winds coming off the Indian Ocean tend to keep the temperatures standard throughout the country; therefore the “warm sticky” feeling is usually not associated with Nairobi as much as one would think. In the summer to autumn months of January to April, relative humidity values have been known to plummet to anywhere from 10% to 20%. The typical day, humidity-wise, starts off with nearly saturated in the morning hours, and steadily decreases throughout the remainder of the day.

#### 3.4.3 Average Rain Amounts

With these routinely high relative humidity figures, it is not surprising that the Nairobi climate is one that produces much rain annually. In fact, from the past 50 years, the expected amount of rain could be anywhere in the range of 500 to 1500 mm, with the average ringing in at 900 mm. The majority of these rainfall figures crash down in Nairobi in one major and one minor monsoon seasons respectively. The major monsoon season occurs within the months of March to May, and is called the “Long Rains” by the locals. The minor monsoon seasons emerges within the October to December Months, and is called the “Short Rains” by the Nairobi citizens. That is what the meteorologists as a whole know about the monsoon seasons. What they do not know is exactly when these seasons will start. There is usually not an indication of when these rainy seasons will start, since it is difficult to determine when one starts...
and when the other finishes. Consequently, a person may think there is only one rainy season when looking at the annual rainfall amounts (See table below).

### Table 3-3: The average rainfall (mm) for each month of the year, based on the records for 50 years

<table>
<thead>
<tr>
<th></th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
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<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
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<tbody>
<tr>
<td></td>
<td>48</td>
<td>48</td>
<td>115</td>
<td>195</td>
<td>137</td>
<td>42</td>
<td>15</td>
<td>21</td>
<td>24</td>
<td>52</td>
<td>114</td>
<td>77</td>
</tr>
</tbody>
</table>

#### 3.4.4 Average Winds

Winds along the surface are predominantly easterly throughout the entire year. They are shifted to northeast between October and April, and they are shifted southeast between May and September. Right before the “Long Rains” season, the strongest winds occur, reaching speeds of 20 to 25 miles per hour. During the rest of the year, winds are usually at speeds of 10 to 15 miles per hour. During the night, the winds are calm.

#### 3.4.5 Average Sunshine

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

#### 3.5 Geological Setting

The geological history of Nairobi has been dominated by volcanic activity whereby a thick succession of alkaline lavas and associated tuffs began accumulating in mid-miocene time and continued into the upper Pleistocene. Practically the entire Nairobi area is covered by these volcanic rocks derived from the Rift Valley region and estimated to accumulate in volume to more than 250 cubic miles (1,042 cubic km) and covering an area of nearly 1,200 square miles (3,000 km²). In the present area, the extent of the lava flows beneath the cover of Limuru Trachytes has been estimated to form a major part of geology of western areas of Nairobi. Volcanism began with the extrusion of Kapiti phonolite which has been dated 13Ma. The eruptive products of the volcanoes provide the most topographic expression of Nairobi. The main geologic formations in Nairobi area are, undifferentiated Ngong volcanic materials (Tva₃), Tva₁ (Basanites), Tva₂ (Tephrites), Tvp2 (Kandizi phonolites), Tvt₂ (Nairobi Trachytes), which covers most of the Karen area; Tvt₂ (middle and upper Kerichwa valley tuffs) which covers Wilson Airport area; Tvp₂ (Nairobi phonolites – of lower Trachyte Division) which covers most of eastern parts of Nairobi, including Jomo Kenyatta International Airport (JKIA). The Central Business District (CBD) and the rest of the city is covered by various forms of Trachytes.

#### 3.6 Potential Disaster Sites for City of Nairobi

Nairobi sits close to the eastern flanks of the Great Rift Valley and recent revelations that the valley may be expanding at a rate of (2-3) mm per year due to tensional forces in the crust. The high heat flow beneath the crust is represented by the geothermal activities at Olkaria, Bogoria and Kapedo in Turkana District and the high seismicity around Lake Magadi is evidence of the continental plate break-up. Recent geodynamic studies based on the International GPS Service (IGS) indicate that the African...
plate has moved northwards by 7 cm into European plate between 1993 and 2000. This proximity to the active rifting system and general behaviour of African plate calls for continuous assessment of the tectonic state of the City. Preliminary results on the potential disaster sites for the city of Nairobi indicate that there are numerous faultlines towards the western edge of the city passing through some prime plots in Bellevue estate and Lang’ata area. The Ngong/Ongata/Kiserian area shows a lot of seismicity and numerous faultlines. Lack of seismicity on the faultlines within Karen/Lang’ata area however implies that the faultlines are not active. No faultlines are available within the Central Business District (CBD) of the city and towards the eastern end. Seismicity in the city is also minimal and all the points are below magnitude.

3.7 Soils and Geology

The rocks in the Nairobi area mainly comprise a succession of lavas and Pyroclastics of the Cainozoic age and overlying the foundation of folded Precambrian schist’s and gneisses of the Mozambique belt. The crystalline rocks are rarely exposed but occasionally fragments are found as agglomerates derived from former Ngong volcano. The soils of the Nairobi area are products of weathering of mainly volcanic rocks. Weathering has produced red soils that reach more than 50 feet (15m) in thickness. A number of subdivisions are recognized in the Nairobi area according to drainage, climatic regions and slopes, and other categories have been introduced for lithosols and regosols.

3.8 Infrastructure

Due to such rapid urban growth, provision of basic infrastructure for all has become an important concern of development planners in Nairobi. Basic infrastructural services that have deteriorated due to such rapid increase in population include: Solid Waste Management (SWM) system; water and sewage systems; drainage and flood protection; roads; mass transportation; electric installations; and telecommunications. Greater environmental pollution, congestion and other problems have been the result of under-provision of such basic services. The city is well served, with good communication and transport network such as air, road, and railway. It is centrally located to serve the Eastern African countries. Bus and train stations are within an easy walk of the City Centre. The main railway line runs from Mombasa to Malaba through Nairobi City. This network facilitates transportation of agricultural products from western Kenya to the coast. The city is a hub of road transport connecting other major towns in the country. On air transport Jomo Kenyatta International airport makes it easy to transport goods from all over the world into the country and vice versa.

The Tecla Lorupe road connecting with Mombasa road is not in a good state of repair, with the sections bordering the Substation site not complete (drainage). Traffic congestion characterizes the road and the proponent should do a small diversion to access the Substation site.

3.9 Population

The city of Nairobi has a population city’s population in 2009 was be about 3.138,395 million, and is projected to reach 3.8 million by 2015 which represents 51% of the country’s urban population. This increase will put even more pressure on the available resources. Although it covers only 0.1 per cent of Kenya’s total surface area, Nairobi already has about 8 per cent of the country’s total population and 25 percent of Kenya’s urban population. Nairobi City has one of the highest urban population densities in the country of up to 3,079 persons per square kilometre, bringing with it the associated needs for supply of household goods groceries among other basic items. Such needs can be catered for by establishment of adequate facilities such as shopping complexes which stock an assortment of products. Nairobi City has experienced rapid growth both in terms of population and physical expansion.
The physical area of Nairobi has been expanding tremendously from 3.84 Km² in 1900 to 684 Km² in 1963 which is the current official size of the City, but with the introduction of the Nairobi Metropolis, the area is much larger now.

### 3.10 Economic Activities

Nairobi city is the centre of commercial, manufacturing and industrial development in East Africa. The major economic activities in Nairobi City include trade. Like most modern cities, Nairobi has crowded markets and trading areas, middle class suburbs, and spacious mansions for the rich and powerful. It also has vast overcrowded tenements and slums, exploitation, and high unemployment. Between these two worlds, the city offers big screen film, theatres, restaurants, bookshops, cafes and bars for the local population and tourists from all over the world.

### 3.11 Waste Management

Out of 3000 metric tons of solid wastes generated daily in the City by 2010, only 40 per cent is being collected. Out of this total the Nairobi City Council and Private Companies combined, only manage to dispose only 47.1 per cent of the total garbage turnover. The accumulated mess of waste collection over the years has continued to be a bottle neck to Nairobi City administrators. By 1986, some of the City residents, who were able and willing to pay for the refuse-collection service, opted for Private Companies (PCs). There are over 80 companies that have emerged in the city targeting domestic and large waste producers like industries and supermarkets.

### 3.12 Drainage

Nairobi City lies in the Athi River Drainage Basin. The major rivers that cross the City include Nairobi, Ruaraka, Ngong, Athi and Mathare River. All these drain from the West and flow towards the Eastern direction as dictated by the topographical features. As the rivers pass through the City, industrial effluents, municipal waste and siltation heavily pollute them.

Nairobi’s main drainage follows the regional slope of the volcanic rocks towards the east, while subsidiary internal drainage into the Rift region is confined to the western part. The lava plains east of the line Ruiru-Nairobi-Ngong are underlain by a succession of lava flows alternating with lakebeds, streams deposits, tuffs and volcanic ash. These plains, comprising mainly the Athi plains and the northern section of the Kapiti plain, extend westwards, rising from 4900 feet (1493 m) at the Athi River to 6000 feet (1829 m) m in the faulted region near Ngong. The lava plains are crisscrossed with steep-walled gullies and canyon-like gorges, such as those along the Mbagathi valley. Further east this valley widens slightly where soft material is being actively eroded. Water draining eastward from the hill area accumulates on the low-lying ground between Parklands in the north and Nairobi South estate, forming a perched water table above the Nairobi phonolite. The Kerichwa Valley Tuffs lying to the east of the highway function like a sponge and the contact between them and the underlying impermeable phonolite thus forms a perfect aquifer, so much so that a number of channels containing water occur beneath Nairobi.

### 3.13 Human Settlement

In 1948, about 51.95km² (58.43percent) of the city’s area was covered with residential areas ranging from very low to very high density. In 1979 residential land use had increased to 217.6 km², constituting about 31.81 percent of the city’s 684 km², but by 1994 the planned residential land area decreased to about 175.6 km² out of 696.27 km², covering approximately 25.22 percent of the city. This
was due to the re-zoning of various residential neighbourhoods to commercial and other institutional uses, particularly around Capitol Hill and Kilimani, Ngara, Pangani, Westlands and Parklands areas. The existing environmental problems in human settlements are the result of current urban policies. These problems are exacerbated by locating settlements on fragile land; inadequate infrastructure and provision of services such as solid waste management, water supply and sanitation and inadequate development control. Housing constitutes a major dilemma for Nairobi. The housing deficit has resulted in the proliferation of informal settlements, construction of unauthorized extensions in existing estates, poor standards of construction of housing units and increasing conflicts between tenants and landlords, especially in low income housing estates and informal settlements.

3.14 Transport

Nairobi acts as the central point where journeys begin to destinations all-round the country and is itself the country's primary destination. Transport in Nairobi can be divided into five categories: private vehicles, buses, matatus (minibuses), motorcycles commuter trains and taxis. Sometimes ignored, but equally important are the non-motorized forms of transport, such as walking and cycling. Dealing with urban mobility issues is an economic, social and environmental priority. The city’s traffic jams, pollution and inadequate pedestrian facilities and cycle lanes represent a major setback to the productive capacity of the economy, affecting all segments of society. The development of housing should be evenly distributed around the Nairobi Metropolitan Area so as to reduce the traffic jams experienced in the city and other modes of transportation to be explored.

Villa Franca being at the city centre has an improved transport infrastructure with a well developed public transport system. The railway line connecting the city to eastlands and Thika is about 2kilometres from the project site. The city centre like many other busy towns in Kenya is characterized by heavy traffic and People.

3.15 Industry

Nairobi is the most industrialized urban centre in Kenya and in East Africa in general. Most of these industries are located in the main industrial area and along Mombasa road, some in the Ruaraka Industrial area, some in the CBD and the rest dispersed in other parts of the city. Gaseous emissions from industries contribute to smog and haze over the city. The industrial area is located to the east of the city and the prevailing winds come from the east. Gaseous emissions from industries and vehicles are thus trapped against the western hills and sometimes form a cloud of smog over the city. Apart from contributing to respiratory ailments in people, this affects visibility and can cause traffic accidents or create an unpleasant living environment for inhabitants. In 1992, measurements of the concentration of suspended particulate matter in Nairobi revealed the highest concentrations in the industrial area (252µg/m³), decreasing with distance from the industrial area. Other areas of the city had levels less than a third of this 80 and 83µg/m³ in Buru Buru area and Woodley areas respectively. Due to high number of city residents who are working in these industries there is need for adequate housing so as their need are taken into consideration to enhance environmental sustainability.

The area around the proposed project site was is an open field which was being used by the Kenya Power as a concrete pole storage field. The nearest residential areas are located about 100metres from the proposed site but the site is also surrounded by industries and other major commercial installations. The area around the site is marked with several activities including business and both heavy and light industries. The proposed site will be an epicenter for three districts namely Embakasi, Makadara and Langata.
4 CHAPTER FOUR: RELEVANT LEGISLATIVE AND REGULATORY FRAMEWORKS

4.1 Introduction

There are many environmental problems and challenges in Kenya today. Among the cardinal environmental problems include: loss of biodiversity and habitat, land degradation, land use conflicts, human animal conflicts, water management and environmental pollution. This has been aggravated by lack of awareness and inadequate information amongst the public on the consequences of their interaction with the environment.

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 damage the natural resources upon which the economies are based. 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.

Kenya has over 77 statutes which relate to environmental concerns. Most of the statutes are sector specific, covering issues such as land use, occupational health and safety, water quality, wildlife, public health, soil erosion, air quality among others.

4.2 Environmental Policy Framework

Environmental Impact Assessment (EIA) critically examines the effects of a project on the environment. An EIA identifies both negative and positive impacts of any development activity or project, how it affects people, their property and the environment. EIA also identifies measures to mitigate the negative impacts, while maximizing on the positive ones. EIA is basically a preventive process. It seeks to minimize adverse impacts on the environment and reduces risks. If a proper EIA is carried out, then the safety of the environment can be properly managed at all stages of a project-planning, design, construction, operation, monitoring and evaluation as well as decommissioning. The assessment is required at all stages of project development with a view to ensuring environmentally sustainable development for both existing and proposed public and private sector development ventures. The National EIA regulations were issued in accordance with the provisions of Environmental Management and Coordination Act (EMCA) of 1999. The EIA Regulations must be administered, taking into cognizance provisions of EMCA 1999 and other relevant national laws.

4.3 Institutional Framework

At present there are over twenty (20) institutions and departments which deal with environmental issues in Kenya. Some of the key institutions include the National Environmental Council (NEC), National Environment Management Authority (NEMA), the Forestry Department, Kenya Wildlife Services (KWS) and others.

In Kenya, the Environmental Management and Coordination Act (EMCA) of 1999 is the main legislation that deals with ESIA studies. In retrospect, the EMCA established various administrative bodies to operationalize EMCA. These include among others:
National Environment Council (NEC) – Is the apex body which among other things is charged with the responsibility of developing the national environmental policy in Kenya and setting annual environmental goals and standards.

The National Environment Management Authority (NEMA) – exercises general supervision and coordination over all matters relating to environment in Kenya.

The Public Complaints Committee (PCC) – investigates environmental complaints against any person, submit their findings/recommendations to NEC

The Standards and Enforcement Review Committee (SERC)—advises the NEMA on the criteria and procedures for the measurement of environmental quality in Kenya. Environmental quality relates to air quality, wastewater quality, waste quality, noise quality, land use quality, etc. The institutional framework for EMCA is shown in Figure 4.1

![Institutional Framework under the EMCA](image)

**Figure 4-1: Institutional Framework under the EMCA**
4.3.1 National Environment Management Authority (NEMA)
The objective and purpose for which NEMA was established was 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. However, NEMA's mandate is designated to the following committees:

4.3.2 Provincial and District Environment Committees
According to EMCA, 1999 No. 8, the Minister by notice in the gazette appoints Provincial and District Environment Committees of the Authority in respect of every province and district respectively. The Provincial and District Environment Committees are responsible for the proper management of the environment within the Province and District in respect of which they are appointed. They are also to perform such additional functions as are prescribed by the Act or as may, from time to time be assigned by the Minister by notice in the gazette. The decisions of these committees are legal and it is an offence not to implement them.

4.3.3 Public Complaints Committee
The Committee performs the following functions:
- Investigate any allegations or complaints against any person or against the authority in relation to the condition of the environment in Kenya and on its own motion, any suspected case of environmental degradation and to make a report of its findings together with its recommendations thereon to the Council.
- Prepare and submit to the Council periodic reports of its activities which shall form part of the annual report on the state of the environment under section 9 (3) and
- To perform such other functions and excise such powers as may be assigned to it by the Council.

4.3.4 National Environment Action Plan Committee
This Committee is responsible for the development of a 5-year Environment Action Plan among other things. The National Environment Action Plan shall:
- Contain an analysis of the Natural Resources of Kenya with an indication as to any pattern of change in their distribution and quantity over time.
- Contain an analytical profile of the various uses and value of the natural resources incorporating considerations of intergenerational and intra-generational equity.
- Recommend appropriate legal and fiscal incentives that may be used to encourage the business community to incorporate environmental requirements into their planning and operational processes.
- Recommend methods for building national awareness through environmental education on the importance of sustainable use of the environment and natural resources for national development.
- Set out operational guidelines for the planning and management of the environment and natural resources.
- Identify actual or likely problems as may affect the natural resources and the broader environment context in which they exist.
- Identify and appraise trends in the development of urban and rural settlements, their impact on the environment, and strategies for the amelioration of their negative impacts.
- Propose guidelines for the integration of standards of environmental protection into development planning and management.
Identify and recommend policy and legislative approaches for preventing, controlling or mitigating specific as well as general diverse impacts on the environment.

Prioritize areas of environmental research and outline methods of using such research findings.

Without prejudice to the foregoing, be reviewed and modified from time to time to incorporate emerging knowledge and realities and;

Be binding on all persons and all government departments, agencies, States Corporation or other organ of government upon adoption by the national assembly.

### 4.3.5 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.

### 4.3.6 National Environment Tribunal

This tribunal guides the handling of cases related to environmental offences in the Republic of Kenya.

### 4.3.7 National Environment Council (NEC)

EMCA 1999 No. 8 part III section 4 outlines the establishment of the National Environment Council (NEC). NEC is responsible for policy formulation and directions for purposes of EMCA; set national goals and objectives and determines policies and priorities for the protection of the environment and promote co-operation among public departments, local authorities, private sector, non-governmental organizations and such other organizations engaged in environmental protection programmes.

### 4.3.8 Kenyan Environmental Legal Framework

Previously, environmental management activities were implemented through a variety of instruments such as policy statements, permits and licenses and sectoral laws. There was however need for a stronger enforcement machinery to achieve better standards in environmental management. The enactment of the Environmental Management and Coordination Act (EMCA) in 1999 provided for the establishment of an appropriate legal and institutional framework for the management and protection of the environment.

### 4.3.9 The Environment Management and Co-ordination Act, 1999

The Environmental Management and Coordination Act (EMCA) 1999 is an Act of Parliament to provide for the establishment of an appropriate legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto.

The main objective of the Act is to:

- Provide guidelines for the establishment of an appropriate legal and institutional framework for the management of the environment in Kenya;
- Provide a framework legislation for over 77 statutes in Kenya that contain environmental provisions;
- Provide guidelines for Environmental Impact Assessment, environmental audit and monitoring, environmental quality standards and environmental protection orders.
The Act empowers the National Environment Management Authority (NEMA) to exercise general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of government in the implementation of all policies related to the environment.

Part II of the Environment Management & Coordination Act, 1999 states that every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance the environment. In order to partly ensure this is achieved, Part VI of the Act directs that any new programme, activity or operation should undergo Environmental Impact Assessment and a report prepared for submission to the National Environmental Management Authority (NEMA), who in turn may issue a license as appropriate.

Part VIII section 72 of the Act prohibits discharging or applying poisonous, toxic, noxious or obstructing matter, radioactive or any other pollutants into aquatic environment. Section 73 require that operators of projects which discharges effluent or other pollutants to submit to NEMA accurate information about the quantity and quality of the effluent. Section 74 demands that all effluent generated from point sources be discharged only into the existing sewerage system upon issuance of prescribed permit from the local authorities or from the licensee. Finally, section 75 requires that parties operating a sewerage system obtain a discharge license from NEMA to discharge any effluent or pollutant into the environment.

Section 87 Sub-section 1 states that no person shall discharge or dispose of any wastes, whether generated within or outside Kenya, in such a manner as to cause pollution to the environment or ill health to any person, while section 88 provides for acquiring of a license for generation, transporting or operating waste disposal facility. According to section 89, any person who, at the commencement of this Act, owns or operates a waste disposal site or plant or generate hazardous waste, shall apply to the NEMA for a licence. Sections 90 through 100 outline more regulations on management of hazardous and toxic substances including oils, chemicals and pesticides.

Finally the Environmental Impact Assessment Guidelines require that a study be conducted in accordance with the issues and general guidelines spelt out in the Second and Third schedules of the Environmental Regulations (2003). These include coverage of the issues on Schedule 2 (ecological, social, landscape, land use and water considerations) and general guidelines on Schedule 3 (impacts and their sources, project details, national legislation, mitigation measures, a management plan and environmental auditing schedules and procedures.

Under EMCA 1999 NEMA has developed regulations to establish guidelines for better management of the environment and promote sustainable development. To date, the regulations presented in the following sections have been gazetted.

a) Environmental Impact Assessment and Audit Regulations (2003) Legal Notice No. 101
The Environmental Impact Assessment and Audit Regulations state in Part III Rule No. 6 that an Environmental Impact Assessment study shall be conducted in accordance with the terms of reference developed.

Part III Rule 16, takes into account environmental, social, cultural, economic, and legal considerations, and shall:

- Identify the anticipated environmental impacts of the project and the scale of the impacts;
- Identify and analyze alternatives to the proposed project;
Proposed mitigation measures to be taken during and after the implementation of the project; and
- Develop an environmental management plan with mechanisms for monitoring and evaluating the compliance and environmental performance which shall include the cost of mitigation measures and the time frame of implementing the measures.

The Proponent has commissioned the Environmental Impact Assessment study in compliance with the Act. The environmental management and monitoring plan laid out in this report shall be adhered to by the Proponent.

b) Environmental Management and Coordination (Water Quality) Regulation 2006

These regulations are described in Legal Notice No. 120 of the Kenya Gazette Supplement No. 74, September 2006. The regulation applies to drinking water, water used for agricultural purposes, water used for recreational purposes, water used for fisheries and wildlife and water used for any other purposes. This includes the following:

- Protection of sources of water for domestic use;
- Water for industrial use and effluent discharge;
- Water for agricultural use.

The regulations outline:

- Quality standards for various sources of domestic water;
- Quality monitoring for sources of domestic water;
- Standards for effluent discharge into the environment;
- Monitoring guide for discharge into the environment;
- Standards for effluent discharge into public sewers;
- Monitoring for discharge of treated effluent into the environment.

This Legal Notice on Water Quality provides that anyone who discharges effluent into the environment or public sewer shall be required to apply for Effluent Discharge License. The license for discharge is Ksh 5,000 while annual license fee for discharge into the environment will be Ksh. 20,000 or Ksh 100,000 depending on the facility. Non-compliance with the regulations attracts a fine not exceeding Ksh 500,000 and the polluter pay principle may apply depending on the court ruling. Table 4-1, gives Waste Water Discharge Guidelines from NEMA.
C) Environmental Management and Coordination (Waste Management) Regulation 2006

These regulations are described in Legal Notice No. 121 of the Kenya Gazette Supplement No. 69, September 2006. These Regulations apply to all categories of waste as provided in the regulations. These include:

- Industrial wastes;
- Hazardous and toxic wastes;
- Pesticides and toxic substances;
- Biomedical wastes;
- Radio-active substances.

### Table 4-1: NEMA Waste Water Discharge Guidelines

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Discharge into public sewers</th>
<th>Discharge into open water bodies</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH</td>
<td></td>
<td>6.0 – 9.0</td>
<td>6.0 – 9.0</td>
</tr>
<tr>
<td>BOD (5 days at 20°C) not to exceed</td>
<td>Mg/l</td>
<td>500</td>
<td>20</td>
</tr>
<tr>
<td>COD not to exceed</td>
<td>Mg/l</td>
<td>1000</td>
<td>50</td>
</tr>
<tr>
<td>Total suspended solids not to exceed</td>
<td>Mg/l</td>
<td>500</td>
<td>30</td>
</tr>
<tr>
<td>n-hexane extract not to exceed</td>
<td>Mg/l</td>
<td>Nil</td>
<td>30</td>
</tr>
<tr>
<td>Oils(mineral, animal &amp; vegetable)</td>
<td>Mg/l</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Total phenol not to exceed</td>
<td>Mg/l</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Copper (Cu) not to exceed</td>
<td>Mg/l</td>
<td>1.0</td>
<td>0.05</td>
</tr>
<tr>
<td>Zinc (Zn) not to exceed</td>
<td>Mg/l</td>
<td>5.0</td>
<td>0.5</td>
</tr>
<tr>
<td>Lead (Pb) not to exceed</td>
<td>Mg/l</td>
<td>1.0</td>
<td>0.1</td>
</tr>
<tr>
<td>Arsenic (As) not to exceed</td>
<td>Mg/l</td>
<td>0.2</td>
<td>0.002</td>
</tr>
<tr>
<td>Total Mercury (Hg) not to exceed</td>
<td>Mg/l</td>
<td>0.05</td>
<td>0.005</td>
</tr>
<tr>
<td>Alkyl mercury not to exceed</td>
<td>Mg/l</td>
<td>0.01</td>
<td>0.001</td>
</tr>
<tr>
<td>PCB (Polychlorinated biphenyl) not to exceed</td>
<td>Mg/l</td>
<td>Nil</td>
<td>0.003</td>
</tr>
<tr>
<td>Pesticides residues not to exceed</td>
<td>Mg/l</td>
<td>Nil</td>
<td>0.05</td>
</tr>
<tr>
<td>Sulphates not to exceed</td>
<td>Mg/l</td>
<td>1000</td>
<td>500</td>
</tr>
<tr>
<td>Dissolved manganese (Mn)</td>
<td>Mg/l</td>
<td>-</td>
<td>1.0</td>
</tr>
<tr>
<td>Chromium (total)</td>
<td>Mg/l</td>
<td>1.0</td>
<td>0.1</td>
</tr>
<tr>
<td>Chloride not to exceed</td>
<td>Mg/l</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>Fluoride not to exceed</td>
<td>Mg/l</td>
<td>-</td>
<td>2.0</td>
</tr>
<tr>
<td>Coliform bacteria</td>
<td>-</td>
<td>-</td>
<td>1000/100ml</td>
</tr>
<tr>
<td>Free ammonia not to exceed</td>
<td>Mg/l</td>
<td>2.0</td>
<td>0.2</td>
</tr>
<tr>
<td>Sulphides (S) not to exceed</td>
<td>Mg/l</td>
<td>2.0</td>
<td>0.1</td>
</tr>
<tr>
<td>Cadmium (Cd) not to exceed</td>
<td>Mg/l</td>
<td>0.5</td>
<td>0.05</td>
</tr>
<tr>
<td>Cyanide (CN) total not to exceed</td>
<td>Mg/l</td>
<td>0.5</td>
<td>0.1</td>
</tr>
<tr>
<td>Organic phosphorus not to exceed</td>
<td>Mg/l</td>
<td>0.5</td>
<td>0.05</td>
</tr>
<tr>
<td>Chromium six (Cr 6) not to exceed</td>
<td>Mg/l</td>
<td>30</td>
<td>1.0</td>
</tr>
<tr>
<td>Total dissolved solids not to exceed</td>
<td>Mg/l</td>
<td>0.5</td>
<td>0.005</td>
</tr>
<tr>
<td>Selenium (Se) not to exceed</td>
<td>Mg/l</td>
<td>3000</td>
<td>1200</td>
</tr>
<tr>
<td>Nickel (Ni) not to exceed</td>
<td>Mg/l</td>
<td>1.0</td>
<td>0.05</td>
</tr>
<tr>
<td>Barium (Ba) not to exceed</td>
<td>Mg/l</td>
<td>3.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Temperature not to exceed</td>
<td></td>
<td>+/- 2°C of the ambient temperature of the sewer</td>
<td>+/- 2°C of ambient temperature of the water body</td>
</tr>
<tr>
<td>Oil/ grease</td>
<td>Mg/l</td>
<td>No trace</td>
<td>Nil/ no trace</td>
</tr>
<tr>
<td>Toxic substances</td>
<td>Mg/l</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>Odour</td>
<td>-</td>
<td>-</td>
<td>Not objectionable to the nose</td>
</tr>
<tr>
<td>Colour</td>
<td>-</td>
<td>-</td>
<td>Not objectionable to the eye or not to exceed 5 mg Pt/l</td>
</tr>
</tbody>
</table>
These Regulations outline requirements for handling, storing, transporting, and treatment/disposal of all waste categories as provided therein.

The regulation provides that a waste generator shall use cleaner production methods, segregate waste generated and the waste transporter should be licensed. The notice further states no person shall engage in any activity likely to generate any hazardous waste without a valid Environmental Impact Assessment licence issued by the National Environment Management Authority.

a) Environmental Management and Coordination, (Conservation of Biological Diversity) (BD) Regulations 2006

These regulations are described in Legal Notice No. 160 of the Kenya Gazette Supplement No. 84, December 2006. These regulations apply to conservation of biodiversity which includes conservation of threatened species, inventory and monitoring of BD and protection of environmentally significant areas, access to genetic resources, benefit sharing and offences and penalties.

Additionally, these links provide for the local enforcement of the International Convention on Biological Diversity (CBD).

The proposed site has no rich biodiversity and there is no known rare or endangered species in the site.

b) Environmental Management and Coordination, (Fossil Fuel Emission Control) Regulations 2006

These regulations are described in Legal Notice No. 131 of the Kenya Gazette Supplement No. 74, October 2006. These regulations include internal combustion engine emission standards, emission inspections, the power of emission inspectors, fuel catalysts, licensing to treat fuel, cost of clearing pollution and partnership to control fossil fuel emissions. The fossil fuels considered are petrol, diesel, fuel oils and kerosene.

This legislation gives caution to proponent and contractor on careless handling of fuels and possible consequences for failing to observe.

c) Environmental Management and Coordination, (Wetlands, Riverbanks, Lake Shores and Sea Shore Management) Regulations 2009

These regulations are described in Legal Notice No. 19 of the Kenya Gazette Supplement No. 9, February 2009. These regulations include management of wetlands, wetland resources, river banks, lake shores and sea shores. Specific sections have requirements that apply to wetlands in Kenya either in private or public land. These regulations empower the District Environment Committee to coordinate, monitor and advise on all aspects of wetland resource management within the district.

d) Environmental Management and Coordination, (Noise and Excessive Vibration Pollution) Regulations 2009

These regulations are described in Legal Notice No. 31 of the Kenya Gazette Supplement No. 21, May 2009. These regulation prohibit any person from making or causing to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort,
repose, health or safety of others and the environment. It also prohibits excessive vibration which annoys, disturb, injure or endanger the comfort, repose, health or safety of others and the environment or excessive vibrations which exceed 0.5 centimetres per second beyond any source property boundary or 30 metres from any moving source.

Part 11 section 6(1) provides that no person shall cause noise from any source which exceeds any sound level as set out in the First Schedule of the regulations.

Rules 5 and 6 of the regulations define noise levels for various types of activities that generate noise. The first schedule to the regulations defines permissible noise levels and is reproduced below.

The regulation in addition specifies that a noise license will be required during the construction and operational phase of a project if such equipment that will produce noise during these two phases will be used.

There will be need for the contractor to apply for a noise license from the NEMA during the construction phase of the project.

Table 4-2: Permissible Noise Levels

<table>
<thead>
<tr>
<th>Zone</th>
<th>Day</th>
<th>Night</th>
<th>Day</th>
<th>Night</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Silent Zone</td>
<td>40</td>
<td>35</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>B. Places of Worship</td>
<td>40</td>
<td>35</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>C. Residential:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indoor</td>
<td>23</td>
<td>35</td>
<td>35</td>
<td>25</td>
</tr>
<tr>
<td>Outdoor</td>
<td>50</td>
<td>35</td>
<td>40</td>
<td>25</td>
</tr>
<tr>
<td>D. Mixed residential (with some</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>commercial and places of</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>entertainment)</td>
<td>55</td>
<td>35</td>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td>E. Commercial</td>
<td>60</td>
<td>35</td>
<td>55</td>
<td>25</td>
</tr>
</tbody>
</table>

This regulation guides on permissible noise levels during construction, operation and decommissioning phases.

4.3.10 Public Health Act (Cap. 242)
This is an Act of Parliament to make provisions for securing and maintaining health. Sections include those dealing with notification of infectious diseases; inspection of infected premises and examination of persons suspected to be suffering from infectious diseases; rules for prevention of diseases; venereal diseases and infection by employees, among others. The proposed project will encourage the movement of people in search of jobs and opportunities, and with this, the risk associated with spread of diseases.

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 Local Authorities take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to
prevent occurrence of nuisance or condition liable to be injurious or dangerous to human health. Such nuisance or conditions are defined under section 118 and include nuisances caused by accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbour rats or other vermin.

The environmental management plan (EMP) advises the Proponent on safety and health aspects, potential impacts, personnel responsible for implementation and monitoring, frequency of monitoring, and estimated cost.

4.3.11 Local Government Act (Rev. 1998)
This Act provides for the establishment of authorities for local government, to define their functions and to provide for matters connected therewith and incidental thereto. In all areas where the project shall be undertaken, the local authorities will require to be informed.

Section 160 helps local authorities ensure effective utilization of the sewages systems. Section 170, allows the right to access to private property at all times by local authorities, its officers and servants for purposes of inspection, maintenance and alteration or repairs of sewers.

The Act under section 176 gives powers to local authority to regulate sewage and drainage, fix charges for use of sewers and drains and require connecting premises to meet the related costs. According to section 174, any charges so collected shall be deemed to be charges for sanitary services and will be recoverable from the premise owner connected to the facility. Section 20 also requires that all charges due for sewage sanitary and refuse removal shall be recovered jointly and severally from the owner and occupier of the premises in respect of which the services were rendered. This in part allows for application of the “polluter-pays-principle”

Section 163 allows the County Council to prohibit all business, which may be or become a source of danger, discomfort, or annoyance due to their noxious nature through smoke, fumes, dust, noise, or vibrations. Section 165 allows the local authority to refuse to grant or renew any license which is empowered in this act or any other written law on the grounds that the activity does not conform to the requirements of any by-laws in force in the area of such local authority the granting of the license would be contrary to the public interest.

Part XI section 168 provides that every municipal council, town council or urban council may establish and maintain sewerage and drainage works within or without its area of jurisdiction. For purposes of the land required for such development, section 144 states in part “A local authority may, subject to the approval of the Minister, apply to the government or any other authority having power to acquire land required for purposes of any of its functions, to be acquired compulsorily for and on behalf of, and at the expense of the local authority”. The Act, however, does not indicate the repercussions of impacts on landowners.

Section 160 helps local authorities ensure effective utilization of the sewers 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. However, to protect against illegal connections, section 173 states that any person who, without prior consent in writing from the council, erects a building on: excavate or opens-up: or injures or destroys any sewers, drains or pipes
shall be guilty of an offence. Any demolitions and repairs thereof shall be carried out at the expense of the offender.

For maintenance of such sewerage systems, the following relevant clauses have been drawn from section 169 of the Act that reads in part “A municipal council may for purposes of carrying out any drainage or sewerage works------”:

“------cause such sewers, drains and pipes to be made, altered, deepened, covered, laid and maintained either within or without as may be necessary for effectively disposing of the sewage and draining of its area ------"

“------carry such sewers, drains and pipes through, across, or under any public road, street, square or open place laid out for public road, street, square or open space without paying compensation and after giving 30 days notices in writing to the owner or occupier of the intention to do so ------“

“------from time to time alter, enlarge, divert, discontinue, close-up or destroy any sewers, drains, or pipes under its control ------“

Section 170, allows the right of access to private property at all times by local authorities, its officers and servants for purposes of inspection, maintenance and alteration or repairs. In addition, the municipal Council may establish and maintain sewage farms or disposal works, and dispose of the effluent therefrom, but shall not be liable for any nuisance or damage as a consequence of proper and ordinary conduct of the sewage farms or disposal works (section 171). To ensure sustainability in this regard, the local authority is empowered to make by-laws in respect of all such matters as are necessary or desirable for the maintenance of health, safety and wellbeing of the inhabitants of its area as provided for under section 201 of the Act.

To ensure sustainability in this regard, the local authority is empowered to make by-laws in respect of all such matters as are necessary or desirable for the maintenance of health, safety and wellbeing of the inhabitants of its area as provided for under section 201 of the Act.

*The Proponent shall observe the guidelines as set out in the environmental management and monitoring plan laid out in this report as well as the recommendations provided for mitigation/minimisation/avoidance of adverse impacts arising from the project activities.*

**4.3.12 Physical Planning Act, 1996**

The Local Authorities are empowered under section 29 of the Act to reserve and maintain all land planned for open spaces, parks, urban forests and green belts. The same section, therefore allows for the prohibition or control of the use and development of land and buildings in the interest of proper and orderly development of an area.

Section 24 of the Physical Planning Act gives provision for the development of local physical development plan for guiding and coordinating development of infrastructure facilities and services within the area of authority of County, municipal and town council and for specific control of the use and development of land. The plan shows the manner in which the land in the area may be used.

Section 29 of the physical Planning Act gives county councils power to prohibit and control the use of land, building, and subdivision of land, in the interest of proper and orderly development of its area. The same section also allows them to approve all development applications and grant development permissions as well as to ensure the proper execution and implications of approved physical
development plans. On zoning, the act empowers them to formulate by-laws in respect of use and density of development.

Section 30 states that any person who carries out development within an area of a local authority without development permission shall be guilty of an offence and the development shall be invalid. The act also gives the local authority power to compel the developer to restore the land on which such development has taken place to its original conditions within a period of ninety days. If no action is taken, then the council will restore the land and recover the cost incurred thereto from the developer. In addition, the same section also states that no person shall carry out development within the area of a local authority without development permission granted by the local authority. At the same time, subsection 5, re-enforce it further that, no licensing authority shall grant under any written law, a license for commercial use for which no development permission had been granted by the respective local authority.

Section 36 states that if in connection with development application a local authority is of the opinion that, the proposed activity will have injurious impact on the environment, the applicant shall be required to submit together with the application an Environmental Impact Assessment report. The Environmental Impact Assessment report must be approved by the National Environmental Management Authority (NEMA) and followed by annual environmental audits as spelled out by EMCA 1999. Section 38 states that if the local authority finds out that the development activity is not complying to all laid down regulations, the local authority may serve an enforcement notice specifying the conditions of the development permissions alleged to have been contravened and compel the developer to restore the land to its original conditions.

The Proponent has applied for Development Permission from the local authority and has also commissioned an Environmental Impact Assessment study for approval by NEMA.

4.3.13 Land Planning Act (Cap. 303)
Section 9 of the subsidiary legislation (The Development and Use of Land Regulations, 1961) under this Act requires that before the local authorities submit any plans to the Minister for approval, steps should be taken as may be necessary to involve the owners of any land affected by such plans.

The proponent is liaising with directorate of City planning to get clearance as concerns the intended project and existing development plans.

4.3.14 Water Act, 2002
The Act vests the water in the State and gives the provisions for the water management, including irrigation water, pollution, drainage, flood control and abstraction. It is the main legislation governing the use of water especially through permit system.

Part II, section 18, of the Water Act 2002 provides for national monitoring and information system on water resources. Following on this, sub-section 3 allows the Water Resources Management Authority (WRMA) to demand from any person or institution, specified information, documents, samples or materials on water resources. Under these rules, specific records may require to be kept by a facility operator and the information thereof furnished to the authority.
The Water Act Cap 372 vests the rights of all water to the state, and the power for the control of all body of water with the Minister, the powers is exercised through the Minister and the Director of water resources in consultation with the water catchments boards, it aims at provision of conservation of water and appointment and use of water resources.

Part II Section 18 provides for national monitoring and information systems on water resources. Following on this, Sub-section 3 allows the Water Resources Management Authority to demand from any person, specified information, documents, samples or materials on water resources. Under these rules, specific records may be required to be kept and the information thereof furnished to the authority on demand.

Section 20 of the Act requires a permit to be obtained for among others any use of water from a water resources, discharge of a pollutant into any water resource. According to section 29 of the same Act, application for such a permit shall be subject to public consultation as well as an Environmental Impact Assessment as per the Environmental Management and Coordination Act, 1999. The conditions of the permit may also be varied if the authority feels that the water so used is causing deterioration of water quality or causing shortage of water for other purposes that the authority may consider has priority. This is provided for under section 35 of the Act.

Section 73 of the Act allows a person with a license to supply water (licensee) to make regulations for purposes of protecting against degradation of sources of water which he is authorised to take. Under the Act, the licensee could be a local authority, a private Trust or an individual and the law will apply accordingly under the supervision of the Regulatory Board.

Section 76 states that no person shall discharge any trade effluent from any trade premises into sewers of a licensee without the consent of the licensee upon application indicating the nature and composition of the effluent, maximum quantity anticipated, flow rate of the effluent and any other information deemed necessary. The consent shall be issued on conditions including the payment rates for the discharge as may be provided under section 77 of the same Act.

**Construction of access road will ensure leveling and soil erosion prevention measures. All construction, operation and decommissioning phases will take caution to contain oil spills to prevent soil and water pollution.**

### 4.3.15 Energy Act of 2006

This is an Act of Parliament passed to amend and consolidates the law relating to energy, to provide for the establishment, powers and functions of the Energy Regulatory Commission and the Rural Electrification Authority and for connected purposes.

The Energy Act of 2006 replaced the Electric Power Act of 1997 and The Petroleum Act, Cap 116. The Energy Act, amongst other issues, deals with all matters relating to all forms of energy including the generation, transmission, distribution, supply and use of electrical energy as well as the legal basis for establishing the systems associated with these purposes.

The Energy Act, 2006, also established the Energy Regulatory Commission (ERC) whose mandate is to regulate all functions and players in the Energy sector. One of the duties of the ERC is to ensure compliance with Environmental, Health and Safety Standards in the Energy Sector, as empowered by Section 98 of the Energy Act, 2006.

In this respect, the following environmental issues will be considered before approval is granted:
1. The need to protect and manage the environment, and conserve natural resources;
2. The ability to operate in a manner designated to protect the health and safety of the project employees; the local and other potentially affected communities.

Licensing and authorization to generate and transmit electrical power must be supported by an Environmental Impact Assessment Report (EIA) approved by NEMA.

Part IV Section 80(1) provides that a person shall not conduct a business of importation, refining, exportation, whole sale, retail, storage or transportation of petroleum, except under and in accordance with the terms and conditions of a valid licence.

Part IV Section 90 (1) stipulates that a person intending to construct a pipeline, refinery, bulk storage facility or retail dispensing site shall before commencing such construction, apply in writing to the Energy Regulatory commission for a permit to do so. The application shall: specify the name and address of the proposed owner; be accompanied by three (3) copies of plans and specifications and be accompanied by an Environmental Impact Assessment (EIA) Report.

Part IV section 91(1) stipulates that the Energy Regulatory Commission shall, before issuing a permit under section 90, take into account all relevant factors including the relevant government policies and compliance with Environment Management and Coordination Act, 1999 and in particular EIA report as per Impact Assessment and Audit Regulations 2003, the Physical Planning Act, 1996 and the Local Government Act.

Part iv section 100 (1) provides that it is an offence if a person being the owner or operator of a refinery, pipeline, bulk liquefied Petroleum gas or natural gas facility, service station, filling station or storage depot, fails to institute appropriate environmental, health or safety control measures. The offence if convicted, he/she shall be liable to a fine not exceeding two million shillings or to a maximum term of imprisonment of two years, or to both.

The proposed project will be required to follow the guidelines set out in this Act.

4.3.16 The Standards Act Cap 496
The Act is meant to promote the standardization of the specification of commodities, and code of practice; to establish a Kenya Bureau of Standards, to define its functions and provide for its management and control.

The proponent will ensure that commodities and codes of practice utilized in the project adhere to the provisions of this Act.

All materials and spares used to construct the substation will comply with the Standardized specifications and Certification.

4.3.17 Penal Code Act (Cap.63)
Section 191 of the penal code states that if any person or institution that voluntarily corrupts or foils water for 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, dwelling or business premises in the neighborhood or those passing along public way, commits an offence.

The Proponent shall observe the guidelines as set out in the environmental management and monitoring plan laid out in this report as well as the recommendation provided for mitigation/minimisation/avoidance of adverse impacts arising from the project activities.

4.3.18 The Wildlife Conservation and Management Act, Cap 376


This Act provides for the protection, conservation and management of wildlife in Kenya. The provisions of this Act should be applied in the management of the project.

Part III Section 13 subsection (I) stipulates that any person who not being an officer of Kenya Wildlife Service hunts any animal in a National Park shall be guilty of a forfeiture offence and liable to a fine or imprisonment. Subsection 2 of the Act likewise provides that any person who, without authorisation conveys into a National Park, or being within the area thereof, in possession of, any weapon, ammunition, explosive, trap or poison, shall be guilty of a forfeiture offence.

The Act provides that no person is allowed to use any aircraft, motor vehicle or mechanically propelled vessel in such a manner as to drive, stampede or unduly disturb any protected animal or game animal. Therefore it will be prudent that the construction workforce is conversant with the provisions of this Act.

The proposed project is not located within a conservation/protected area and this act will not be triggered by the project at the stages.

4.3.19 The Lakes and Rivers Act Chapter 409 Laws of Kenya:

This Act provides for protection of rivers, lakes and associated flora and fauna. The provisions of this Act may be applied in the management of the project.

4.3.20 The Forestry Services Act, 2005

The Act led to the establishment of Kenya Forest Service which is charged with management of forests in consultation with the forest owners. The body enforces the conditions and regulations pertaining to logging, charcoal making and other forest utilization activities.

To ensure community participation in forest management, the service collaborates with other organizations and communities in the management and conservation of forests and for the utilization of the biodiversity.

Section 43 (1) provides that if mining, quarrying or any other activity carried out in the forest, where the activity concerned is likely to result in forest cover depletion, the person responsible shall undertake compulsory re-vegetation immediately upon the completion of the activity.

The proposed project does not traverse any Gazetted forest nor any conservation area hence the Act will not be triggered but the proponent will adhere to recommendations in the EMP in regards to
vegetation clearance in the private farms and the provisions of this act will be observed where applicable.

4.3.21 Occupational Safety and Health Act, 2007

This is an Act of parliament to provide for the safety, health and welfare of all workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. It applies to all workplaces where any person is at work, whether temporarily or permanently.

The purpose of the Act is to:

- Secure the safety, health and welfare of persons at work;
- Protect persons other than persons at work against safety and health arising out of, or in connection with the activities of persons at work.

The Act provides that before any premises are occupied, or used as a workplace, a certificate of registration must be obtained from the Director of Occupational Safety and Health Services. The Act provides for the health, safety and welfare for employees at workplaces. This shall be considered at the construction, implementation and decommissioning phases of the project. The following are other provisions of the Act.

4.3.21.1 Health

The premise must be kept clean; a premise must not be overcrowded. The circulation of fresh air must secure adequate ventilation of workrooms. There must be sufficient and suitable lighting in every part of the premise in which persons are working or passing. There should also be sufficient and suitable sanitary conveniences separate for each sex, must be provided subject to conformity with any standards prescribed by rules. Food and drinks should not be partaken in dangerous places or workrooms. Provision of suitable protective clothing and appliances including where necessary, suitable gloves, footwear, goggles, gas masks, and head covering, and maintained for the use of workers in any process involving exposure to wet or to any injurious or offensive substances.

4.3.21.2 Safety

Fencing of premises and dangerous parts of other machinery is mandatory. Training and supervision of inexperienced workers, protection of eyes with goggles or effective screens must be provided in certain specified processes. Floors, passages, gangways, stairs, and ladders must be soundly constructed and properly maintained and handrails must be provided for stairs. Special precaution against gassing is laid down for work in confined spaces where persons are liable to overcome by dangerous fumes. Air receivers and fittings must be of sound construction and properly maintained. Adequate and suitable means for extinguishing fire must be provided in addition to adequate means of escape in case of fire must be provided.

4.3.21.3 Welfare

An adequate supply of both quantity and quality of wholesome drinking water must be provided. Maintenance of suitable washing facilities, accommodation for clothing not worn during working hours must be provided. Sitting facilities for all female workers whose work is done while standing should be provided to enable them take advantage of any opportunity for resting.
Every premise shall be provided with maintenance, readily accessible means for extinguishing fire and person trained in the correct use of such means shall be present during all working periods.

Regular individual examination or surveys of health conditions of industrial medicine and hygiene must be performed and the cost will be met by the employer. This will ensure that the examination can take place without any loss of earning for the employees and if possible within normal working hours.

The (OSH) Act provides for development and maintenance of an effective programme of collection, compilation and analysis of occupational safety. This will ensure that health statistics, which shall cover injuries and illness including disabling during working hours, are adhered.

_The environmental management plan (EMP) advises the Proponent on safety and health aspects, potential impacts, personnel responsible for implementation and monitoring, frequency of monitoring, and estimated cost._

### 4.3.22 Work Injury and Benefits Act, 2007

This Act provides for compensation to employees for work related injuries and disease contracted in the course of their employment and for connected purposes. Key sections of the Act include the obligations of employers; right to compensation; reporting of accidents; compensation; occupational diseases; medical aid etc. _In case of any accidents or incidents during the project cycle, this Act will guide the course of action to be taken._

### 4.3.23 Occupiers Liability Act (Cap. 34)

This Act provides that it’s the duty of occupier of the premises owes to his visitors in respect of danger and risk due to the state of the premises or to things omitted or attributes an affliction on his/her health to a toxic materials in the premises.

### 4.3.24 The Radiation Protection Act (Cap 243 Laws of Kenya)

This is an Act of Parliament to provide for the protection of the public and radiation workers from the dangers arising from the use of devices or material capable of producing ionizing radiation and for connected purposes.

Since 1982, Kenya decided to join in the global movement for the use of nuclear energy for peaceful purposes, a movement lead by the International Atomic Energy Agency (IAEA). Most of such uses are in the fields of medicine, agriculture, energy and environmental monitoring. The dangers of injury to the public prompted the adoption of the Radiation Protection Act (Cap 243) in November 1984 to provide according to its citation, protection of the public and radiation workers from the dangers arising from the use of devices or materials capable of producing ionizing radiation and for connected purpose.

The Act prohibits the unauthorized manufacture, production, possession or use, sale, disposal, lease, loan or dealership, import, export of any irradiating device or radioactive material. All authorized buyers, sellers, users, of such device must be properly licensed. The Act is administered by the Chief Radiation Protection Officer assisted by a Radiation Protection Board.

_The proposed project won't emit/produce ionizing radiations._
4.3.25 The Traffic Act Chapter 295 Laws of Kenya

This Act consolidates the law relating to traffic on all public roads. Key sections include registration and licensing of vehicles; driving licenses; driving and other offences relating to the use of vehicles on roads; regulation of traffic; accidents; offences by drivers other than motor vehicles and other road users.

Many types of equipment and fuel shall be transported through the roads to the proposed site. Their registration and licensing will be required to follow the stipulated road regulations.

The Act also prohibits encroachment on and damage to roads including land reserved for roads. The project will observe the provisions of the Act.

4.3.26 The Public Roads and Roads of Access Act (Cap 22 Laws of Kenya)

Section 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 landowners seeking permission to construct the respective roads.

The project design concept has left the required road reserves and relevant road widening surrenders.

This Act consolidates the law relating to traffic on all public roads. The Act also prohibits encroachment on and damage to roads including land reserved for roads.

The proposed facility location complies with the provision of the Act. It is not on road reserves.

4.3.27 The Way leaves Act Cap 292

According to the Way leaves Act cap 292 Section 2, Private land does not include any land sold or leased under any Act dealing with Government lands. Section 3 of the Act states that the Government may carry any sewer, drain or pipeline into, through, over or under any lands whatsoever, but may not in so doing interfere with any existing building. Section 8 further states that any person who, without the consent of the Permanent Secretary to the Ministry responsible for works (which consent shall not be unreasonably withheld), causes any building to be newly erected over any sewer, drain or pipeline the property of the Government shall be guilty of an offence and liable to a fine of one hundred and fifty shillings, and a further fine of sixty shillings for every day during which the offence is continued after written notice in that behalf from the Permanent Secretary; and the Permanent Secretary may cause any building erected in contravention of this section to be altered, demolished or otherwise dealt with as he may think fit, and may recover any expense incurred by the Government in so doing from the offender.

The proposed substation will not trigger the act. No compensation will arise because the land has been purchased through open tender on willing seller willing buyer basis hence all aspects of the act have been adequately addressed.
4.3.28 The Agriculture Act, Cap 318 of 1980 (revised 1986)

This Act has stated objectives to promote and sustain agricultural production, provide for conservation of the soil and its fertility, and stimulate the development of agricultural land in accordance with accepted practices of good land management and good husbandry.

*The proposed project will not trigger the act. Any aspects which may affect farms, recommendations to mitigate the impacts have been adequately addressed in the ESMP.*

4.3.29 Antiquities and Monuments Act, 1983 (Cap 215)

This Act aims to preserve Kenya’s national heritage. Kenya is rich in its antiquities, monuments and cultural and natural sites which are spread all over the country. The National Museums is the custodian of the country’s cultural heritage. Through the National Museums many of these sites are protected by law by having them gazette under the Act.

*The Act will not be triggered because there are no known monuments, cultural and natural sites along the proposed project area.*

4.3.30 The Registration of Titles Act Cap 281

This Act provides for the transfer of the land by registration of titles. Parts within the Act elaborate on mechanisms of bringing lands under the Act, and for related purposes. The Act also elaborates on the incorporation of group representatives and the administration of groups.

Section 34 of this Act states that when land is intended to be transferred or any right of way or other easement is intended to be created or transferred, the registered proprietor or, if the proprietor is of unsound mind, the guardian or other person appointed by the court to act on his/her behalf in the matter, shall execute, in original only, a transfer in form F in the First Schedule, which transfer shall, for description of the land intended be dealt with, refer to the grant or certificate of title of the land, or shall give such description as may be sufficient to identify it, and shall contain an accurate statement of the land and easement, or the easement, intended to be transferred or created, and a memorandum of all leases, charges and other encumbrances to which the land may be subject, and of all rights-of-way, easements and privileges intended to be conveyed.

*The Act will be applicable because the Proponent has already purchased land from the owner on willing seller willing buyer basis. The land title has already been transferred to Kenya Power.*

4.3.31 The Land Titles Act Cap 282

The Land Titles Act Cap 282 section 10 (1) states that there shall be appointed and attached to the Land Registration Court a qualified surveyor who, with such assistants as may be necessary, shall survey land, make a plan or plans thereof and define and mark the boundaries of any areas therein as, when and where directed by the Recorder of Titles, either before, during or after the termination of any question concerning land or any interest connected therewith, and every area so defined and marked shall be further marked with a number of other distinctive symbol to be shown upon the plan or plans for the purposes of complete identification and registration thereof as is herein after prescribed.
The proponent has held consultative meeting with the land owner and land will be taken by the proponent hence the Act will triggered. The land has already been surveyed and title transferred to Kenya Power.

4.3.32 The Land Acquisition Act Chapter 295 Laws of Kenya

The Act provides for the compulsory or otherwise acquisition of land from private ownership for the benefit of the general public. Section 3 states that when the Minister is satisfied on the need for acquisition, notice will be issued through the Kenya Gazette and copies delivered to all the persons affected. Full compensation for any damage resulting from the entry onto land, to do things such as survey upon necessary authorization, will be undertaken in accordance with section 5 of the Act. Likewise where land is acquired compulsorily, full compensation shall be paid promptly to all persons affected in accordance to sections 8 and 10 along the following parameters:

(i) Area of land acquired
(ii) The value of the property in the opinion of the Commissioner of land (after valuation),
(iii) Amount of the compensation payable,
(iv) Market value of the property,
(v) Damages sustained from the severance of the land parcel from the land,
(vi) Damages to other property in the process of acquiring the said land parcel,
(vii) Consequences of changing residence or place of business by the land owners,
(viii) Damages from diminution of profits of the land acquired.

Part II of the Act allows for the temporary acquisition of the land for utilisation in promotion of the public good for periods not exceeding 5 years. At the expiry of the period, the Commissioner of Land shall vacate the land and undertake to restore the land to the conditions it was before. Any damages or reduction of value shall be compensated to the landowners.

4.3.33 The Civil Aviation Act Cap 394

Under this act, the Kenya Civil Aviation Authority (KCAA) has to authorize and approve the height of Transmission lines and masts when they are on or proximal to flight Paths so as to ensure the safety of flying aircraft.

Under Section 9 of this act, notwithstanding the provisions of any written law, or terms of any deed, grant, lease, or license concerning the use and occupation of land, the minister may, where he considers it to be necessary in the interests of air navigation, by order published in the Gazette, prohibit the erection within a declared area of any structure above height specified in the order.

Failure to adhere to the provisions of this act, one commits an offence and upon conviction shall be liable to a fine not exceeding two million shillings or to imprisonment for a term not exceeding three years or to both.
4.4 International Environmental Guidelines

Kenya is a signatory to a number of conventions on sustainable development and is a member of various bilateral and multilateral organizations. Some of the relevant International treaties and conventions include:

- Vienna Convention for the Protection of the Ozone Layer. Inter-governmental negotiations for an International agreement to phase out ozone depleting substances concluded in March 1985 with The adoption of this convention to encourage Inter-governmental co-operation on research, systematic observation of the ozone layer, monitoring of CFC production and the exchange of information;

- Montreal Protocol on Substances that Deplete the Ozone layer: Adopted in September 1987 and intended to allow the revision of phase out schedules on the basis of periodic scientific and technological assessment, the Protocol was adjusted to accelerate the phase out schedules and has since been amended to introduce other kinds of control measures and to add new controlled substances to the list;

- The Basel Convention: Sets an ultimate objective of stabilizing greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system;

- Kyoto Protocol: Drawn up in 1997, pursuant to the objectives of the United Nations Framework Convention on Climate Change, in which the developed nations agreed to limit their greenhouse gas emissions, relative to the levels emitted in 1990;

- Convention on Biological Diversity (CBD, 1992): This Convention entered into force on 29 December 1993, and its objectives are to: conserve biological diversity; use biological diversity in a sustainable fashion and share the benefits of biological diversity fairly and equitably. This Convention governs Kenya’s international obligations regarding biological diversity;

- UNESCO Convention for the protection of the World Cultural and Natural Heritage (World Heritage Convention, 1972): This Convention aims to encourage the identification, protection, and preservation of Earth’s cultural and natural heritage. It recognizes that nature and culture are complementary and that cultural identity is strongly related to the natural environment in which it develops;

- Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar Convention): The Convention was signed in Iran in 1971 and came into force in 1975. It represents the first attempt to establish a legal instrument providing comprehensive protection for a particular type of ecosystem. The Ramsar parties agree to implement their planning so as to promote conservation of the wetlands included in the list. There is no Ramsar site near the proposed site.

- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES): This convention seeks to control the trade in species of wild animals and plants that are, or may be, threatened with extinction as a result of International trade. CITES is an important line of defense against the threat posed to diversity by invasive species.
The Africa-Eurasia Migratory Water Bird Agreement (AEWA, 1995): The goal of the agreement is to protect migratory waterfowl by ensuring that they are protected for the entire length of their migratory routes. The list of birds protected under the AEWA Convention covers 235 species of birds.

African Convention on Conservation of Nature and Natural Resources (1968): This Convention of the African Union is ratified by 40 African countries, including Kenya. The fundamental principle requires contracting states to adopt the measures necessary to ensure conservation, utilization and development of soil, water, flora and fauna resources in accordance with scientific principles and with due regard to the best interests of the people.

Kenya has a duty under these multilateral agreements. The project should adhere to strict guidelines and procedures to ensure the agreements are not violated.

4.5 World Bank /IFC Environment and Social Safeguards Policies

The objective of the World Bank’s environmental and social safeguard policies is to prevent and mitigate undue harm to people and their environment in the development process. These policies provide guidelines for the bank and borrower staffs in the identification, preparation, and implementation of programs and projects. Safeguard policies have often provided a platform for the participation of stakeholders in project design, and have been an important instrument for building ownership among local population.

The Safeguard Policies aims at improving decision making, to ensure that project options under consideration are sound and sustainable, and that potentially affected people have been properly consulted.

4.5.1 Environment Assessment (Operational Policy, OP/BP 4.01)

The objective of this policy is to ensure that Bank-financed projects are environmentally sound and sustainable, and that decision-making is improved through appropriate analysis of actions and of their likely environmental impacts. This policy is considered to be the umbrella policy for the Bank’s environmental ‘safeguard policies’.

The proposed project triggers this policy because although there is justification of the proposed substation, there are environmental and social concerns associated with the construction and operation of the proposed project.

4.5.2 Natural Habitats (Operational Policy, OP/BP 4.04)

This policy recognizes that the conservation of natural habitats is essential to safeguard their unique biodiversity and to maintain environmental services and products for human society and for long-term sustainable development. The Bank therefore supports the protection, management, and restoration of natural habitats in its project financing, as well as policy dialogue and economic and sector work. The Bank supports, and expects borrowers to apply, a precautionary approach to natural resource management to ensure opportunities for environmentally sustainable development. Natural habitats are land and water areas where most of the original native plant and animal species are still present.
Natural habitats comprise many types of terrestrial, freshwater, coastal, and marine ecosystems. They include areas lightly modified by human activities, but retaining their ecological functions and most native species.

The proposed project doesn’t trigger this policy because the project won’t cause significant conversion (loss) or degradation of natural habitats, whether directly (through construction) or indirectly (through human activities induced by the project). The area is private owned land. The substation will pose insignificant environmental impacts.

4.5.3 Physical Cultural Resources (Operational Policy 4.11)

The objective of this policy is to assist countries to avoid or mitigate adverse impacts of development projects on physical cultural resources. For purposes of this policy, “physical cultural resources” are defined as movable or immovable objects, sites, structures, groups of structures, natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above ground, underground, or underwater. The cultural interest may be at the local, provincial or national level, or within the international community.

The policy will not be triggered because the proposed project is not in the vicinity of, any recognized cultural heritage, archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance sites.

4.5.4 Involuntary Resettlement (Operational Policy, OP/BP 4.12)

The objective of this policy is to (i) avoid or minimize involuntary resettlement where feasible, exploring all viable alternative project designs; (ii) assist displaced persons in improving their former living standards, income earning capacity, and production levels, or at least in restoring them; (iii) encourage community participation in planning and implementing resettlement; and (iv) provide assistance to affected people regardless of the legality of land tenure.

The policy will not be triggered because no household will have to be relocated since the substation will not be constructed close to any community houses, businesses or any industrial establishments within the locality.

4.5.5 Forests (Operational Policy, OP/BP 4.36)

The objective of this policy is to assist borrowers to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development and protect the vital local and global environmental services and values of forests. Where forest restoration and plantation development are necessary to meet these objectives, the Bank assists borrowers with forest restoration activities that maintain or enhance biodiversity and ecosystem functionality. The Bank assists borrowers with the establishment of environmentally appropriate, socially beneficial and economically viable forest plantations to help meet growing demands for forest goods and services.

This policy will be not be triggered because proposed route does not pass next any gazette forest or any National Park (Forest).
4.6 Environmental Conventions and Treaties

4.6.1 World Commission on Environment and Development

The Commission commonly referred to as “the Brutland 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.

4.6.2 Convention on Biological Diversity (1992)

This was ratified on 11th September 1994. 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 underscore that environmental issues are best handled with participation of all concerned citizens at all the relevant levels. At the national level, each individual shall have appropriate access to information that is concerning environment that is held by public authorities. States shall encourage and facilitate public participation by making information widely available. 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 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.

4.6.3 Montreal Protocol, 1987

The Montreal Protocol on Substances that deplete the ozone layer (1987) was ratified on November 9, 1988. This treaty was designed to protect the ozone layer by phasing out the production of a number of substances believed to be responsible for ozone depletion.

4.6.4 United Nations Convention to combat Desertification (1994)

An agreement to combat desertification and mitigate the effects of drought through national action programs that incorporate long term strategies supported by international cooperation and partnership arrangements.

4.6.5 United Nations Framework Convention on Climate Change (1992)

International environmental treaty produced at the United Nations Conference on Environment and Development (UNCED), informally known as the Earth Summit, held in Rio de Janeiro in 1992. The treaty is aimed at reduced emissions of greenhouse gas in order to combat global warming.

4.6.6 Bamako Convention (1991)

A treaty of African nations prohibiting the import of any hazardous (including radioactive) wastes.
4.6.7 Kyoto Protocol (2004)
An amendment to the international treaty on climate change, assigning mandatory emission limitations for the reduction of greenhouse gas emissions to the signatory nations

4.7 Environmental Policy

4.7.1 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. 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. The policy paper emphasizes that environmental impact assessment must be undertaken by the developer 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.

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

4.7.3 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. 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.
CHAPTER FIVE: PUBLIC CONSULTATION AND PARTICIPATION

5.1 Public Stakeholder Consultation

Public participation is an essential and legislative requirement for environmental authorization. The ESIA team undertook the public stakeholder consultation (PSC) for the proposed project in accordance with the requirements for an EIA Study stipulated in the EMCA, 1999 and EIA/EA Regulations 2003.

The purpose of public participation is to identify PAPs and PIPs and to allow such parties the opportunity to provide input and comment on the EIA process, including issues and alternatives that are to be investigated, thereby facilitating informed decision-making. In complying with the public participation process (PPP) for the EIA, consultations were carried out to ensure that issues, concerns and potential impacts identified by PAPs, including the authorities, proponents, technical specialists and the public are addressed fully.

5.2 Sources of Information

Public participation was a key component of the ESIA of the Proposed Villa Franca 66/11 kV Substation. Positive and negative views and comments of the immediate neighbours were sought as from September 2012 to February 2013. The exercise was conducted through consultative stakeholder visits in Embakasi district. Public consultations were conducted through the use pre-designed questionnaires and interviews with neighbours within the project area.

5.3 Objective of Public Stakeholder Consultation

The objectives of public participation in an EIA are to provide sufficient and accessible information to Interested and Affected Parties (I&APs) in an objective manner to assist them identify issues of concern, and provide suggestions for enhanced benefits and alternatives.

5.4 Approach used in carrying out the PSC

The Proponent in consultation with the team of experts informed the neighbors as well as the relevant authorities two weeks before consultation began. Owing to the sizeable number of the stakeholders, the experts opted to do individual consultation, focused group consultation. The following stakeholders were consulted:

<table>
<thead>
<tr>
<th>1. General Motors East Africa Ltd</th>
<th>2. GAPCO group companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Buyline industries Ltd</td>
<td>4. TEKENEKA Enterprises</td>
</tr>
<tr>
<td>5. Kenline Ltd</td>
<td>6. Daybreak Ltd, Airport View Total Station</td>
</tr>
<tr>
<td>7. Hwan Sung IND (K) Ltd</td>
<td>8. Samani Construction Ltd</td>
</tr>
<tr>
<td>9. Imara Daima Residents Association</td>
<td>10. International Christian Centre (Imara Daima)</td>
</tr>
<tr>
<td>11. Provincial Administration</td>
<td>12. Nairobi City Council</td>
</tr>
<tr>
<td>15. District Development officer,</td>
<td>16. Political leaders- area Councilors’</td>
</tr>
<tr>
<td>17. Ministry of youth affairs,</td>
<td>18. Members of the public owning property neighboring the substation</td>
</tr>
</tbody>
</table>
5.5 Site Visit and Consultation with Relevant Authorities

5.5.1 Meeting with District commissioner’s team (HODs)
Since the project area falls under the jurisdictions of one District, consultations were made with the District Commissioner of Embakasi District to get their views and inputs on the project. The DC and his team were in support of the project and added that it of great importance to ensure that the public is widely consulted and awareness created coupled appropriate compensation for those to be affected by the proposed project.

5.5.2 Local community consultation
Public consultations through interviews and pre designed questionnaires were done which included visits to owners of various business premises, Churches, educational institution and industrial establish. It is important to note that the project may not impact the public so much in that it is located within an expansive land within a highly protected area of the Kenya Power. Much of the area is devoid of any settlements except a few industrial installations and upcoming residential houses and a few temporary structures on the road reserve along the Tecla Lorupe road and International Christian Church/sunrise estate slip Road.

5.6 Comments and Responses from the Stakeholders
During consultations the Scope of activities associated with project were presented by ESIA expert to the key stakeholders and community members. The audience was then asked to make suggestions, comments and ask questions for clarifications. All comments received on the consultation were incorporated into the Final Impact Assessment Report and submitted to the NEMA for the issuance of a decision on the proposed development.

Detailed Public Participation and Consultation was envisaged as part of the EIA exercise as required under EMCA 1999 regulations. The consultations were undertaken as part of the ESIA in order to obtain the views of stakeholders, their concerns and suggestions towards sustainable implementation of the project. The summary of the various stakeholders concerns and suggestions are summarized below.

The following were the major concerns that were raised up by various stakeholders in regard to the proposed project

A summary of concerns and possible mitigation measures discussed in four Public consultative meetings is as in the following table.

<table>
<thead>
<tr>
<th>CONCERNS</th>
<th>RESPONSES &amp; MITIGATION MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrocution</td>
<td>The proponent would ensure the distribution lines and poles are maintained in a good state of repair, with frequent monitoring and necessary corrective measures.</td>
</tr>
<tr>
<td>Noise and dust:</td>
<td>It was agreed that the Proponent would ensure construction to be done during the day and to observe NEMA Noise regulations.</td>
</tr>
<tr>
<td>Employment</td>
<td>The contractor will be expected to engage the locals for unskilled and semiskilled jobs during the project. This forms part of the contractual agreement with the proponent. The locals should be able and willing to accept the wages offered. Further recruitments can also be during the</td>
</tr>
</tbody>
</table>
CONCERNS | RESPONSES & MITIGATION MEASURES
--- | ---
Cheap and increased connections to the locals after project implementation | It was clarified that the KPLC connection charges are standard and will apply. Since the Line will be 33 and 66 KV no connections from the line but after power is stepped down and evacuated to the existing and to be expanded distribution system, more connections will be possible. More industries expected to be implemented in the locality and locals can also use power in their artisan industrial activities.
Destruction of flora and Fauna | Generally the area is an open field with no known wildlife. The surrounding area is mainly made up of light industries hence the project is compatible with the area. The proposed site cannot be a natural habitat for birds and wild animals.

**Stakeholders Views**

Table 5-2 Summary of concerns from both Key and Public stakeholders consulted

<table>
<thead>
<tr>
<th>Name</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samani Construction Ltd</td>
<td>• Reliable electricity supply will enhance development and industrial growth</td>
</tr>
<tr>
<td>Tel 020-2089066/77</td>
<td>• Provide quality and reliable Power to our company hence will minimize the use of diesel generators during power outages which is common in the area</td>
</tr>
<tr>
<td>Tel 020-2089066/77</td>
<td>• The project is a necessary infrastructure especially in light of the Kenya’s Vision 2030</td>
</tr>
<tr>
<td>Tel 020-2089066/77</td>
<td>• Proper EIA process to be fully followed</td>
</tr>
<tr>
<td>Amos Odoyo</td>
<td>• Trade activities which require consumption of a lot of electricity will be boosted lending to increased productivity and income generation- reduce poverty</td>
</tr>
<tr>
<td>Tel 020-2020017</td>
<td>• A good idea, the project should be fast trucked</td>
</tr>
<tr>
<td>Tel 020-2020017</td>
<td>• It will ensure uninterrupted power supply and reduction in no of outages</td>
</tr>
<tr>
<td>Tel 020-2020017</td>
<td>• Noise pollution from the currently used generator will be eliminated</td>
</tr>
<tr>
<td>James Njoroge</td>
<td>• Supports the project</td>
</tr>
<tr>
<td>Manager, Manufacturing</td>
<td>• Project will result in Domestic and commercial lighting</td>
</tr>
<tr>
<td>Engineering Quality,</td>
<td>• Provide cheaper sources of energy compared to diesel generators we use a times during power outages</td>
</tr>
<tr>
<td>Environment,</td>
<td>• Provide employment opportunities for city dwellers</td>
</tr>
<tr>
<td>General Motors E.A Ltd</td>
<td>• Will result in well-lit streets and improved security</td>
</tr>
<tr>
<td>Tel: 0722 779355</td>
<td>• Unexpected fires incase of faults or accidents</td>
</tr>
<tr>
<td>ID: No: 13571075</td>
<td></td>
</tr>
<tr>
<td>Rita Otengo</td>
<td>• Reliable and cheap power</td>
</tr>
<tr>
<td>Tekeneke enterprise</td>
<td>• Power installation will promote economic growth in the area</td>
</tr>
<tr>
<td>Tel. 0788-344-178</td>
<td>• Direct and indirect Employment</td>
</tr>
<tr>
<td>Tel. 0788-344-178</td>
<td>• However, they may be incidents of fire outbreaks</td>
</tr>
<tr>
<td>Name</td>
<td>Comments</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Abednego Ntheu Masele              | • Job opportunities to community members  
• Improve security  
• General developments in to area  
• Public institutions will have electricity supply  
• Supports the project  
• Lead to death when not well handled  
• Mismanagement will cause accidents  
• More people will open business and promote employment  
• Supports the project                                                                                                                                                               |
| Airport view Total Station         |                                                                                                                                                                                                                                                                                                                                 |
| ID.No: 22347769                    |                                                                                                                                                                                                                                                                                                                                 |
| Amar Shah                          | • It will create both formal and informal jobs for the locals  
• It will enhance security  
• Supports the project  
• Boost the economy and accelerates industrial development and expansion                                                                                                                                 |
| Head of Operations Buyline Industries Ltd |                                                                                                                                                                                                                                                                                                                                 |
| Mombasa road Box 11946, Nairobi Tel 020-3564752 |                                                                                                                                                                                                                                                                                                                                 |
| Geoffrey Gathuki Imara Daima       | • Trees will be destroyed and should be replaced  
• Good storage of medicine  
• More work for locals will be created  
• Project good for development and security                                                                                                                                                                                                 |
| ID.No: 9824898                      |                                                                                                                                                                                                                                                                                                                                 |
| George Okal                        | • Need electricity very much due to the kind of business they do. Running generators during power outages is very expensive.  
• Employment will be improved since people will be using power available to create new enterprises and new industries will come up.  
• Potential electromagnetic radiation affecting other communication systems and human beings  
• Potential fires from high voltage faults  
• Dust and noise from construction  
• Small businesses will be put in place hence more income will be generated  
• Security will be improved since there will be security lights on the streets near the substation plot which has been a security threat.  
• Risk of people getting shocked by electricity                                                                                                                                 |
| General Motors E.A. Enterprise /Mombasa Rd Tel: 0720376640 ID.No:9951252 |                                                                                                                                                                                                                                                                                                                                 |
| Harminder Singh Kenroid Limited    | • Creation of more jobs  
• Improved income due to more hours of working                                                                                                                                                                                                                                                                                  |
<table>
<thead>
<tr>
<th>Name</th>
<th>Comments</th>
</tr>
</thead>
</table>
| p.o. box 39375-00623 Tel:0789-653-247 | • Improved security  
• Health risk associated with noise and air pollution  
• Environmental degradation during construction  
• May lead to loss of biodiversity  
• Welcomed the project |
| Eric Kyalo  
Hwan Sung IND (K) Ltd  
P.O. Box 5047-00506, Nairobi  
Tel: 0738-008212  
ID. No: 20558302 | • Rapid restoration of Power in case of black out  
• Efficient rescue response in case of fire alarms  
• Schools will have enough light for students to use in their studying and programmes  
• Improvement in life due to availability of electricity  
• Power supply will create multiple products hence development in the community  
• Result in more saloons and barbershops hence improved body care  
• Improved security due to the lighting system  
• Improve businesses due to long hours of operation |
| Chris Naicca Matseshe  
Chairman, Imara Daima Residents Association  
Tel: 0722244518  
ID. No: 21974686 | • Improve security – The plot has been a threat to residents hence once built, properly fenced and put security/ flood lights it will improve our security.  
• Employment provision  
• Reliable power supply  
• We great support the project as residence association because it will bring positive impacts in the area.  
• Kenya power can also assist in improving on the access road hence will also benefit the residence who have been victims of carjacking due to poor access road |
| Ouma Olloo  
International Christian Church  
Imara  
ID. 22167452 | • Reliable power supply  
• Greatly reduce blackouts which are a common occurrence in the area.  
• The will be the issue of noise during construction  
• It will affect the environmental aesthetic of the area  
• The project is welcome provided proper mitigation measures are put in place.  
• The project will provide a good and perfect neighbourhood to the International Christian Church |

### 5.6.1 Positive Issues

#### 5.6.1.1 Employment opportunities

Most neighbours close to the proposed project site especially expected the project to create casual and permanent employment opportunities during the proposed project construction work, operation and decommissioning phases. The employment opportunities could be either directly in the project or indirectly through associated businesses. One of the main positive impacts during projects construction
Proposed Villa Franca 66/11 kV Substation in Nairobi

phase will be the availability of job opportunities especially to casual workers and several other specialized workers.

5.6.1.2 Improvement of local and national economy
Through the use of locally available materials during the construction phase of the proposed Villa Franca 2x23 MVA 66/11 kV substation will contribute towards growth of the economy by contributing to the gross domestic product. The transmission of reliable electricity will lead to industrialization and general urbanization. It will improve electricity availability in the country resulting in low competitive costs of electricity in long term.

5.6.1.3 Boosting of the informal sector
During the construction, operational and decommissioning phase of the proposed Villa Franca 2x23 MVA 66/11 kV Substation it is expected that the other businesses in the informal sector will flourish. These include activities such as food vending who will be benefiting directly from the construction, operational and decommissioning staff members who will be buying food and other commodities from them. This will promote the informal sector in securing some temporary revenue and hence livelihood.

5.6.1.4 Improved Electricity Supply
The proposed project aims to increase the quality and security of the power supply to the surrounding industries, businesses, homes and social institutions among others. The neighbours, who are mostly from the neighbouring industries, were optimistic that power outages will be minimized and that they will not be subjected to power rationing. With this additional reliable electricity in the national grid, the country and the local area are expected to attract more investments.

5.6.1.5 Improved security
The proposed project will greatly improve on the security in the area. The current expansive unutilized opened field has been a threat to the residents who uses the access road next to the plot. They have incidences of attacks and carjacking in the area and sometimes bodies for dead persons found in the field. This will improve because the land will be fenced and security and flood lights will be installed in the areas and a 24 hour security provided in the area. The residents are happy on the development because the sight has been a nightmare for them.

5.6.2 Negative Issues

5.6.2.1 Increased Emissions (Air Pollution)
During construction and decommissioning phase of the proposed 2X23MVA Villa Franca 66/11kV substation, there will be undesirable emissions that will be emitted like Sulphur Oxide and Nitrogen Oxide. Dust will also be emitted during the construction and decommissioning phases. Neighbours asked for air pollution control measures to be put in place.

5.6.2.2 Increased Noise Level and Vibration
There was concern over the possibility of high noise and vibration levels in the proposed project site as a result of construction works. However, the project proponent will have to take appropriate steps to minimize noise production by using silent machines, construction works should be done during the daytime working hours and ensuring that all equipments are well maintained.
5.6.2.3 Social concerns
Some neighbours thought that the location of the project will attract people to the area. This may lead to social vices like drug abuse, spread of diseases including HIV and insecurity especially near Imara Daima Estate. This will be of concerned due to presence of school children using section of access road.

5.6.2.4 Oil Spillage and Fire Incidents
Some neighbours expressed their concerns on the possibilities of transformer oil spills and fire outbreaks during project implementation. Neighbours want the project proponent to put in place oil spill prevention measures and to have the facility well fenced to prevent unauthorized access.
6  CHAPTER SIX: CONSTRUCTION MATERIALS

This section of the Project Report qualitatively outlines the resources that are required for construction and implementation of the project. Exact quantities of materials are not known at this stage of the project. Consequently an identification and estimation of the resources required for construction and implementation of the project are provided in the following subsections.

6.1 Labor

The size and the composition of the workforce will be at the discretion of the contractor(s). The contractors will adhere to the Employment Act of 2007 in the recruitment and management of the employees.

6.2 Safety of the facility

The Proposed project like other similar projects could be prone to both natural and man-made disasters. It should be noted that it is difficult to prevent the occurrence of the natural disaster but the consequences could be reduced by engineering measures. Man-made disasters on the other are preventable. The following safety concerns will be addressed in the proposed project.

6.2.1 Natural disasters

In order to reduce the impacts of any potential natural disaster, the proposed project will be designed according to acceptable standards and code and shall be able to reasonably withstand any impacts which may arise as a result of the worst credible seismic event.

6.2.2 Malicious damage or theft

The proposed project could be prone to malicious damage such as terrorist attack or theft. In order to prevent the occurrence of such events, the following measures will be taken:

• Regular monitoring and inspection of the substation and its associated infrastructure.

6.3 Hazard Risk Assessment

Hazard risk assessment is one of the concerns associated with substation. The HRA will be conducted on the proposed project to determine the potential risks the project will pose in its lifecycle. The risk assessment will be done in accordance with the Occupational Safety and Health Act of 2007.

The HRA will include an emergency response procedure which will be based on the company’s emergency procedures for substation and associated facilities. As a minimum requirement, the emergency management plan will cover the following aspects:

• Safety regulations
• Scope of the safety emergency plan
• Notification of local authorities
• Details of the proposed project
• Aim of the safety emergency plan
• Objectives of the study emergency plan
• Emergency arrangements, procedures and plans
• Roles and responsibilities in the event of an emergency
• Evacuation of people
• The role of local communities
• Regular testing of the safety emergency plan
• The risk assessment will include as a minimum:
  o A general process of the project being investigated
o A description of the potential major incidents associated with that type of installation and
o the consequences of such incidents
o An estimation of the probability of a major incident
o A copy of the site emergency plan
o An estimation of the damages in the case of an explosion or fire
o An estimation of the effects of toxic gas releases.
  o The potential effect of an incident on the project or part thereof or an adjacent project or part
    thereof.
  o The potential effect of a major incident on any other installations, members of the public and
    residential areas.
  o Meteorological tendencies
  o The suitability of existing emergency procedures for the risks identified.
  o Any requirements laid down in the OSHA 2007 and EMCA 1999.
  o Recommendations regarding any organizational measures
7 CHAPTER SEVEN: PRODUCTS, BY-PRODUCTS AND WASTE

7.1 Introduction
This section provides an overview of the products, by-products and wastes to be generated by the project. Most of these will be generated during the construction phase of the project while some will be generated during the operation and decommissioning phases.

7.1.1 Construction Phase
The final product after construction phase is a modern substation and its associated structures.

7.1.1.1 By-products
During the construction phase of the project it is envisaged that the by-products might include:
- Metal cuttings generated from the construction activities
- Any excess construction materials brought to the project site by the contractor which can be reused later
- Excavated material

7.1.1.2 Waste
During construction the proposed project is anticipated to generate different waste which shall include:

Domestic Waste from the Construction Area
The workers will not be supplied with any forms of foodstuffs. They are expected to buy or carry their own food. Plastic bags and containers which the workers will use to carry their food are expected to increase within the site and in the immediate vicinity. Other forms of waste include sanitary waste and therefore the provision of sanitary facilities will need to be considered both for the site construction workers and the visiting population.

Site Construction Waste
The project will generate waste from the site construction activities which includes:
- Excavated soils and vegetation;
- Construction equipment and maintenance wastes;
- Dust and fumes;
- Scrap metals;
- Packaging materials, etc.

Dust
The construction activities that will occur particularly during the site excavation process will generate dust and other particulates particularly during dry weather conditions that will be released into the atmosphere.

Smoke Emissions
The site machinery, equipment and trucks brought in by the Contractor are expected to generate smoke emissions when in operation during the construction activities. The concentration of emissions will depend on the maintenance levels of the equipment, machinery and trucks used by the Contractor.
7.1.2 Operation Phase

7.1.2.1 Products
The primary product of the proposed project during the operational phase will be 66/11kV power distribution substation.

7.1.2.2 By-products
The only byproduct anticipated to be generated during operational phase is conductor wires and scrap metals during replacement which takes several years before being replaced.

7.1.2.3 Waste
The wastes that will be generated will include;

Domestic Waste
Some of the domestic waste to be generated at the facility will waste such as paper, empty cans.

Process waste
No waste is anticipated from the process since the project entails substation and its associated infrastructures only.

7.1.3 Decommissioning Phase

7.1.3.1 Products and By-products
During the decommissioning phase it is expected that there will be no product. However the By-products during decommissioning phase will include:

- Metal generated from the decommissioning of substation and associated infrastructure; and
- Foundation materials which can be donated to individuals for reuse

7.1.3.2 Waste
During the Decommissioning phase of the proposed project, several waste products are expected to be generated. These shall include:

- Metals from substation infrastructure
- Remains of concrete from demolition of substation foundation
- Dusts and fumes;
- Scrap metals;

7.1.3.3 Dust
The activities that will occur particularly during the demolition process will generate a considerable amount of dust and other particulates that will be released into the atmosphere.

7.1.3.4 Smoke Emissions
The demolition machinery, equipment and trucks brought in by the Contractor are expected to generate smoke emissions. The concentration of emissions will depend on the maintenance levels of the equipment, machinery and trucks used by the Contractor.
8 CHAPTER EIGHT: IDENTIFICATION AND ASSESSMENT OF POTENTIAL ENVIRONMENTAL IMPACTS

8.1 Introduction

This Section identifies and discusses both negative and positive impacts associated with the proposed construction of 2x23MVA Villa Franca 66/11 kV Substation. The impacts are identified across the three phases namely: Construction Phase, Operational Phase and Decommissioning Phase.

Environmental impacts may result from the activities that are undertaken during the construction, operation and decommissioning of the power-line and these are discussed below.

8.2 Impact Identification and Assessment

The proposed project a medium term strategy for power transmission and distribution in Nairobi metropolis over the planning period of 2009-2015 in the energy sector has immense benefits that could save Nairobi metropolis and its environment to enhance quality electricity supply. However poor planning of the project could also affect the environment that supports millions of Kenyans through the potential hazards that the project could pose to the public like water and soil contamination and poor waste disposal.

Several environmental impacts (positive and negative) associated with the proposed project were identified through public participation process and through the use of experts’ judgment method. The following section highlights the impacts anticipated throughout the lifecycle of the proposed project. The associated impact assessment tables for each impact will be categorized according to project phases, prior to and post mitigation. Effects of activities are categorized as negative impact and or positive impact.

The summary of the main potential impacts of the proposed project are listed in Table below and have been analyzed into different categories based on stakeholder’s views and perceptions as well as the consultant’s previous experience in undertaking ESIA of similar nature. The project impacts are classified as positive or negative. However the study goes further to categorize the impacts in terms of direct or indirect, temporary or permanent, major or minor.

<table>
<thead>
<tr>
<th>Environmental &amp; Social Impact</th>
<th>Positive/ Negative</th>
<th>Direct/ Indirect</th>
<th>Temporary/ Permanent</th>
<th>Major/ Minor</th>
<th>Occurrence</th>
<th>Construction</th>
<th>Operation</th>
<th>Decommissioning</th>
</tr>
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<tbody>
<tr>
<td>Employment Opportunities</td>
<td>Positive</td>
<td>Direct</td>
<td>Permanent/ Temporary</td>
<td>Major</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Gains in the Local and National Economy</td>
<td>Positive</td>
<td>Direct</td>
<td>Permanent</td>
<td>Major</td>
<td>✓</td>
<td>✓</td>
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<td>x</td>
</tr>
<tr>
<td>Provision of Market for Supply of Building Materials</td>
<td>Positive</td>
<td>Direct</td>
<td>Temporary</td>
<td>Major</td>
<td>✓</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Informal Sectors Benefits</td>
<td>Positive</td>
<td>Direct</td>
<td>Temporary</td>
<td>Minor</td>
<td>✓</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Environmental Benefits</td>
<td>Positive</td>
<td>Indirect</td>
<td>Permanent</td>
<td>Minor</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Noise pollution &amp;</td>
<td>Negative</td>
<td>Direct</td>
<td>Permanent</td>
<td>Major</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
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### Environmental & Social Impact

<table>
<thead>
<tr>
<th>Impact Description</th>
<th>Positive/Negative</th>
<th>Direct/Indirect</th>
<th>Temporary/Permanent</th>
<th>Major/Minor</th>
<th>Occurrence</th>
<th>Construction</th>
<th>Operation</th>
<th>Decommissioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>increased vibration</td>
<td>Negative</td>
<td>Direct</td>
<td>Permanent</td>
<td>Minor</td>
<td>√</td>
<td>√</td>
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<td>√</td>
</tr>
<tr>
<td>Generation of Exhaust Emissions</td>
<td>Negative</td>
<td>Direct</td>
<td>Permanent</td>
<td>Minor</td>
<td>√</td>
<td>x</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Dust Emissions</td>
<td>Negative</td>
<td>Direct</td>
<td>Temporary</td>
<td>Minor</td>
<td>√</td>
<td>x</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Disposal of Excavated Soil</td>
<td>Negative</td>
<td>Direct</td>
<td>Temporary</td>
<td>Minor</td>
<td>√</td>
<td>x</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Increased water demand</td>
<td>Negative</td>
<td>Direct</td>
<td>Permanent</td>
<td>Major</td>
<td>√</td>
<td>√</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Workers accidents and hazards</td>
<td>Negative</td>
<td>Direct</td>
<td>Permanent</td>
<td>Minor</td>
<td>√</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Energy (Transformer oil) Consumption</td>
<td>Negative</td>
<td>Direct</td>
<td>Permanent</td>
<td>Major</td>
<td>x</td>
<td>√</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Extraction and Use of Building Materials</td>
<td>Negative</td>
<td>Direct</td>
<td>Temporary</td>
<td>Minor</td>
<td>√</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Solid Waste Generation</td>
<td>Negative</td>
<td>Direct</td>
<td>Permanent</td>
<td>Major</td>
<td>√</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Liquid Waste Generation</td>
<td>Negative</td>
<td>Direct</td>
<td>Permanent</td>
<td>Major</td>
<td>√</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Possible Exposure of Workers to Diseases</td>
<td>Negative</td>
<td>Direct</td>
<td>Permanent</td>
<td>Major</td>
<td>√</td>
<td>√</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Increased Storm Water Runoff from New Impervious Areas</td>
<td>Negative</td>
<td>Direct</td>
<td>Permanent</td>
<td>Major</td>
<td>√</td>
<td>√</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Soil Erosion</td>
<td>Negative</td>
<td>Direct</td>
<td>Temporary</td>
<td>Minor</td>
<td>√</td>
<td>x</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Oil Spills Hazards</td>
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<td>Direct</td>
<td>Permanent</td>
<td>Major</td>
<td>√</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Destruction of existing vegetation</td>
<td>Negative</td>
<td>Direct</td>
<td>Permanent</td>
<td>Minor</td>
<td>√</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Fire Outbreaks</td>
<td>Negative</td>
<td>Direct</td>
<td>Temporary</td>
<td>Major</td>
<td>√</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Quality electricity supply</td>
<td>Positive</td>
<td>Direct</td>
<td>Permanent</td>
<td>Major</td>
<td>x</td>
<td>√</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Increased Population around the project area</td>
<td>Negative</td>
<td>Direct</td>
<td>Permanent/Temporary</td>
<td>Minor</td>
<td>√</td>
<td>√</td>
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<td>x</td>
</tr>
<tr>
<td>Visual Impacts</td>
<td>Negative</td>
<td>Direct</td>
<td>Permanent</td>
<td>Minor</td>
<td>√</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
</tbody>
</table>

#### 8.3 Positive Impacts during Construction Phase

The positive impacts associated with the proposed 2x23MVA 66/11 kV substation, in Villa Franca, during construction phase are as discussed below;

#### 8.3.1 Employment Opportunities

With the construction of 2x23MVA 66/11 kV substation, in Villa Franca, there will be employment opportunities especially for casual workers from the local community. Creation of employment opportunities has both economic and social benefit. In the economic benefit, abundant unskilled labour will be used in economic production while socially these young and energetic otherwise poor people will be engaged in productive employment other than remaining idle. Employees with diverse skills are expected to work on the site during the construction period.
8.3.2 Gains in the Local and National Economy
There will be gains in the local and national economy as a result of the construction of the proposed Villa Franca 2x23MVA- 66/11 kV substation, through consumption of locally available materials including: timber, glasses, metals, and cement among other construction materials. The consumption of these materials in addition to fuel oil and others will attract taxes including Value Added Tax (VAT) which will be payable to the government. The cost of the materials will be payable directly to the producers.

8.3.3 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 from the surrounding areas especially Villa Franca, Embakasi Estate, Imara Daima and Nairobi city. This provides ready market for building material suppliers such as quarrying companies, hardware shops and individuals with such materials.

8.3.4 Informal Sectors Benefits
During construction phase of proposed Villa Franca 2x23MVA 66/11 kV substation; the informal sectors are temporarily likely to benefit from the operations. This will involve kiosk operators who will be selling food to the construction workers on site. This will finally promote Jua Kali entrepreneurs in Villa Franca area and its catchment area during the operation period.

8.3.5 Environmental Benefits
The proposed Villa Franca 2x23MVA 66/11 kV substation has a potential for contributing to the good of the environment of the area. The project will enhance electricity to the surrounding customers of Nairobi metropolitan area. This will lead to a substantial reduction in reliance on other sources of energy that have impacts on the forest cover and greenhouse.

8.4 Negative Impacts during Construction Phase
The following negative impacts are also associated with the construction of the proposed Villa Franca 2x23MVA 66/11 kV substation in Villa Franca.

8.4.1 Noise pollution
The proposed area is not such tranquil but quite noise due to industrial facilities and ongoing constructions. The construction works of the proposed Villa Franca 2x23MVA 66/11 kV substation is most likely to be less or more noiser operation due to the moving machines (mixers, tippers, communicating workers) and incoming vehicles to deliver construction materials to site. The construction workers who will be working in the site will generate some noise as they are communicating to one another. This will be a potential source of disturbance at the site and surrounding neighbourhoods of the proposed 2x23MVA 66/11 kV substation. The impact however will not be major.
8.4.2 Generation of Exhaust Emissions

Exhaust emissions are likely to be generated by the construction equipment during the construction phase of proposed 2x23MVA 66/11 kV substation. Motor vehicles that will be used to ferry construction materials would cause air quality impact by emitting pollutants through exhaust emissions. The impacts will be direct, permanent but not significant.

8.4.3 Dust Emissions

Particulate matter pollution is likely to occur during the site clearance, excavation and spreading of the topsoil during construction of proposed 2x23MVA 66/11 kV substation. There is a very small possibility of PM$_{10}$ suspended and settleable particles affecting the site workers and even neighbours' health, it is minimal given the construction method of minimum excavation and nil cart away of soil. The impacts will be direct, temporary and minor.

8.4.4 Disposal of Excavated Soil

Though little excavation is likely to take place at the proposed 2x23MVA 66/11 kV substation, the excavation works to level the site will result in the generation of small amounts of excavated material. But there will be no cart away of excavated material. The impact will be direct, temporary and minor.

8.4.5 Increased water demand

During the construction phase of the proposed 2x23MVA 66/11 kV substation, both the construction workers and works will be using water that will cause additional demand for water in addition to the existing demands. Water will be mostly used in the creation of concrete for construction works and for wetting surfaces or cleaning completed structures. It will also be used by the construction workers to wash themselves and even drink. The impact will be direct, permanent and major.

8.4.6 Workers accidents and hazards during construction

During construction of the proposed 2x23MVA 66/11 kV substation, it is expected that construction workers especially non-skilled casuals are likely to have accidental injuries and hazards. Because of these 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 objects. The impacts will be direct, permanent and minor.

8.4.7 Energy Consumption

During the construction phase of the proposed 2x23MVA 66/11 kV substation 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 impact will be direct, permanent and major.
8.4.8 Extraction and Use of Building Materials

Building materials such as hard core, ballast, cement, rough stone and sand required for the construction of the proposed 2x23MVA 66/11 kV substation will be obtained from quarries, hardware shops and sand harvesters who extract such materials from natural resource banks such as rivers and land. Small quantities of these materials will be required for construction of the buildings transformer sites and pavements, the availability and sustainability of such resources at the extraction sites will be negatively affected as they are not renewable in the short term. In addition, the sites from which the materials will be extracted may be significantly affected in several ways including landscape changes, displacement of animals and vegetation, poor visual quality and opening of depressions on the surface leading to several human and animal health impacts. The impact will be direct, temporary and minor.

8.4.9 Solid Waste Generation

During construction of the proposed 2x23MVA 66/11 kV substation in Embakasi district, Nairobi County will generate a lot of solid waste. These wastes include papers used for packing cement, plastics, metal scraps and timber remains among others. Dumping of these wastes around the proposed project site will interfere with the aesthetic status of the area. This has a direct effect to the surrounding community. Disposal of these solid wastes off-site could also be a social inconvenience if done in the wrong places. The off-site effects could be aesthetic, pest breeding, pollution of physical environment, invasion of scavengers and informal recycling communities.

8.4.10 Possible Exposure of Workers to Diseases

Workers are likely to be exposed to diseases from building materials during the construction phase of the proposed 2x23MVA 66/11 kV substation. It is therefore recommended that before the construction phase of the proposed 2x23MVA 66/11 kV substation commences, there is need for the construction materials to be well inspected according to the occupational health and safety standards and worker encouraged to use personal protective equipments.

8.4.11 Increased Storm Water Runoff from New Impervious Areas

Construction of the proposed 2x23MVA 66/11 kV substation buildings, pavements and its associated structures within the proposed project site will lead to additional runoff through creation of impervious areas and compaction of soils. Impervious areas and compacted soils generally have higher runoff coefficients than natural area, and increased flood peaks are a common occurrence in developed areas. The impact will be direct, permanent and minor.

8.4.12 Soil Erosion

There are possibilities of soil erosion occurring during the construction of the proposed 2x23MVA 66/11 kV substation especially during rainy and windy seasons. The impact will however be minimal as there area to be disturbed for the proposed development is small. The impacts will be direct, temporary and minor.
8.4.13 Oil Spills Hazards
The construction machines on the proposed site for the 2x23MVA 66/11 kV substation may be containing moving parts which will require continuous oiling to minimise the usual corrosion or wear and tare. This will contaminate the soil. Likewise, moving vehicles on site may require oil change. The impact will be direct, permanent and major.

8.4.14 Destruction of existing vegetation
The construction process of the proposed 2x23MVA 66/11 kV substation buildings and other associated facilities and structures will involve clearing of the existing vegetation cover (mainly grass) and some small trees on site. The impact will be direct, permanent and minor.

8.4.15 Surface and ground water Hydrology and Water Quality Degradation
Changes in surface hydrology alter the flow of water through the landscape. Construction of impervious surfaces such as transformers sites, cabling trenches, parking lots, walking pavements, roads and buildings might increase the volume and rate of runoff, resulting in habitat destruction, increased pollutant loads, and flooding. Contaminated soil or ground water in the path of the project could be disturbed by excavation resulting in a potential transfer of the contamination to surface waters. Oil spills during construction could introduce contaminants into subsurface which may end-up into ground water. Development activities such as the proposed 2x23MVA 66/11 kV substation development as well as the spill-over effects of development such as increased demand for water use and increased auto use can impact water quality by contributing sediment, nutrients, and other pollutants to limit water supplies, increasing the temperature of the water, and increasing the rate and volume of runoff. The impact will be direct, permanent and major.

8.4.16 Fire Outbreaks
Due to various construction activities at the proposed 2x23MVA 66/11 kV substation project, fire outbreaks can occur. Handling of inflammable products increases fire risks like the transformer oil. The impact will be direct, temporary and major.

8.5 Positive Impacts during Operation Phase
Like construction phase, there are positive impacts associated with the proposed 2x23MVA 66/11 kV substation during operation phase. These positive impacts are discussed below.

8.5.1 Quality electricity supply
The existing transmission system capacity In Nairobi and its environment has been constrained during the peak hours when system voltage do drop below acceptable levels, occasioning load shedding despite availability of generation capacity. The problem has been partly due to inadequate reactive power supply in major load centres and also transmission bottleneck. This could be sorted by establishing and constructing new high voltage line that will be stepped down at the proposed Villa.
Franca substation so as to enhance quality electricity supply in Nairobi and its environments. The impact will be direct, permanent and major. The impact will be direct, permanent and major.

8.5.2 Employment Opportunities
Employment opportunities are one of the long-term major positive impacts of the proposed 2x23MVA 66/11 kV substation in Villa Franca. This will occur during the operation and maintenance of the proposed 2x23MVA 66/11 kV substation. These will involve security personnel that will be employed to look after the proposed 2x23MVA 66/11 kV substation. Other sources of employment will involve direct technical service provision to the proposed 2x23MVA 66/11 kV substation e.g. electrical engineers, civil engineers, mechanical engineers, drivers among others. The impact will be direct, permanent and major.

8.5.3 Increase in Revenue
There will be positive gain for the revenue system arising from the step down and distribution of the electricity power from the proposed 2x23MVA 66/11 kV substation to Government, the suppliers and KPLC. This will in turn be supplied to various customers who will be paying taxes to the Government. The impact will be direct, permanent and major.

8.5.4 Improved Security
With the establishment of the proposed 2x23MVA 66/11 kV substation in Villa Franca, the level of security will be improved around the project area. This is as a result of more security lights and security personnel being employed to guard the proposed 2x23MVA 66/11 kV substation. The project site will also be well fenced. Hence if the level of security is increased, the residents will feel more secure than before. The impact will be direct, permanent and minor.

8.6 Negative Impacts during Operation Phase
The following are the negative impacts that are associated with the proposed 2x23MVA 66/11 kV substation during the operation phase.

8.6.1 Solid Waste Generation
The proposed 2x23MVA 66/11 kV substation in Villa Franca is expected to generate some amounts of solid waste during its operation phase. The bulk of the solid waste generated during the operation of the project will consist of drums, paper, plastic, cables, metal, transformers and capacitors. Such wastes can be injurious to the environment. Some of these waste materials especially the plastic, cables, metals, polythene among others are not biodegradable hence may cause long-term injurious effects to the environment. The impact will be direct, permanent and major.

8.6.2 Liquid Waste Generation
Since the substation’ transformers will be using oil for cooling purposes of the transformers for the purpose of stepping down and distributing electric, transformer oil and other effluents will be generated. Likewise waste oil will be generated through transformer leakages. The liquid waste to be generated
will be hazardous hence may cause long-term injurious effects to the environment. The impact will be direct, permanent and major.

8.6.3 6.5.3 Increased oil Consumption
The proposed 2x23MVA 66/11 kV substation shall consume large amount of transformer oil in the process of stepping down electric power. Since transformer oil fuel is produced mainly through non-renewable resources, this will have adverse impacts on these non-renewable resources base and their sustainability. The impact will be direct, permanent and major.

8.6.4 6.5.4 Increased Population around the project area
With the construction and operation of the proposed 2x23MVA 66/11 kV substation in Villa Franca it will lead to the establishment of food kiosks within the proposed project area whereby the workers of the proposed 2x23MVA 66/11 kV substation will be eating from. Since the proposed project site doesn’t have adequate infrastructural facilities, for the speculated population will have some negative environmental impacts. The impact will be direct, permanent and minor.

8.6.5 Increased water demand
The operation activities during the operation phase of the proposed 2x23MVA 66/11 kV substation in Embakasi district will involve the use of large quantities of water for substation cleaning, drinking, washing and toilet flushing. These will increase strain water resources in the area. The impact will be direct, permanent and major.

8.6.6 Increased Pressure on Infrastructure
The proposed 2x23MVA 66/11 kV substation in Villa Franca will have a potential of increasing pressure on existing infrastructure such as roads and water among others. This would be due to increased use of volumes on water, human and vehicle traffic in the project area. The impact will be direct, permanent and major.

8.6.7 Increased Storm Water Flow
The building roofs and pavements of the proposed 2x23MVA 66/11 kV substation in Villa Franca will lead to increased volume and velocity of storm water or run-off flowing across the area covered by the proposed 2x23MVA 66/11 kV substation during operation phase. This will lead to increased amounts of storm water entering the drainage systems. The impact will be direct, permanent and minor.

8.6.8 Water Pollution
During the operation phase of the proposed 2x23MVA 66/11 kV substation in Villa Franca, If the sites for dumping solid wastes are not well taken care of, they may cause contamination of ground water sources. There is need therefore for the project proponent to put in place an efficient waste management scheme that will prevent the accumulation of uncontrolled waste, as well as an efficient collection system and off-site disposal. The impact will be direct, permanent and minor.
8.6.9 6.5.9 Oil Spills Hazards
Potential oil spills and accidents during oil transportation, storage and operations of the transformers and batteries of the proposed 2x23MVA 66/11 kV substation in Villa Franca may occur. In the case of oil spill the relatively lighter, more volatile, mobile, and water soluble compounds in transformer oil will tend to evaporate fairly quickly into the atmosphere or migrate to groundwater. When exposed to oxygen and sunlight, most of these compounds will tend to break down relatively quickly. Accidental oil spills can occur due to leakage from the transformers. Poor maintenance of transformers can also lead to oil spills. The impact will be direct, permanent and minor.

8.6.10  Fire Outbreaks
Due to handling of flammable substances at the proposed 2x23MVA 66/11 kV substation project, fire outbreaks can occur. Handling of inflammable products increases fire risks. The impact will be direct, temporary and major.

8.6.11  Visual Impacts
The substation might present unwanted visual impacts, both by its physical presence and profile against the surrounding area, and by visual impacts its associated structures that may also have adversely impact the visual quality of the area. The impact will be direct, permanent and minor.

8.7  Positive Impacts during Decommissioning Phase
The following positive impacts are associated with the proposed 2x23MVA 66/11 kV substation during the decommissioning phase:

8.7.1 Site Rehabilitation
Upon decommissioning of the proposed 2x23MVA 66/11 kV substation in Villa Franca rehabilitation of the project site will be carried out to restore the site to its original status or to a better state than it was originally. This will include replacement of topsoil and re-vegetation which will lead to restoration of the visual quality of the area.

8.7.2 Employment Opportunities
For faster and timely demolition to take place, several people will be involved. As a result several employment opportunities will be created for the demolition staff during the demolition phase of the proposed 2x23MVA 66/11 kV substation in Villa Franca. The impact will be direct, temporary and minor.

8.8  Negative Impacts during Decommissioning Phase
The following three negative impacts discussed below are associated with the proposed 2x23MVA 66/11 kV substation in Villa Franca during its decommissioning phase.

8.8.1 Noise and Vibration
The demolition works will lead to significant deterioration of the acoustic environment within the project site and the surrounding areas. This will be as a result of the noise and vibration that will be
experienced as a result of demolishing the proposed 2x23MVA 66/11 kV substation in Villa Franca. The impact will be direct, temporary and minor.

**8.8.2 Solid Waste Generation**

Demolition of the proposed 2x23MVA 66/11 kV substation and other related infrastructure will result in generation of solid waste. The waste will contain the materials used in construction including concrete, metal, drywall, wood, glass, paints, adhesives, sealants and fasteners. Although demolition waste is generally considered as less harmful to the environment since they are composed of inert materials, there is growing evidence that large quantities of such waste may lead to release of certain hazardous chemicals into the environment. The impact will be direct, permanent and major.

**8.8.3 Generation of Dust**

Some dust will be generated during demolition works of the proposed 2x23MVA 66/11 kV substation. This will affect demolition staff as well as the neighbours. The impact will be direct, temporary and minor.
9 CHAPTER NINE: MITIGATION MEASURES AND MONITORING PROGRAMMES

This section highlights the mitigation measures for the expected negative impacts of the proposed 2x23MVA 66/11 kV substation in Villa Franca. The potential impacts and the possible mitigation measures have herein been analyzed under three categories: Construction, Operational and Decommissioning.

9.1 Mitigation of Construction Related Negative Impacts

The following measures can be considered as mitigation measures of the negative impacts associated with the proposed 2x23MVA 66/11 kV substation in Villa Franca during construction phase.

9.1.1 Minimization of Noise and Vibration

The project proponent of the proposed 2x23MVA 66/11 kV substation in Villa Franca should put in place several measures that will mitigate noise pollution arising during the construction phase. The following noise-suppression techniques will be employed to minimise the impact of temporary construction noise at the project site.

- Install portable barriers to shield compressors and other small stationary equipment where necessary.
- Use quiet equipment (i.e. equipment designed with noise control elements).
- Co-ordinate with relevant agencies regarding all construction.
- Limit vehicles to a minimum idling time and observe a common-sense approach to vehicle use, and encourage drivers to switch off vehicle engines whenever possible.

Compliance with the recently issued Noise and Vibration Regulations of 2009 is expected at all the phases of the project.

9.1.2 Control of generation of Exhaust Emissions

In order to control exhaust emissions that are likely to occur during the construction of the proposed 2x23MVA 66/11 kV substation in Villa Franca, the following measures shall be implemented during construction.

- Vehicle idling time shall be minimized
- Alternatively fuelled construction equipment shall be used where feasible
- Equipment shall be properly tuned and maintained

This will also be achieved through proper planning of transportation of materials to be used during construction of the project to ensure that vehicle fills are increased in order to reduce the number of trips done or the number of vehicles on the road.

9.1.3 Dust Emissions and Air quality

Controlling dust emissions that is likely to take place during construction phase of the proposed 2x23MVA 66/11 kV substation in Villa Franca is useful in minimizing nuisance conditions. It is
recommended that a standard set of feasible dust control measures be implemented for all construction activities. Emissions of other contaminants (NO$_x$, CO$_2$, SO$_x$, transformer oil and diesel related PM$_{10}$) that would occur in the exhaust from heavy equipment are also included. The project proponent is committed to implementing measures that shall reduce air quality impacts associated with construction.

- During construction, any stockpiles of earth should be enclosed / covered / watered during dry or windy conditions to reduce dust emissions;
- Construction trucks removing soil from the site, delivering sand and cement to the site should be covered to prevent material dust into the surrounding areas;
- All personnel working on the project will be trained prior to starting construction on methods for minimizing air quality impacts during construction. This means that construction workers will be trained regarding the minimization of emissions during construction.
- Specific training will be focused on minimizing dust and exhaust gas emissions from heavy construction vehicles. Drivers of vehicles used during construction will be under strict instructions to minimize unnecessary trips and minimize idling of engines.
- During construction, where water is available, sprinkle the construction area with water to keep dust levels down.
- Masks should be provided to all personnel in areas prone to dust emissions throughout the period of construction.
- Drivers of construction vehicles must be supervised so that they do not leave vehicles idling, and they limit their speeds so that dust levels are lowered.
- Maintain all machinery and equipment in good working order to ensure minimum emissions including carbon monoxide, NO$_x$, SO$_x$ and suspended particulate matter;

9.1.4 Excavated Soil during Construction

The Excavated soil during the construction of the proposed 2x23MVA 66/11 kV substation will not be disposed. It is recommended that part of the topsoil excavated from the proposed construction site be re-spread in areas to be landscaped to enhance plant health.

9.1.5 Minimization of increased Water Demand

The proponent of the proposed 2x23MVA 66/11 kV substation in Villa Franca shall ensure that water is used efficiently at the site by sensitizing construction staff to avoid irresponsible water use.

9.1.6 Minimization of Worker accidents and hazards during Construction phase

To reduce the workers accidents and hazards during the construction phase of the proposed 2x23MVA 66/11 kV substation in Villa Franca, the contractor and proponent are expected to adhere to the provisions of the Occupational Safety and Health Act, 2007 and its subsidiary legislation. It is the responsibility of the project proponent and contractor to provide a safe and healthy environment for construction workers as outlined in the EMP. The proposed 2x23MVA 66/11 kV substation Response and Evacuation Plan must be in place in addition to safety education and training shall be provided to the employees.
9.1.7 Reduction of Energy Consumption
The project proponent and contractor 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 (transformer oil, 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.

9.1.8 Reduction of Impacts at Extraction Sites and Efficient Use of Raw Materials
The proponent of the proposed 2x23MVA 66/11 kV substation in Villa Franca 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 NEMA approval. Since such firms are expected to apply acceptable environmental performance standards, the negative impacts of their activities at the extraction sites are considerably well mitigated.

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

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

9.1.9 Minimization of Solid Waste during Construction Phase
It is recommended that demolition and 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 off. In addition, damaged or wasted construction materials including cabinets, doors, plumbing and lighting fixtures, marbles and glass will be recovered for refurbishing and use in other projects. Such measures will involve the sale or donation of such recyclable/reusable materials to construction companies, local community groups, institutions and individual residents or home owners.

The proponent shall put in place measures to ensure that construction materials requirements are carefully budgeted for 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 proposed 2x23MVA 66/11 kV substation in Villa Franca include:-

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

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

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

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

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

vi. Adequate collection and storage of waste on site and safe transportation to the disposal sites and disposal methods at designated area shall be provided.

9.1.10 **Possible exposure of workers to diseases**

Possible exposure of workers to diseases from building materials at construction site shall be mitigated by compliance with occupational health and safety standards.

9.1.11 **Minimization of Storm Water Run-off and Soil Erosion**

The proponent of the proposed 2x23MVA 66/11 kV substation in Villa Franca 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 levelling the project site to reduce runoff velocity and increase infiltration of rain water 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. Increased runoff from paved grounds and expansive roofs causing extreme flooding and overflows of drainage systems shall be mitigated. Surface runoff and roof water shall be harvested and stored in underground reservoir for reuse. A storm water management plan that minimizes impervious area infiltration by use of recharge areas and use of detention and/or retention with graduated outlet control structures will be designed.

Excavations at the site will be restricted to the sections of the substation. Excavated earth will be held away from trenches and on locations of the site not susceptible to surface runoff of storm water. The earth removed for external disposal will require to be deposited on sites without the risk of being washed down during rains and where it will not compromise other land use activities in those areas. Caution will be required during construction at times of heavy rains.

Re-vegetate exposed areas around the site so as to mitigate erosion of soil by storm water runoff. The final site grade should facilitate drainage and avoid flooding and pooling. A site drainage plan should be developed to protect against erosion. Protecting stockpiles through the use of silt fencing and reduced slope angles should be used to minimize soil erosion during construction. Installation of drainage ditches, construction of runoff and retention ponds is necessary. Minimization of disturbances and
scarification of the surface should be observed to reduce erosion impacts. All slopes and working surfaces should be returned to a stable condition and topsoil on the final site would be graded and planted as appropriate.

9.1.12 Controlling Oil Spills during Construction Phase
The proponent of the proposed 2x23MVA 66/11 kV substation in Villa Franca will control the dangers of oil spills during construction by maintaining the machinery in specific areas designed for this purpose hence might not be a serious impact as a result of the construction of the proposed 2x23MVA 66/11 kV substation in Villa Franca.

9.1.13 Minimization of Vegetation Disturbance
Clearance of part of the vegetation (mainly grass and shrubs) at the proposed 2x23MVA 66/11 kV substation in Villa Franca site to pave way for construction will be inevitable. However, the project 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 is restricted to the actual project area and avoid spillover effects to 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. Another important measure aimed at reducing disturbance of vegetation in the proposed project area will be preservation of individual trees within the site. In addition, the proponent will be involved in re-vegetation of some of the disturbed areas through implementation of a well-designed landscaping programme.

9.1.14 Hydrology and Water Quality Degradation
Several measures shall be put in place to mitigate the impacts that are likely to lead to Hydrology and water quality degradation at the proposed 2x23MVA 66/11 kV substation in Villa Franca. The project proponent will prepare a hazardous substance control and 2x23MVA 66/11 kV substation response plan that will include preparations for quick and safe cleanup of accidental spills. It will prescribe hazardous-materials handling procedures to reduce the potential for a spill during construction, and will include a 2x23MVA 66/11 kV substation response programme to ensure quick and safe cleanup of accidental spills. The plan will identify areas where refueling and vehicle maintenance activities and storage of hazardous materials, if any, will be permitted. Trial holes digging will be conducted before construction begins and soil information will be provided to construction crews to inform them about soil conditions and potential hazards. Oil absorbent material, tarps and storage drums will be used to contain and control any minor releases of transformer and other equipment oil.

9.2 Mitigation of Operation Phase Negative Impacts
The negative impacts of the proposed 2x23MVA 66/11 kV substation in Villa Franca will be mitigated as discussed below.
9.2.1 Ensuring Efficient Solid Waste Management
The project proponent of the proposed 2x23MVA 66/11 kV substation in Villa Franca 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 labeled waste bins and skips for temporarily holding solid waste generated at the site.

In addition, the project proponent will ensure that such are disposed of regularly and appropriately. It is recommended that the proponent puts in place measures to ensure that the proposed 2x23MVA 66/11 kV substation operating personnel manage the waste efficiently through recycling, reuse and proper disposal procedures.

The proponent will put in place an integrated solid waste management system and give priority to reduction at source of the materials. This option will demand a solid waste management awareness programme in the management and the operator employees. Solid wastes shall be disposed off in a manner that is acceptable to NEMA and Environmental Regulations.

9.2.2 Ensuring efficient liquid Waste Management
The transformer oil should be re-used in the substation or other related sites and the unusable one should be disposed by a NEMA approved contractor. The substation should be well paved to prevent spilled oil from reaching the sub-surface. It is proposed that a bundwall and oil holding dam be constructed to contain transformer oil in case of accidental leakage.

9.2.3 Ensure Efficient Energy Consumption
To ensure efficient energy consumption during the operation phase of the proposed 2x23MVA 66/11 kV substation in Villa Franca, the proponent plans to install an energy-efficient lighting system at the project site. This will contribute immensely to energy saving during the operational phase of the project. In addition, the substation operators will be sensitized to ensure energy efficiency in their daily operations. To complement these measures, it will be important to monitor energy use during the operation of the proposed 2x23MVA 66/11 kV substation in Villa Franca and set targets for efficient energy use.

9.2.4 Ensure Efficient Water Use
The proponent of the proposed 2x23MVA 66/11 kV Villa Franca substation will install water-conserving automatic taps and toilets. Moreover, any water leaks through damaged pipes and faulty taps will be fixed promptly by qualified staff. In addition, the substation operators of the proposed 2x23MVA 66/11 kV Villa Franca substation will be sensitized to use water efficiently.

9.2.5 Oil Spills
To prevent oil spills and environmental contamination, the substation and transformers should be designed with spill prevention and detection systems to protect the environment. With spill prevention and protection measures there should no adverse effects to the ground and surface water and soil.
Need to design appropriate protection devices against accidental discharge of toxic substances (bases/airtight tanks for machines, reservoirs etc.).

All the transformers should have secondary containment with sufficient volume to contain any spill from them in the containment structure. The containment area should have a means of removing accumulated water. The containment area should have a means of removing accumulated water. A retention area should be designed that surrounds the fuel storage tanks.

The substation operators should provide containers for the storage of chemical and lubricating products. Drains should be routed through a site/water separator. A spill and substation response plan would be developed and put in place prior to commencement of construction.

A written substation response plan should be prepared and retained on the site and the workers should be trained to follow specific procedures in the event of oil leakages and spills. The project proponent will orientate the workers on site on their specific EHS policies to prevent incidents and accidents of oil spill.

A floating boom should be used to contain spillage during refilling and unrefilling oil to transformers procedures. Frequent inspection and maintenance of transformer can minimize leakages.

The waste oil or used oil from maintenance of the transformers for proper disposal. In the Environmental Management Plan (EMP), disposal of used oil will be the responsibility of the project operator. The proponent will identify a reputable company to handle disposal of oil and oil filters.

9.2.6 Visual Impacts

The visual negative impacts can be mitigated through landscaping the area with trees to screen the project stacks, poles, cables and transformers by the project proponent of the proposed 2x23MVA 66/11 kV Villa Franca substation. Since the area is zoned as industrial, the visual impact will not be out of conformity with the surrounding areas.

9.2.7 Minimization of Sewage Release

The project proponent of the proposed 2x23MVA 66/11 kV Villa Franca substation will ensure that there are adequate means for handling the sewage generated at the proposed 2x23MVA 66/11 kV Villa Franca substation. It will also be important to ensure that toilets are kept clean and properly maintained.

9.2.8 Fire Suppression

The site must contain firefighting equipment of recommended standards and in key strategic points all over the proposed project site of the proposed 2x23MVA 66/11 kV Villa Franca substation. Fire pumps, Hydrants, Sprinkler/water spray systems, Hose houses, Dry chemical systems, Carbon dioxide systems, Detection/alarm systems, Portable fire extinguishers among others. A fire evacuation plan must be posted in various points of the construction site including procedures to take when a fire is reported. All workers must be trained on fire management and fire drills undertaken regularly.
9.2.9 Workers Health and Safety
All workers entering the proposed 2x23MVA 66/11 kV Villa Franca substation must be equipped with appropriate and adequate PPE includes ear muffs, safety footwear, overalls, gloves, dust masks, among others. The PPE should be those meeting the international standards of PPE. Personal protection gear must be provided and its use made compulsory to all. The entire workforce of the substation should be trained in the use of protective gear, handling of chemical products and acid storage cells, electric safety equipment, procedures for entering enclosed areas, fire protection and prevention, substation response and care procedures. Training given to the employees should be backed by regular on-site training in safety measures. ‘Restricted ENTRY’ signs such as “HATARI” should be installed to keep away unauthorized persons from access to restricted areas. Machines and Equipments must be operated only by qualified staff and a site supervisor should be on site at all times to ensure adherence. The project operator must develop a Workplace Health and Safety Policy Manual for which all the workers should be conversant and comply with. The project operator should appoint a responsible person from the management team to be in charge of workplace Safety, Health and Environmental issues. The operator should develop a substation Response Plan for handling any emergencies arising thereof during the project implementation phase.

9.2.10 Hazardous waste
The amount of hazardous waste created will be very low and possibly originate from maintenance sources. The waste would primarily consist of transformer oil and their containers, used rags and spent clean-up solvents. The used oil should be stored in a place with a drip collection mechanism before they are collected by the disposal agent for proper disposal. The substation operator should ensure that the used oil and its containers are properly disposed off in an environmental sound way. The mitigation measure is to provide training to site operation and maintenance staff to properly handle and dispose of the hazardous wastes using acceptable methods. Hazardous wastes on the site shall be clearly marked out and the entire workforce trained to recognize the danger signs and familiarize themselves with procedures to be followed before entering hazardous areas.

9.2.11 Noise and Vibration
Noise and vibration are expected during the operation phase of the project. Mitigation is through installation of generator muffling materials and with inbuilt sound and vibration absorption materials. The project operator will be expected to comply with the recent EMCA (Noise and Vibration) Regulations of 2009 during the operation phase of the project. All equipments and machinery installed must be tested to verify if they are compliant with Kenya and the World Bank acceptable standards of noise. Tested noise levels should be recorded as baseline and used for future monitoring.

Noise emitting equipment should comply with the applicable Kenya and World Bank noise standards and should be properly maintained. All workers in the project site must be equipped with the necessary and required Personal Protective Equipment (PPE) prescribed by the Directorate of Occupational Safety and Health of the Ministry of Labour like PPE.
9.3 Mitigation of Decommissioning Phase Impacts

Just as in the case during the construction and operation phase, the negative impacts of the decommissioning phase of the proposed 2x23MVA 66/11 kV Villa Franca substation can be mitigated as follows.

9.3.1 Minimization of Noise and Vibration

Significant impacts on the acoustic environment will be mitigated by the project proponent of the proposed 2x23MVA 66/11 kV Villa Franca substation shall put in place several measures that will mitigate noise pollution arising during the decommissioning phase. The following noise-suppression techniques will be employed to minimize the impact of temporary destruction noise at the project site.

- Install portable barriers to shield compressors and other small stationary equipment where necessary.
- Use quiet equipment (i.e. equipment designed with noise control elements).
- Co-ordinate with relevant agencies regarding all substation construction activities in the residential areas.
- Install sound barriers for pile driving activity.
- Limit pickup trucks and other small equipment to a minimum idling time and observe a common-sense approach to vehicle use, and encourage workers to shut off vehicle engines whenever possible.
- Demolish mainly during the day. The time that most of the neighbours are out working.

9.3.2 Efficient Solid Waste Management

Solid waste resulting from demolition or dismantling works associated with the proposed 2x23MVA 66/11 kV Villa Franca substation during decommissioning phase will be managed as follows:

- Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of demolition waste generated during decommissioning phase
- Provision of facilities for proper handling and storage of demolition materials to reduce the amount of waste caused by damage or exposure to the elements
- Use of materials that have minimal packaging to avoid the generation of excessive packaging waste
- Adequate collection and storage of waste on site and safe transportation to the disposal sites and disposal methods at designated area shall be provided.

9.3.3 Reduction of Dust Concentration

High levels of dust concentration resulting from demolition or dismantling works will be minimized as follows:

- Watering all active demolition areas as and when necessary to lay dust.
- Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard.
- Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at demolition sites.

9.3.4 Site Rehabilitation after Decommissioning

The project operator shall, on decommissioning of the project, restore the site to its original status as far as practicable and plant trees at the site.
CHAPTER 10: ANALYSIS OF PROJECT ALTERNATIVES

10.1 Consideration of Project Alternatives

This chapter describes and examines the various alternatives available for the project. The following alternatives were identified and investigated during EIA study. This section discusses the various alternatives considered to date for the proposed substation development project, including the “no-go / do nothing” alternative, alternative construction materials and technology, the alternative substation site, alternative sources of energy and power-line corridor routes identified during the Scoping Phase of the EIA.

10.2 Alternative Structure Types and Designs

The cost of a proposed substation project such as this is substantial, resulting in detailed research and development being put into the design of the components of the substation construction. The current design for the 66/11kV substations and its components at Villa Franca is regarded as the most cost effective whilst operationally sound for such a project.

Overhead incoming and outgoing feeders’ power lines have been determined to be the most feasible option for the Villa Franca 66/11kV Substation for the following reasons:
- Underground cabling will incur significantly higher installation and maintenance costs given the length of the power line;
- Overhead lines are far quicker and easier to repair should faults occur; and
- Relative to overhead lines, underground cables requires a larger area to be disturbed during construction and maintenance operations.

10.3 Analysis of Alternative Construction Materials and processes

The proposed substation will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements. Equipment that guarantees efficient use of locally available materials will be encouraged to ensure reliability in supply with minimum power loss and good design to allow efficient distribution of power in Nairobi County.

The support structures in a substation can be wooden or steel. Because of its durability and strength, steel is the best choice and all support structures will be steel. Perimeter fence can be a reinforced wire mesh fixed to support structures that can be wooden, concrete or steel. Alternatively a stone perimeter wall can be constructed and this is the option of choice since it is more durable, offer better protection and requires less maintenance.

The design of the Villa Franca 66/11kv substation will be easy to install and dismantle with minimum labour requirements and maintenance costs will be minimal.

The process material that are consumed by the proposed project area, transformer oil for cooling the transformer and water for substation cleaning purposes are critical elements. There is no alternative for transformer oil for transformer cooling and for substation cleaning water. So the task was to assess alternative water and transformer oil sources for the project. The study had four alternatives sources for substation cleaning water they include; piped Municipal water, groundwater and rainwater.
Groundwater quality and recharge in the area is very poor, making it less viable for any firm to venture into groundwater extraction.

Surface water from streams and rivers is not a viable option for the substation as the area has no nearby river. But this would be costly and unfeasible for the proposed 2x23MVA 66/11 kV Villa Franca substation. Tapping rainwater would also be an option but it would require the project proponent to have a large roof catchment surface which is not the case. Nairobi City water supply thus is the only viable option for the project based on the steady supply and quantities that would not impact other water users. Another material input for the project that was assessed for sustainable alternative was fuel for running the generators.

The transformer oil helps cool the transformer, because it provides part of the electrical insulation between internal live parts, transformer oil must remain stable at high temperatures for an extended period. To improve cooling of large power transformers, the oil-filled tank may have external radiators through which the oil circulates by natural convection. Very large or high-power transformers (with capacities of thousands of KVA) may also have cooling fans, oil pumps, and even oil-to-water heat exchangers. Large, high voltage transformers undergo prolonged drying processes, using electrical self-heating, the application of a vacuum, or both to ensure that the transformer is completely free of water vapor before the cooling oil is introduced. This helps prevent corona formation and subsequent electrical breakdown under load. Oil filled transformers with a conservator (an oil tank above the transformer) tend to be equipped with Buchholz relays. These are safety devices that detect the build-up of gases (such as acetylene) inside the transformer (a side effect of corona or an electric arc in the windings) and switch off the transformer. Transformers without conservators are usually equipped with sudden pressure relays, which perform a similar function as the Buchholz relay.

10.4 Alternative Sources of Energy

During the EIA study; alternative sources of energy other than relying on the KPLC's National Grid were analyzed. Some of the possible options included relying on small diesel generators at household / individual level. This would lead to increased noise and emission of greenhouse gases. Other sources of energy include Biogas and Biofuel which have not yet been fully explored towards electricity generation. Other alternatives would include use of firewood to generate energy at individual levels. It is worth noting that most of these alternatives are not sustainable and some have adverse environmental impacts like desertification and increased concentration of greenhouse gases in the atmosphere. Other alternatives would be Generating solar power which is not yet adequately explored for commercial purposes in Kenya. Solar Power is green energy with minimal maintenance costs but it is capital intensive. Many people still opt to being connected to the National power grid for domestic and commercial power supply.

10.5 The ‘Do-nothing’ Option

The existing substation and power-line networks supplying the Nairobi County and and its environs are highly constrained in terms of capacity and are unable to supply additional electrification load growth in the area. It is therefore imperative for KPLC to establish a new 66/11kV substation in the area to cater for existing and projected electrification load.

Should the proposed development not be undertaken, the risk for electrical faults and associated power outages, which are currently occurring in the area on a relatively frequent basis, will increase significantly. In addition, the ability to supply new customers would be severely limited in that it is
anticipated that the demand for electricity in the study area will soon exceed the capacity of KPLC’s existing 66/11kV electrical system. This will consequently have a significant negative impact on existing and proposed new developments in the area. The no project option will have the forgone costs and benefits including

- The targeted consumers will forgo improved electricity supply
- Generation of employment opportunities through expansion of business activities that would have been spurred by availability of electric power will not occur
- The country won’t meet its energy requirement
- The objectives of the right issue, as well as the Governments efforts towards achieving Vision 2030 will not be realized.

It is thereby concluded that the ‘do-nothing’ option is not a viable or acceptable option, and should therefore be discounted.

10.6 Alternative Substation Site

The identification of potential substation site for the proposed Villa Franca 66/11 kV Substation involved site visits to the study area, preliminary site investigations and consultation with KPLC as well as IAPs.

The suitability of potential substation sites identified by KPLC/SHE/Property during the initial site visits was assessed in terms of various suitability criteria and technical restrictions stipulated by KPLC, as outlined below:

- Size – potential sites need to be sufficient for the average size of a substation and associated incoming and outgoing powerlines;
- Topography – consideration is given to the topography of potential sites whereby flat or gently sloping topography is preferred. An ideal gradient for the natural ground is 1:100. A gentle slope facilitates surface drainage and movement of vehicles and people on-site during construction. A steep slope requires costly leveling (cut and fill) for the construction of the substation. In addition, a steep slope inhibits movement, makes vehicle access problematic and increases the potential for environmental impacts during construction as well as operation e.g. steeper slopes have higher surface water flow rates and therefore higher erosive potential;
- Hydrology – consideration is given to the proximity of potential sites to adjacent water courses and wetlands where there may be potential impacts in terms of erosion and siltation of water courses, as well as implications associated with storm-water control at the substation;
- Geology and soils – consideration is given to the soil type present within the potential site whereby stable soil and founding conditions are preferable. Less stable soils, i.e. shallow, dispersive soils and soils with poor drainage present an erosion hazard if not managed correctly, and also require the installment of additional, costly foundation infrastructure;
- Flora and fauna – potential sites need to be assessed in terms of their ecological value at both a macro and micro scale i.e. within the site and the environment surrounding the site. Both a faunal and floral investigation may be required, with particular emphasis on ensuring the protection of endemic and red data species and their habitat, should they be present. An identified site that has a high ecological value may be excluded from the list of potential sites;
- Visibility – highly visible sites i.e. on a ridge / elevated terrain are considered less favorable in that they have a high visual impact on the surrounding landscape. Sites that are hidden or out of site e.g. behind a hill, may be considered more suitable;
- Access – it is preferable that potential sites are located in close proximity to existing provincial roads so as to avoid the need for construction of new access roads of considerable length. Access is also important particularly as it relates to the transportation of the substation transformer to the site, which weighs approximately 38 tons and requires the use of a low-bed vehicle. As such, long access routes with sharp bends are to be avoided and the site should not be located in an area that has excessively steep inclines or declines that could hinder access, particularly during periods of heavy rainfall;
- Distance to site – it is important that the site be located strategically within the receiving area’s electrical load centre;
- Adjacent land use – adjacent land use has implications for access and required clearances for the powerlines extending into the substation, i.e. it is important that the land surrounding the substation is relatively clear of obstructions which might otherwise inhibit / obstruct the path of the powerlines in and out of the substation. Current and future development planning of adjacent land use should therefore also be considered; and
- Public acceptability – public acceptance criteria relate to such issues as the possible adverse impact on public health, quality of life, and local land and property values.

Based on the above-mentioned suitability criteria and technical restrictions, KPLC SHE has identified one potential site for the location of the proposed Villa Franca 66/11 kV Substation, located along Mombasa Road, but access through Imara Daima-Sunrise drive. There was no alternative site because the proposed site is nine acre land belonging to Kenya Power. Relocation option to a different site is an option available for the project implementation. The project proponent can look for alternative land to accommodate the scale and size of the project. This will be a costly venture, may take a long time although there is no guarantee that the land would be available. Fresh Project design and planning before the stage of implementation will cost the developer additional money. It is recommendable that the proponent be allowed to install the project in already existing site.

10.7 Analysis of Alternative Construction Materials and Technology

The proposed 2x23MVA 66/11 kV Villa Franca substation will be constructed 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 (washed and clean), metal bars and fittings that meet the Kenya Bureau of Standards requirements.

Beautiful and durable re-enforced concrete roofs with tile profile will be used because they are good in heat insulation as compared to the iron sheet roofs, and afford more security. This will ensure that the rainwater harvested will be used in the proposed 2x23MVA 66/11 kV Villa Franca substation operations and landscaping. 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.

10.8 Solid waste management alternatives

The proposed 2x23MVA 66/11 kV Villa Franca substation will generate some of solid wastes. The proponent will give priority to reduction at Source of the materials. This option will demand a solid waste management awareness programme in the management and the residents. Solid wastes shall be disposed off in a manner that is acceptable to NEMA and Environmental Regulations.
CHAPTER ELEVEN: ENVIRONMENTAL MANAGEMENT PLAN (EMP)

11.1 Environmental Management Plan

Environmental and Social Management Plan (ESMP) for development projects provides a logical framework within which identified negative environmental and socio-economic impacts can be mitigated and monitored. In addition, the ESMP assigns responsibilities of actions to various actors and provides a timeframe within which mitigation measures and monitoring can be done. ESMP is a vital output of an Environmental Impact Assessment as it provides a checklist for project monitoring and evaluation. The ESMP outlined below addresses the identified potential negative impacts and mitigation measures of the proposed substation during construction, operational and decommissioning phases, based on the Chapter of Environmental Impacts and Mitigation Measures of the expected Negative Impacts.

This section presents the environmental and social management plan (ESMP) for the proposed project. The ESMP specifies the mitigation and management measures which the Proponent will undertake and shows how the Project will mobilize organizational capacity and resources to implement these measures. The ESMP covers information on the management and/or mitigation measures that will be taken into consideration to address impacts in respect of the following project phases: design, construction, operation and decommissioning.

11.2 Significance of an EMP

Environmental Management Plan (EMP) for development projects provides a logical framework within which identified negative environmental impacts can be mitigated and monitored. In addition the EMP assigns responsibilities of actions to various actors and provides a timeframe within which mitigation measures and monitoring can be done. EMP is a vital output of an Environmental Impact Assessment as it provides a checklist for project monitoring and evaluation. The EMP outlined below have addressed the identified potential negative impacts and mitigation measures of the proposed 2x23MVA 66/11 kV Villa Franca substation during construction, operational and decommissioning phases, based on the Chapters of Environmental Impacts and Mitigation Measures of the expected Negative Impacts.

11.3 Construction phase EMP

Environmental Management Plan for the construction phase is as shown on the Table 11-1.
Table 11-1: Environmental Management Plan during CONSTRUCTION PHASE of the proposed 2x23MVA 66/11 kV Villa Franca substation

<table>
<thead>
<tr>
<th>Demand of Raw material</th>
<th>Expected Negative Impacts</th>
<th>Recommended Mitigation Measures</th>
<th>Responsible Party</th>
<th>Time Frame</th>
<th>Cost (Ksh)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Minimize extraction site impacts and ensure efficient use of raw materials in construction</td>
<td>1. Source building materials from local suppliers who use environmentally friendly processes in their operations.</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>Throughout construction period</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Ensure accurate budgeting and estimation of actual construction material requirements to ensure that the least amount of material necessary is ordered.</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>Throughout construction period</td>
<td>5,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Ensure that damage or loss of materials at the construction site is kept minimal through proper storage.</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>Throughout construction period</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Use at least 5%-10% recycled refurbished or salvaged materials to reduce the use of raw materials and divert material from landfills.</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>Throughout construction period</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vegetation disturbance</th>
<th>Expected Negative Impacts</th>
<th>Recommended Mitigation Measures</th>
<th>Responsible Party</th>
<th>Time Frame</th>
<th>Cost (Ksh)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Minimize vegetation disturbance at and or around construction site</td>
<td>1. Ensure proper demarcation and delineation of the project area to be affected by construction works.</td>
<td>Contractor, Resident Project Manager</td>
<td>1 month</td>
<td>3,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Specify locations for trailers and equipment, and areas of the site which should be kept free of traffic, equipment, and storage.</td>
<td>Civil Engineer and Resident Project Manager</td>
<td>1 month</td>
<td>1,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Designate access routes and parking within the site.</td>
<td>Civil Engineer and Resident Project Manager</td>
<td>1 month</td>
<td>5,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Introduction of vegetation (trees, shrubs and grass) on open spaces and around the project site and their maintenance.</td>
<td>Architect &amp; Landscape specialist</td>
<td>Monthly to Annually</td>
<td>10,000</td>
</tr>
<tr>
<td>Expected Negative Impacts</td>
<td>Recommended Mitigation Measures</td>
<td>Responsible Party</td>
<td>Time Frame</td>
<td>Cost (Ksh)</td>
<td></td>
</tr>
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</tr>
<tr>
<td>5. Design and implement an appropriate landscaping programme to help in re-vegetation of part of the project area after construction.</td>
<td>Architect &amp; Landscape specialist</td>
<td>2 months</td>
<td>10,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**3. Reduce storm-water, runoff and soil erosion**

<table>
<thead>
<tr>
<th>Increased storm water, runoff and soil erosion</th>
<th>1. Surface runoff and roof water shall be harvested and stored in tanks so that it can be used for cleaning purposes.</th>
<th>The Civil Engineer, Mechanical Engineer and Resident Project Manager</th>
<th>2 months</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2. A storm water management plan that minimizes impervious area infiltration by use of recharge areas and use of detention and/or retention with graduated outlet control structure will be designed.</td>
<td>The Civil Engineer, Mechanical Engineer and Resident Project Manager</td>
<td>1 month</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>3. Apply soil erosion control measures such as levelling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil.</td>
<td>The Civil Engineer, Mechanical Engineer and Resident Project Manager</td>
<td>1 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Ensure that construction vehicles are restricted to use existing graded roads</td>
<td>Contractor</td>
<td>Throughout construction period</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Ensure that any compacted areas are ripped to reduce run-off.</td>
<td>Contractor</td>
<td>2 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Site excavation works to be planned such that a section is completed and rehabilitated before another section begins.</td>
<td>Resident Project Manager</td>
<td>Throughout construction period</td>
<td>5,000 per unit</td>
<td></td>
</tr>
<tr>
<td>7. Interconnected open drains will be provided on site.</td>
<td>Civil Engineer</td>
<td>Throughout construction period</td>
<td>5,000 per unit</td>
<td></td>
</tr>
<tr>
<td>8. Roof catchments will be used to collect the storm water for some substation uses.</td>
<td>Civil Engineer</td>
<td>Throughout construction period</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Construction of water storage tanks to collect storm water for substation uses.</td>
<td>Civil Engineer</td>
<td>Throughout construction period</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**4. Minimize solid waste generation and ensure efficient solid waste management during construction**
<table>
<thead>
<tr>
<th>Expected Negative Impacts</th>
<th>Recommended Mitigation Measures</th>
<th>Responsible Party</th>
<th>Time Frame</th>
<th>Cost (Ksh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased solid waste generation</td>
<td>1. Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Reduction at source 2. Recycling 3. Reusing 4. Incineration 5. Sanitary land filling.</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>Throughout construction period</td>
<td>10,000</td>
</tr>
<tr>
<td></td>
<td>2. Through accurate estimation of the dimensions and quantities of materials required.</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>One-off</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>3. 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.</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>Throughout construction period</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>4. Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements.</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>One-off</td>
<td>12,000</td>
</tr>
<tr>
<td></td>
<td>5. Use building materials that have minimal or no packaging to avoid the generation of excessive packaging waste.</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>Throughout construction period</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>6. Reuse packaging materials such as cartons, cement bags, empty metal and plastic containers to reduce waste at site.</td>
<td>Resident Project Manager, Mechanical Engineer &amp; Contractor</td>
<td>Throughout construction period</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>7. Dispose waste more responsibly by contracting a registered waste handler who will dispose the wastes at designated sites or landfills only.</td>
<td>Resident Project Manager, Mechanical Engineer &amp; Contractor</td>
<td>Throughout construction period</td>
<td>10,000 /month</td>
</tr>
<tr>
<td></td>
<td>8. Waste collection bins to be provided at designated points on site.</td>
<td>Resident Project Manager, Mechanical Engineer &amp; Contractor</td>
<td>Throughout construction period</td>
<td>40,000</td>
</tr>
</tbody>
</table>

5. Air Pollution

Dust emission

1. Ensure strict enforcement of on-site speed limit regulations | Resident Project Manager & Contractor | Throughout construction period | 5,000 |
## Expected Negative Impacts

<table>
<thead>
<tr>
<th>Expected Negative Impacts</th>
<th>Recommended Mitigation Measures</th>
<th>Responsible Party</th>
<th>Time Frame</th>
<th>Cost (Ksh)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Avoid excavation works in extremely dry weathers</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>Throughout construction period</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>3. Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>Throughout construction period</td>
<td>30,000 per month</td>
</tr>
<tr>
<td></td>
<td>4. Personal Protective equipment to be provided to employees and worn</td>
<td>Resident Project Manager</td>
<td>Throughout construction period</td>
<td>0</td>
</tr>
</tbody>
</table>

### Exhaust emission

1. Vehicle idling time shall be minimized
2. Alternatively fuelled construction equipment shall be used where feasible equipment shall be properly maintained
3. Sensitize truck drivers to avoid unnecessary running engines of stationary vehicles and to switch off engines whenever possible

### Noise and vibration

1. Sensitize construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used.
2. Sensitize construction drivers to avoid running of vehicle engines or hooting
3. Ensure that construction machinery are kept in good condition to reduce noise generation
4. Ensure that all generators and heavy duty equipment are insulated or placed in enclosures (containers) to minimize ambient noise levels.
5. Trees to be planted around the site to provide some buffer against noise propagation
### Expected Negative Impacts

<table>
<thead>
<tr>
<th>Expected Negative Impacts</th>
<th>Recommended Mitigation Measures</th>
<th>Responsible Party</th>
<th>Time Frame</th>
<th>Cost (Ksh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. The noisy construction works will entirely be planned to be during day time when most of the neighbours will be at work.</td>
<td>Resident Project Manager &amp; all site foreman</td>
<td>Throughout construction period</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

### Minimization of Energy Consumption

<table>
<thead>
<tr>
<th>Increased energy consumption</th>
<th>Recommended Mitigation Measures</th>
<th>Responsible Party</th>
<th>Time Frame</th>
<th>Cost (Ksh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ensure electrical equipment, appliances and lights are switched off when not being used</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>Throughout construction period</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2. Install energy saving bulbs/tubes at all lighting points instead of incandescent bulbs which consume higher electric energy</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>Throughout construction period</td>
<td>5,000</td>
<td></td>
</tr>
<tr>
<td>3. Plan well for transportation of materials to ensure that fossil fuels (diesel, transformer oil, petrol) are not consumed in excessive amounts</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>Throughout construction period</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>4. Monitor energy use during construction and set targets for reduction of energy use.</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>Throughout construction period</td>
<td>5,000</td>
<td></td>
</tr>
</tbody>
</table>

### Minimize water consumption and ensure more efficient and safe water use

<table>
<thead>
<tr>
<th>Increased Water Demand</th>
<th>Recommended Mitigation Measures</th>
<th>Responsible Party</th>
<th>Time Frame</th>
<th>Cost (Ksh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Water to be brought in from the City Water and Sewerage Company</td>
<td>Mechanical Engineer and Resident Project Manager</td>
<td>Throughout construction period</td>
<td>5,000 per unit</td>
<td></td>
</tr>
<tr>
<td>2. Harness rainwater for office &amp; gardening</td>
<td>Mechanical Engineer and Resident Project Manager</td>
<td>Throughout construction period</td>
<td>5,000 per unit</td>
<td></td>
</tr>
<tr>
<td>3. Install water conserving taps that turn-off automatically when water is not being used</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>One-off</td>
<td>40% more than price of ordinary taps</td>
<td></td>
</tr>
<tr>
<td>5. Promote recycling and reuse of water as much as possible</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>Throughout construction period</td>
<td>2,000</td>
<td></td>
</tr>
<tr>
<td>6. Install a discharge meter at water outlets to determine and monitor total water usage</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>One-off</td>
<td>2,000</td>
<td></td>
</tr>
<tr>
<td>7. Promptly detect and repair of water pipe and tank leaks</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>Throughout construction period</td>
<td>1,000 per month</td>
<td></td>
</tr>
<tr>
<td>Expected Negative Impacts</td>
<td>Recommended Mitigation Measures</td>
<td>Responsible Party</td>
<td>Time Frame</td>
<td>Cost (Ksh)</td>
</tr>
<tr>
<td>---------------------------</td>
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</tr>
<tr>
<td>Expected Negative Impacts</td>
<td>Recommended Mitigation Measures</td>
<td>Responsible Party</td>
<td>Time Frame</td>
<td>Cost (Ksh)</td>
</tr>
<tr>
<td>8. Sensitive construction workers to conserve water by avoiding unnecessary toilet flushing etc.</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>Throughout construction period</td>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td>9. Ensure taps are not running when not in use</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>Throughout construction period</td>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td><strong>10. Minimize release of liquid effluent</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generation of wastewater</td>
<td>1. Provide means for handling sewage generated at the construction site</td>
<td>Mechanical Engineer &amp; Resident Project Manager</td>
<td>One-off</td>
<td>30,000</td>
</tr>
<tr>
<td></td>
<td>2. Conduct regular checks for sewage pipe blockages or damages since such vices can lead to release of the effluent into the land and water bodies</td>
<td>Mechanical Engineer &amp; Resident Project Manager</td>
<td>Throughout construction period</td>
<td>2,000/month</td>
</tr>
<tr>
<td></td>
<td>3. Monitor effluent quality regularly to ensure that the stipulated discharge rules and standards are not violated</td>
<td>Mechanical Engineer &amp; Resident Project Manager</td>
<td>Throughout construction period</td>
<td>2,000/month</td>
</tr>
<tr>
<td><strong>11. Minimize occupational health and safety risks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statutory Requirements</td>
<td>Ensure compliance with The OSHA (Building Operations and Works of Engineering Construction Rules), L.N. 40 of 1984</td>
<td>Contractor</td>
<td>During the construction period</td>
<td></td>
</tr>
<tr>
<td>Worksite Safety and Health Hazards to employees</td>
<td>Ensure compliance with the Occupational Safety and Health Act (OSHA) 2007 provisions e.g. employees to be provided with appropriate PPE</td>
<td>Developer</td>
<td>One-off</td>
<td>5,000</td>
</tr>
<tr>
<td><strong>12. Minimize Oil Spills</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil spills Hazards</td>
<td>Install oil trapping equipments in areas when there a likelihood of oil spillage such during the maintenance of construction facility. Soil in such an area will be well protected from contamination</td>
<td>Resident Project Manager</td>
<td>Continuous</td>
<td>50,000</td>
</tr>
</tbody>
</table>
11.4 Operational Phase EMP

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the operational phase of proposed 2x23MVA 66/11 kV Villa Franca substation, are outlined in this section.

Table 8 below indicates the operational phase EMP.
Table 11-2: Environmental management/monitoring Plan for the OPERATIONAL PHASE of the proposed 2x23MVA 66/11 kV Villa Franca substation

<table>
<thead>
<tr>
<th>Expected Negative Impacts</th>
<th>Recommended Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>1. Minimization of solid waste generation and ensuring more efficient solid waste management</strong></td>
</tr>
<tr>
<td>Solid waste generation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Recommended Project Manager &amp; Contractor</td>
</tr>
<tr>
<td></td>
<td>Time Frame: Throughout construction period</td>
</tr>
<tr>
<td></td>
<td>Cost (Ksh): 20,000</td>
</tr>
<tr>
<td></td>
<td>2. Provide solid waste handling facilities such as rubbish bags and skips</td>
</tr>
<tr>
<td></td>
<td>Recommended Project Manager</td>
</tr>
<tr>
<td></td>
<td>Time Frame: One-off</td>
</tr>
<tr>
<td></td>
<td>Cost (Ksh): 20,000</td>
</tr>
<tr>
<td></td>
<td>3. Ensure that solid wastes generated at the substation are regularly disposed of appropriately at authorised disposal sites</td>
</tr>
<tr>
<td></td>
<td>Recommended Project Manager</td>
</tr>
<tr>
<td></td>
<td>Time Frame: Continuous</td>
</tr>
<tr>
<td></td>
<td>Cost (Ksh): 15,000/month</td>
</tr>
<tr>
<td></td>
<td>4. Ensure that wastes generated at the substation are efficiently managed through recycling, reuse and proper disposal procedures.</td>
</tr>
<tr>
<td></td>
<td>Recommended Project Manager</td>
</tr>
<tr>
<td></td>
<td>Time Frame: Continuous</td>
</tr>
<tr>
<td></td>
<td>Cost (Ksh): 0</td>
</tr>
<tr>
<td></td>
<td>5. A private company to be contracted to collect and dispose solid waste on regular intervals</td>
</tr>
<tr>
<td></td>
<td>Recommended Project Manager</td>
</tr>
<tr>
<td></td>
<td>Time Frame: Continuous</td>
</tr>
<tr>
<td></td>
<td>Cost (Ksh): 30,000 per month</td>
</tr>
<tr>
<td></td>
<td>6. Install site smokeless incinerator</td>
</tr>
<tr>
<td></td>
<td>Recommended Project Manager and contractor</td>
</tr>
<tr>
<td></td>
<td>Time Frame: During design and construction</td>
</tr>
<tr>
<td></td>
<td>Cost (Ksh): To be determined</td>
</tr>
<tr>
<td></td>
<td>2. Ensuring Efficient Liquid waste management</td>
</tr>
<tr>
<td></td>
<td>1. Paving of substation surface to reduce spilled liquid waste from reaching sub-surface</td>
</tr>
<tr>
<td></td>
<td>Recommended Project Manager &amp; Contractor</td>
</tr>
<tr>
<td></td>
<td>Time Frame: During Construction</td>
</tr>
<tr>
<td></td>
<td>Cost (Ksh): Part of construction cost</td>
</tr>
<tr>
<td></td>
<td>2. Install sludge treatment unit on site</td>
</tr>
<tr>
<td></td>
<td>Recommended Project Manager &amp; Contractor</td>
</tr>
<tr>
<td></td>
<td>Time Frame: During construction</td>
</tr>
<tr>
<td></td>
<td>Cost (Ksh): Part of construction cost</td>
</tr>
<tr>
<td></td>
<td>3. Install oil interceptor on site to separate oil and water</td>
</tr>
<tr>
<td></td>
<td>Recommended Project Manager &amp; Contractor</td>
</tr>
<tr>
<td></td>
<td>Time Frame: During construction</td>
</tr>
<tr>
<td></td>
<td>Cost (Ksh): Part of construction cost</td>
</tr>
<tr>
<td></td>
<td>3. Minimise risks of sewage release into environment</td>
</tr>
</tbody>
</table>

Environmental Impact Assessment Project Report

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## Expected Negative Impacts

<table>
<thead>
<tr>
<th>Expected Negative Impacts</th>
<th>Recommended Mitigation Measures</th>
<th>Responsible Party</th>
<th>Time Frame</th>
<th>Cost (Ksh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Release of sewage into the environment</td>
<td>1. Provide adequate and safe means of handling sewage generated at the substation</td>
<td>Resident Project Manager &amp; Mechanical Engineer</td>
<td>One-off</td>
<td>40,000</td>
</tr>
<tr>
<td></td>
<td>2. Conduct regular inspections for sewage pipe blockages or damages and fix appropriately</td>
<td>Resident Project Manager &amp; Mechanical Engineer</td>
<td>Continuous</td>
<td>500 per inspection</td>
</tr>
<tr>
<td></td>
<td>3. Ensure regular monitoring of the sewage discharged from the project to ensure that the stipulated sewage/effluent discharge rules and standards are not violated</td>
<td>Resident Project Manager &amp; Mechanical Engineer</td>
<td>Continuous</td>
<td>500/parameter</td>
</tr>
<tr>
<td>4. Minimize energy consumption</td>
<td>1. Switch off electrical equipment, appliances and lights when not being used</td>
<td>Resident Project Manager</td>
<td>Continuous</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2. Install occupation sensing lighting at various locations such as storage areas which are not in use all the time</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>One-off</td>
<td>10-40 % higher than ordinary lighting</td>
</tr>
<tr>
<td></td>
<td>3. Install energy saving fluorescent tubes at all lighting points within the substation instead of bulbs which consume higher electric energy</td>
<td>Resident Project Manager &amp; Occupants</td>
<td>One-off</td>
<td>10-40% higher than ordinary lighting</td>
</tr>
<tr>
<td></td>
<td>4. Monitor energy use during the operation of the project and set targets for efficient energy use</td>
<td>Resident Project Manager</td>
<td>Continuous</td>
<td>2,000/month</td>
</tr>
<tr>
<td></td>
<td>5. Sensitize the substation workers to use energy efficiently</td>
<td>Resident Project Manager</td>
<td>Continuous</td>
<td>500/month</td>
</tr>
<tr>
<td>5. Minimize water consumption and ensure more efficient and safe water use</td>
<td>1. Promptly detect and repair of water pipe and tank leaks</td>
<td>Resident Project Manager &amp; Mechanical Engineer</td>
<td>Continuous</td>
<td>2,000/month</td>
</tr>
</tbody>
</table>
### Expected Negative Impacts

<table>
<thead>
<tr>
<th>Expected Negative Impacts</th>
<th>Recommended Mitigation Measures</th>
<th>Responsible Party</th>
<th>Time Frame</th>
<th>Cost (Ksh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Substation workers to be sensitized on water conservation techniques.</td>
<td>Recommended Project Manager &amp; Mechanical Engineer</td>
<td>Continuous</td>
<td>500/month</td>
<td></td>
</tr>
<tr>
<td>3. Ensure taps are not running when not in use</td>
<td>Recommended Project Manager &amp; Mechanical Engineer</td>
<td>Continuous</td>
<td>500/month</td>
<td></td>
</tr>
<tr>
<td>4. Install water conserving taps that turn-off when water is not being used</td>
<td>Recommended Project Manager &amp; Mechanical Engineer</td>
<td>One-off</td>
<td>40% more than ordinary taps</td>
<td></td>
</tr>
<tr>
<td>5. Install a discharge meter at water outlets to determine and monitor total water usage</td>
<td>Recommended Project Manager &amp; Mechanical Engineer</td>
<td>One-off</td>
<td>2,000</td>
<td></td>
</tr>
<tr>
<td>6. Create water conservation awareness</td>
<td>Recommended Project Manager &amp; Mechanical Engineer</td>
<td>Continuous</td>
<td>2,000</td>
<td></td>
</tr>
</tbody>
</table>

#### 6. Minimization of health and safety impacts

| Increased health and safety impacts                                                      | Implement all necessary measures to ensure health and safety of the substation workers and the general public during operation of the proposed 2X23 MVA 66/11 kV substation as stipulated in the Occupational Safety and Health Act, 2007 | Resident Project Manager, Mechanical Engineer, & Developer | Continuous   | 5,000 per month   |

#### 7. Ensure the general safety and security of the proposed 2X23MVA 66/11 kV substation and surrounding areas

| Increased general safety and security impacts                                           | Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the premises. | Security Officer, Resident Project Manager & Police | Continuous   | 10,000/month      |

#### 8. Increased Pressure on Infrastructure

| 1. Coordinate with other planning goals and objectives for region                       | Architect, Project Manager, and the Developer                                                   | Continuous                               | 40,000        |
2. Upgrade existing infrastructure and services, if and where feasible.

| 9. Air Pollution | 2. Suitable wet suppression techniques need to be utilized in all exposed areas | Site Safety Officer | Continuous |
| 2. Enforce low speed limits for vehicles moving within the site | Site Safety Officer | Continuous |
| 3. Ensure that the site is located away from such pollution sources | Site Safety Officer | Continuous |
| 4. Use of transformer oil should have been sulphur free for the purpose of cooling the transformers | Residents project manager | Continuous |

| 10. Minimization of fire risks | 1. Installation of fire fighting equipments | Substation manager and contractors | In design and Continuous |
| 2. Development of fire evaluation plan | | | |
| 3. Training of all staff in fire management | | | |

| 12. Worksite Safety and Health Hazards to employees | Ensure compliance with the Occupational Safety and Health Act (OSHA) 2007 provisions e.g. employees to be provided with appropriate PPE | Developer | One-off |
| | | | 5,000 |
11.5 Decommissioning Phase EMP

In addition to the mitigation measures provided in the above two tables, it is necessary to outline some basic mitigation measures that will be required to be undertaken once all operational activities of the proposed 2x23MVA 66/11 kV Villa Franca substation have been implemented and there is need for phasing out. The necessary 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 proposed 2x23MVA 66/11 kV Villa Franca substation project are outlined in the Table 11-3 below.
Table 11-3: Environmental management/monitoring Plan for the DECOMMISSIONING PHASE of the proposed 2x23MVA 66/11 kV Villa Franca substation Project.

<table>
<thead>
<tr>
<th>Expected Negative Impacts</th>
<th>Recommended Mitigation Measures</th>
<th>Responsible Party</th>
<th>Time Frame</th>
<th>Cost (Ksh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demolition waste</td>
<td>2. All machinery, equipment, structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as possible or they be taken to a licensed waste disposal site</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>One-off</td>
<td>0</td>
</tr>
<tr>
<td>2. Rehabilitation of project site</td>
<td>1. Implement an appropriate re-vegetation programme to restore the site to its original status</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>One-off</td>
<td>10,000</td>
</tr>
<tr>
<td>Vegetation disturbance</td>
<td>2. Consider use of indigenous plant species in re-vegetation</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>One-off</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>3. Trees should be planted at suitable locations so as to interrupt slight lines (screen planting), between the adjacent residential area and the development.</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>Once-off</td>
<td>0</td>
</tr>
<tr>
<td>3. Minimization of Generation of Dust</td>
<td>1. Watering all active demolition areas as and when necessary to lay dust.</td>
<td>During Decommissioning</td>
<td>To be determined</td>
<td></td>
</tr>
<tr>
<td>Expected Negative Impacts</td>
<td>Recommended Mitigation Measures</td>
<td>Responsible Party</td>
<td>Time Frame</td>
<td>Cost (Ksh)</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------</td>
<td>-----------------------</td>
<td>------------</td>
</tr>
<tr>
<td></td>
<td>2. Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard.</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>To be determined</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at demolition sites.</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>To be determined</td>
<td></td>
</tr>
</tbody>
</table>

4. Reduction of Noise and vibrations

<table>
<thead>
<tr>
<th>Increase noise and vibration</th>
<th>1. Install portable barriers to shield compressors and other small stationary equipment where necessary.</th>
<th>Resident Project Manager &amp; Contractor</th>
<th>During Decommissioning</th>
<th>To be determined</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Demolish mainly during the day. The time that most of the neighbours are out working.</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>During Decommissioning</td>
<td>To be determined</td>
</tr>
<tr>
<td></td>
<td>3. Co-ordinate with relevant agencies regarding all substation construction activities in the residential areas.</td>
<td>Resident Project Manager &amp; Contractor</td>
<td>During Decommissioning</td>
<td>To be determined</td>
</tr>
</tbody>
</table>
11.6 Environmental and Social Monitoring Plan (ESMP)

11.6.1 Monitoring

The proposed programmes and plans will be subjected to monitoring. Monitoring will have two elements: routine monitoring against standards or performance criteria; and periodic review or evaluation. Monitoring will often focus on the effectiveness and impact of the programme or plan as a whole.

During construction phase, the Proponent shall monitor the contractor’s activities in order to verify that the management measures/procedures/specifications are implemented as contained in the EMP. Compliance will mean that the Contractor is fulfilling their contractual obligation.

During operation phase, the Proponent will monitor facility’s operations to ensure compliance with management measures in the EMP and operation procedures. As part of this monitoring, the Proponent will undertake statutory initial environmental audit as required by the EIA/EA Regulations, 2003 and subsequent annul self environmental audits.

11.6.2 Programme Monitoring

The Proponent shall regularly monitor programme implementation. The process will include the regular monitoring of:

- Erosion of soil resulting in the immediate surroundings of the facility caused by the presence of facility or impacting on structures associated with the facility
- Air quality and ambient emissions, including dust generated by construction activities
- Noise generation during construction, operation and decommissioning phases

11.6.3 Plan Monitoring

All of the management plans make provision for monitoring and evaluation. Special attention should be given to the monitoring arrangements relating to biophysical impacts, occupational health and safety, facility operational and emergency response.

During the construction phase of the project, the Contractor's HSE Officer shall report all environmental impacts as well as accidents and incidents to the Proponent’s SHE Officer.

The reported impacts and incidents will be captured on a database to ascertain trends and track progress in the implementation of preventive and corrective actions, and benchmarking against other, similar operations.

Depending on the level of severity, accidents and incidents will be investigated by the Contractor’s SHE section, with key input from the line management to ensure accountability.

During operation, the Proponent's SHE department will monitor the health and safety of personnel and contractors, in compliance with legislative requirements. Emergency incidents should be reported to the relevant authorities. The reported impacts and incidents will be captured on a database to identify weakness in the emergency response plan and track progress in the implementation of preventative and corrective and benchmarking against other similar operations.
The Environmental and Social Monitoring Plan (ESMP) will provide the basis for monitoring of Potential environmental Impacts associated with the substation Project. The implementation of the Monitoring Plan together with the Environmental and Social Management Plan will provide a benchmark for future environmental audits. The ESMP provides effective observation and documentation of monitorable parameters that will help in analyzing the effectiveness of the proposed mitigation measures with the advantages of improving operational efficiency, promoting competitive advantage, improving risk management, reducing liabilities and improving business performance. The environmental and social parameters monitoring procedures and techniques for proposed project are summarized in table 11-4.

### Table 11-4: Environmental Monitoring Plan (EMP)

<table>
<thead>
<tr>
<th>Potential Environmental /Social impact</th>
<th>Parameter to be monitored</th>
<th>Timing</th>
<th>Cost</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise</td>
<td>Measure the Noise Level within the Project area and at distances of 30 from the substation</td>
<td>During Construction, Operation and Decommissioning phases</td>
<td>Included in Construction contract and Operating costs</td>
<td>The KPLC and Contractor</td>
</tr>
<tr>
<td>Vegetation and Habitat Loss</td>
<td>Quantify the weight of cleared Vegetation</td>
<td>During Construction</td>
<td>Included in the Construction Contract</td>
<td>Contractor</td>
</tr>
<tr>
<td>Soil erosion</td>
<td>Assess size of rills or Gulleys forming from accelerated run off from compacted areas</td>
<td>During operation phase</td>
<td>Included in Operation costs</td>
<td>The KPLC</td>
</tr>
<tr>
<td>Increased water Demand</td>
<td>Record amount of Litres used</td>
<td>During Construction and Decommissioning Phases</td>
<td>Included in the Construction costs. Demolition to be determined</td>
<td>The KPLC and Contractor</td>
</tr>
<tr>
<td>Oil Spills</td>
<td>Record any leakages from Transformers. Record all accidental spills and number of litres</td>
<td>During Operation phase</td>
<td>Included in the Operating costs</td>
<td>The KPLC</td>
</tr>
<tr>
<td>Encroachment</td>
<td>Record any new settlements within the proximity of substation</td>
<td>Monthly during the first six Months from start of Construction and Quarterly for the first one year of operation then annually</td>
<td>Included in Operating Costs</td>
<td>The KPLC</td>
</tr>
<tr>
<td>Fire hazards</td>
<td>Record any Fire incidences and investigate on possible causes</td>
<td>Throughout project cycle</td>
<td>Included in contract and Operating costs</td>
<td>The Contractor and The KPLC</td>
</tr>
<tr>
<td>Occupational Health and Safety Issues</td>
<td>Record any accidents and Possible hazard scenarios</td>
<td>Throughout Project Cycle</td>
<td>Included in Contract and operating Costs</td>
<td>The Contractor and The KPLC</td>
</tr>
</tbody>
</table>

#### 11.7 Rehabilitation and Decommissioning Management Plan

The rehabilitation and decommissioning management plan include the following:
Planning for closure
a) The Proponent shall develop rehabilitation and decommissioning plan in conjunction with relevant stakeholders at least one year before the end of facility’s operations.
b) The Proponent shall investigate practical options for closure of the facility at least one year before decommissioning and submit a report to relevant authorities NEMA included.
c) The Proponent to explore options of re-use and recycling of the facility’s components/structures.

Decommissioning
a) The Proponent shall take into consideration the health and safety of personnel, contractors, neighbors and the public during the planning and implementation of the demolition process.
b) The Proponent shall undertake a further survey to identify any contaminated areas remediate them accordingly.

Post Closure
The Proponent shall ensure that the facility’s site is free of impacts associated with the abandonment/closure.

The Proponent shall develop, rollout and implement a monitoring plan that includes:
a) Monitoring of the rehabilitated site to confirm whether progress is satisfactory.
b) Outline of how land improvement and future land use will be affected by the past operation and decommissioning of the transmission line and its associated infrastructure.

Table 11-5: Environmental management/monitoring Plan for the decommissioning phase of 66/11kV substation Project

<table>
<thead>
<tr>
<th>Expected Impacts</th>
<th>Negative Impacts</th>
<th>Recommended Mitigation Measures</th>
<th>Responsible Party</th>
<th>Time Frame</th>
<th>Cost (Ksh)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2. All machinery, equipment, structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as possible or they be taken to a licensed waste disposal site</td>
<td>Project proponent &amp; Contractor</td>
<td>One-off</td>
<td>1,000,000</td>
</tr>
</tbody>
</table>

2. Rehabilitation of project site
<table>
<thead>
<tr>
<th>Expected Impacts</th>
<th>Negative Impacts</th>
<th>Recommended Mitigation Measures</th>
<th>Responsible Party</th>
<th>Time Frame</th>
<th>Cost (Ksh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetation disturbance</td>
<td>1. Vegetation disturbance</td>
<td>Implement an appropriate re-vegetation programme to restore the site to its original status</td>
<td>Project proponent &amp; Contractor</td>
<td>One-off</td>
<td>500,000</td>
</tr>
<tr>
<td></td>
<td>2. Vegetation disturbance</td>
<td>Consider use of indigenous plant species in re-vegetation</td>
<td>Project proponent &amp; Contractor</td>
<td>One-off</td>
<td>50,000</td>
</tr>
<tr>
<td></td>
<td>3. Vegetation disturbance</td>
<td>Trees should be planted at suitable locations so as to interrupt slight lines (screen planting), between the adjacent residential area and the development.</td>
<td>Project proponent &amp; Contractor</td>
<td>Once-off</td>
<td>50,000</td>
</tr>
</tbody>
</table>
12 Assumptions, Uncertainties Encountered and Gaps in Knowledge

12.1 Assumptions
The Experts made the following assumptions in preparing this ESIA

- All the technical data and information provided by the Proponent and the specialists are accurate and up-to-date
- The design features will be put in place to minimize risks from external factors which could threaten the integrity of the facility which include: risks from landslides and other natural calamities; measures to minimize threats or damage from third parties e.g. terrorist attack
- The public involvement process has been sufficiently effective in identifying the critical issues that needed to be addressed
- The Proponent and the Contractor will implement the measures in the proposed ESMP
- The Proponent will undertake monitoring to track the implementation of the ESMP to ensure that management measures are effective to avoid, minimize and mitigate impacts and that corrective action will be undertaken to address shortcomings and/or non-performances.

12.2 Uncertainty and Difficulties in Compiling Information
Uncertainty arises from a variety of aspects in any development, and for this particular study report has emanated from the following:

- The changes that may occur in baseline conditions, due to external factors over the lifetime of the project;
- Uncertainty related to Proponent’s policy initiatives that might influence the assessment of future baseline and post-development conditions;
- Uncertainty in design information which should be dealt with by the definition of design parameters for the development by the Contractor and Proponent; and
- Uncertainty in relation to project planning and implementation as the detailed program and means of construction may be influenced by the choice of Contractor and the detailed design of the development.

The difficulties in compiling the information for this study report have related principally to the above sources of uncertainty. To obviate these difficulties the lead Expert has used his past experience wherever possible and consultation with Proponents having similar projects to gauge and recommend appropriate mitigation measures in this study report.

12.3 Gaps in Knowledge
This study does not consider how the present global meltdown/ economic recession and donor funding may affect the construction and management of the proposed project.
13 Conclusions and Recommendations

13.1 Conclusions

The analysis of the ESIA has evidenced that the construction and operation of the proposed substation would have positive impacts to the Proponent and Kenyan society at large. The impacts will include Increase in reliable and sustainable clean energy, employment to local community members, increase in the national/local investment, increase in Government revenue, improvement of standards of living for Nairobi county residents. However, despite the outlined positive impacts, the proposed development will cause some negative impacts such as Noise Pollution, dust generation, Soil erosion, oil spills, solid waste generation, Occupational hazards among others.

An Environmental and Socio-economic Management Plan (E&SMP) outline has been developed to ensure sustainability of the project area activities from construction through operation to decommissioning. The plan provides a general outlay of the activities, associated impacts, mitigation action plans and appropriate monitorable indicators. Implementation timeframes and responsibilities are defined, and where practicable, the cost estimates for recommended measures are also provided.

A monitoring plan will be developed and highlights some of the environmental performance indicators that should be monitored. Monitoring creates possibilities to call to attention changes and problems in environmental quality. It involves the continuous or periodic review of operational and maintenance activities to determine the effectiveness of recommended mitigation measures. Consequently, trends in environmental degradation or improvement can be established, and previously unforeseen impacts can be identified or pre-empted.

From the findings of this study, the following conclusions are made:

- The impacts that will be adverse will be temporary during the construction phase and can be managed to acceptable levels with the implementation of the recommendation of the mitigation measures for the project
- The potential adverse impacts associated with the proposed project are possible to mitigate successfully. The impacts before implementation of mitigation measures are assessed as very low to medium low and the ratings are expected to improve further with the implementation of the proposed mitigation measures
- The project will be designed, constructed, and operated according to the acceptable industry norms and standards. Successful implementation of the proposed EMP will ensure environmental sustainability.
- The proposed project will generate socio-economic benefits which would not be realized if the no development option is considered.

The proposed project design has integrated mitigation measures with a view to ensuring compliance with all the applicable laws and procedures. The substation and associated structures will be installed to the required planning/architectural/structural designs and standards. During project implementation, operation and decommissioning stages sustainable environmental management (SEM) would be ensured; avoiding inadequate use of natural resources, conserving nature sensitively and guaranteeing a respectful and fair treatment of all people working on the project, general public at the vicinity and the expected beneficiaries of the project.
In relation to the proposed mitigation measures that will be incorporated during construction, operational and decommissioning phases; the development’s input to the society and environment; the project is considered beneficial and important.

### 13.2 Recommendations

It is quite evident from this study that the construction and operation of the proposed transmission line will bring positive effects in the project area including Reduction of environmental degradation, improved supply of electricity, creation of employment opportunities, gains in the local and national economy, provision of market for supply of building materials, Informal sectors benefits, Increase in national industrial production, Increase in revenue, Improvement in the quality of life for the workers and residents, Optimal use of land and Improved security.

However, although the project will bring various positive impacts, negative impacts will also be experienced hence the need to address and mitigate them.

It is strongly recommended that a concerted effort is made by the site management in particular, to implement the Environmental Management and Monitoring Plan provided herein. Following the commissioning of the project, statutory Environmental and Safety Audits must be carried out in compliance with the national legal requirements, and the environmental performance of the site operations should be evaluated against the recommended measures and targets laid out in this report.

Considering the proposed location, construction, management, mitigation and monitoring plan that will be put in place, the project is considered important, strategic and beneficial and may be allowed to proceed.

Recommendations for the prevention and mitigation of adverse impacts are as follows:

- All solid waste materials and debris resulting from construction of the substation must be disposed off at approved dumpsites.
- Construction activities must be undertaken only during the day i.e. between 0800 hours to 1800 hours. This will minimize disturbance to the general public within the proximity of the site/project.
- The proponent and contractor should follow the guidelines as set by relevant authorities to safeguard and envisage environmental management principles during installation, operation and decommissioning of the proposed 66/11kV substation.
- Maintenance activities for vehicles must be carried out in service bays and garages off site to reduce chances of oils or grease or other maintenance materials, from coming into contact with environment (water or soil).
- Once construction of substation is done, restoration of the worked areas should be carried out immediately by backfilling, landscaping/leveling and planting of low grass (in open areas) and suitable tree species.
- Ensure proper water usage during construction phases.
- Proper and regular maintenance of construction machinery and equipment will reduce emission of hazardous fumes and noise resulting from friction of rubbing metal bodies.
- Workers must be provided with complete protective and safety gear. They must have working boots, complete overalls, helmets, gloves, earmuffs, nose-masks, goggles etc.
- Fully equipped first aid kits must be provided within the site.
• Environmental Audits should be carried annually or as prescribed by the Authority during the operational phase and invitation of Inspectors and Experts from NEMA to ascertain compliance with the provided ESMP and set NEMA regulations and Standards.

Recommendation is for the implementation of this project to be supported at all levels and for KPLC adhere to all the proposed mitigation measures outlined in this study, the various relevant guidelines and legislation governing resettlement and compensation, sensitive ecosystems, labor force management, public and worker health and safety, management of hazardous and contaminating material and management of wastes.

Diligence on the part of the contractor and proper supervision by the proponent is crucial for mitigating the predicted impacts and ensuring structural strength, safety, and efficient operation of the project.

13.3 Authorization Opinion

In terms NEMA requirement the environmental practitioner is required to provide an opinion as to whether the activity should or should not be authorized. The expert is reticent to venture such an opinion since we are not an elected entity mandated to make decisions on behalf of society. Nevertheless, in this section a qualified opinion is ventured and in this regard the Lead expert believes that sufficient information is available for NEMA to take a decision. The fundamental decision is whether to allow development which brings socio-economic advantages and is consistent with planning and certain development and social responsibility and upliftment of policies, but which may impact on an area as a result of loss of biodiversity and increased avifaunal impacts. If NEMA authorizes the proposed substation development, NEMA must also decide whether all the components of the applicant’s preferred alternatives are acceptable. The Lead Expert believes that the EIA studies have shown that the applicant’s preferred alternative and technological alternatives are generally acceptable. The EIA has also assisted in the identification of essential mitigation measures that will mitigate the impacts associated with these components to within acceptable limits.

In conclusion, the expert is of the opinion that on purely ‘environmental’ grounds (i.e. the project’s potential socio-economic and biophysical implications) the application as it is currently articulated in the applicant’s proposal should be approved provided the essential mitigation measures are implemented. It is in the opinion of the Environmental Consultant that the anticipated negative impacts can readily and effectively be mitigated and on the whole the proposed project does not pose any significant threat to the Environment and may be licensed to proceed.
REFERENCES
The following list of references was referred to in preparing this Project Report:

- Environmental Assessment Source Book, 1999 (World Bank),
- George, C. and Lee, N., 2000 Environmental Assessment in Developing and Transitional Countries, Willey: Chichster, UK
- Government of Kenya (GoK), Building code, Building order 1968 and Grade 11 Building Order 1968
- Government of Kenya: Medical Examination Rules 2005
- British Standard (BS) 8233:1999: Sound Insulation and Noise Reduction for Buildings
- British Standard (BS) 5228 Part 1, 1997: Noise and Vibration Control on Construction and Open Sites
- British Standard (BS) 5228 Part 4, 1997: Noise Control on Construction and Open Sites: Code of Practice for Noise and Vibration Control applicable to piling operations
- The Way Leaves Act, Cap. 292,
- The Survey Act, Cap. 299,
ANNEXES

Annex 1: Proposed substation Site location Map
Annex 2: General 66/11 kV Substation Design and Layout Map
Annex 3: Technical Specifications and Layout plan for the 66/11 kV Substation
## ANNEX 4: Kenya power electrical components for Villa Franca 66/11kV Substation

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Code</th>
<th>Unit</th>
<th>Qty</th>
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<td></td>
<td>VILLA FRANCA SUBSTATION, 2 X 23 MVA, 66/11 KV</td>
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<td></td>
<td></td>
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<td>VFR - 001</td>
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<td>VFR - 002</td>
<td>66 kV Circuit Breaker</td>
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<td>VFR - 007</td>
<td>66 kV Bay and Busbar Material</td>
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<td>Steel Structures for support</td>
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<td>VFR - 009</td>
<td>66 kV Surge Arresters</td>
<td>pc</td>
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<td>VFR - 010</td>
<td>66 kV Transformer Protection Panel</td>
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<td>66 kV Control Panel</td>
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<td>11 kV Neutral Link</td>
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<td>VFR-018a</td>
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<td>VFR - 021</td>
<td>Control and measuring cables</td>
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<td></td>
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<td>VFR - 022</td>
<td>Auxiliary AC supply</td>
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<td></td>
</tr>
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<td>VFR - 023</td>
<td>DC supply System</td>
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<td>Earthing system</td>
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<tr>
<td>VFR - 026</td>
<td>Switchyard Lighting System</td>
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<tr>
<td>VFR - 027</td>
<td>MV Power Cables between indoor switchgear and line termination tower</td>
<td>metres</td>
<td>2,000</td>
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</table>
Annex 5: Photo Plate

Upcoming and existing industries and go-downs within the vicinity of the proposed site

Section of the wall church wall

Section of the plot with open space with grass

Section of the plot facing ICC church tents

Upcoming residential houses in Imara Daina Est.
Section of plot facing Mombasa road
Section of plot facing RAMCO group of Co.s
Sections of the plot with some acacia and star grass
Some concrete poles kept on site
Access road to the proposed site
Annex 6: Title Deed

REPUBLIC OF KENYA

THE REGISTRATION OF TITLES ACT
(Chapter 281)

GRANT: NUMBER L.R. 6383P
ANNUAL RENT: SHS. 260,000/-
TERM: 99 YEARS FROM 1.9.1994

KNOW ALL MEN BY THESE PRESENTS that in consideration of the sum of Shillings One Million three hundred thousand (Shs. 1,300,000/-) by way of stand premium paid on or before the execution hereof THE PRESIDENT OF THE REPUBLIC OF KENYA hereby

GRANTS unto EEL'S ESTATES LIMITED, a limited liability company having its registered office at Nairobi (Post Office Box Number 44695)

herein-after called the "Grantee"

ALL that piece of land situated in the City of Nairobi in the Nairobi District containing by measurement three decimal eight hundred five (3.805) hectares thereof or thereabouts that is to say L.R. No. 209/12119

which said piece of land with the dimensions abovatals and boundaries thereof is delineated on the plan annexed hereto and more particularly on Land Survey Plan Number 191049 deposited in the Survey Records Office at Nairobi

TO HOLD

for the term of Ninety Nine (99) years from the first day of September One thousand nine hundred and Ninety four SUBJECT to (a) the payment in advance on the first day of January in each year of the annual rent of Shillings two hundred sixty thousand (Shs. 260,000/-) (REVISABLE)

(b) the provisions of the Government Lands Act (Chapter 280) and (c) the following Special Conditions (namely):

[Signatures]
Annex 7: Change of use from light industrial to electrical substation

FORM P.P.A. 2
THE PHYSICAL PLANNING ACT (NO. 6 OF 1995) [S.33(1)(a)]

OUR REF: CPD/PIS/00379/200/12119/JWG/jan APPLICATION REG. NO. PPAZ.

NOTIFICATION OF APPROVAL OF DEVELOPMENT PERMITION

1. Subdivision
2. Subdivision & Amalgamation
3. Amalgamation
4. Change of use from Light Industrial to Electrical Sub-station
5. Extension
6. Extension of tenure

To

Mairura Omwenga
P.O. Box 15692-00100
NAYROBI

Your application, numbered as above, submitted on 21/7/2011
Seeking permission for Change of use on L.R. No. 200/12119
Situate in 

Was approved by the Town Planning Committee held on 18/8/2011

Under item Subject to the following appended conditions:

11. Submission of satisfactory building plans within one year and
construction commencement within two years otherwise the approval lapses.

11(1) Payment of revised ground rent as will be determined by the CITY OF NAIROBI CITY COUNCIL.

11(2) Payment of revised ground rent as will be determined by the Commissioner of Lands.

11(3) Subject to the plot not constituting part of the disputed public private utility/land allocations.

11(4) Subject to compliance with Sections 38, 41 and 82 of the Physical Planning Act.

11(5) Subject to compliance with the approved zoning policy (density, skyline, character andamenity of the area).

11(6) Subject to provision of adequate and functional car and parking
in the satisfaction of the City Engineer.

11(7) Subject to provision of appropriate setbacks as per the rezoning plan.

11(8) Subject to no direct access from Membara Road.

Date 2/9/2011 Signed

Name: ______________________

For: Director
City Planning & Architecture Department

cc The Director of Physical Planning, Nairobi
The Commissioner of Lands, Nairobi
The Director of Surveys, Nairobi
The Land Registrar
Annex 8: Lead Experts NEMA Certificate and Practicing License

FORM 7

Application Reference: A734

FOR OFFICIAL USE

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY (NEMA)

THE ENVIRONMENTAL MANAGEMENT AND COORDINATION ACT

ENvironmental Impact Assessment / AuDIT (EIA / EA) PRACTICING License

M/S WILFRED K. KOECH

Address: P.O BOX 35943-00200

NAIROBI

is licensed to practice in the capacity of a (Lead Expert / Associate Expert / Firm of Experts)

LEAD

in accordance with the provisions of the Environmental Management and Coordination Act, 1999

Dated this 08TH Day of FEBRUARY 13

Signature

(Seal)

Director General

The National Environment Management Authority

CONDITIONS OF LICENSE

1. This license expires on 31st December of the year it is issued.
2. The expert shall comply with the code of practice and professional Ethics for EIA/EA experts.
3. The expert shall comply with the attached conditions.
FORM 5

THE ENVIRONMENTAL MANAGEMENT AND COORDINATION ACT
CERTIFICATE OF REGISTRATION AS AN ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT EXPERT

This is to certify M/s .... WILFRED KIPKEMOI KOECH ........................................................
of ................................ R.O. BOX 6968 .. 30100, ELDOROT ........................................ (Address)
has been registered as an Environmental Impact Assessment Expert in accordance with the provisions of the Environmental Management and Coordination Act and is authorised to practice in the capacity of a Lead Expert/Associate Expert/Firm of Experts (Type) ........ LEAD EXPERT

Dated this 16th APRIL 10 Day of 20......

Signature .........

(Seal)

Director General
The National Environment Management Authority
Annex 9: Samples of Filled Public and stakeholders Questionnaires

ENVIRONMENTAL IMPACT ASSESSMENT

Public Consultation Questionnaire for Proposed Villa Franca/AA 66/11 kV Substation

The Kenya Power and Lighting Company Limited intend to construct a 66/11 kV Substation in its Plot off Mombasa road Located next to International Christian Centre. The objective of the project is to reinforce and improve quality and reliability of power supply within Embakasi and its environs.

Please respond to the following questions in relation to the proposed project.

1. What benefits do you expect from the construction and operation of the proposed 66/11kv substation.  
   
2. What Negative Environmental Impacts do you expect from the proposed project?  
   
3. What actions should be taken to minimize /reduce the above negative impacts?  
   
4. Do you think the project is beneficial if all precautions are taken? Yes/No  
   
5. If No Give your Comments  
   
6. Do you support the proposed project? Yes/No (Tick as appropriate)

If no give reasons.  

Name of Respondent.  

ID. Number:  

Location:  

Signature:  

Telephone No.  

Date  

---

Environmental Impact Assessment Project Report Page 132
Public Consultation Questionnaire for Proposed Villa Franca/AA 66/11 kV Substation

The Kenya Power and Lighting Company Limited intend to construct a 66/11 kV Substation in its Plot off Mombasa road Located next to International Christian Centre. The objective of the project is to reinforce and improve quality and reliability of power supply within Embakasi and its environs.

Please respond to the following questions in relation to the proposed project.

1. What benefits do you expect from the construction and operation of the proposed 66/11kV substation?

2. What Negative Environmental Impacts do you expect from the proposed project?

3. What actions should be taken to minimize/reduce the above negative impacts?

4. Do you think the project is beneficial if all precautions are taken? Yes/No

5. If No Give your Comments

6. Do you support the proposed project? Yes/No (Tick as appropriate)

If no give reasons

Name of Respondent

ID. Number

Location

Signature

Telephone No.

Date
ENVIRONMENTAL IMPACT ASSESSMENT

Public Consultation Questionnaire for Proposed Villa Franca/AA 66/11 kV Substation

The Kenya Power and Lighting Company Limited intend to construct a 66/11 kV Substation in its Plot off Mombasa road Located next to International Christian Centre. The objective of the project is to reinforce and improve quality and reliability of power supply within Embakasi and its environs.

Please respond to the following questions in relation to the proposed project.

1. What benefits do you expect from the construction and operation of the proposed 66/11 substation?

   Noise reduction and blackouts

2. What Negative Environmental Impacts do you expect from the proposed project?

   Noise and dust during the process

3. What actions should be taken to minimize/reduce the above negative impacts?

   Spray water to reduce dust

4. Do you think the project is beneficial if all precautions are taken? Yes / No

5. If No Give your Comments

6. Do you support the proposed project? Yes / No (Tick as appropriate)

If no give reasons

Name of Respondent: ABENDENG NTHEU MASEKE

ID. Number: 2-347769

Location: AIRPORT VIEW TOTAL STATION

Signature

Telephone No.

Date 13.02.13

DAYBREAK LTD.
AIRPORT VIEW TOTAL STATION
R. O. Box 15383 - 00100 NAIROBI
TEL: 623971
ENVIRONMENTAL IMPACT ASSESSMENT

Public Consultation Questionnaire for Proposed Villa Franca/AA 66/11 kV Substation

The Kenya Power and Lighting Company Limited intend to construct a 66/11 kV Substation in its Plot off Mombasa road. Located next to International Christian Centre. The objective of the project is to reinforce and improve quality and reliability of power supply within Embakasi and its environs.

Please respond to the following questions in relation to the proposed project.

1. What benefits do you expect from the construction and operation of the proposed 66/11 substation?

2. What Negative Environmental Impacts do you expect from the proposed project?

3. What actions should be taken to minimize /reduce the above negative impacts?

4. Do you think the project is beneficial if all precautions are taken? Yes—- No——

5. If No Give your Comments

6. Do you support the proposed project? Yes ———/No——— (Tick as appropriate)

If no give reasons

Name of Respondent: _______________________________ Signature: _______________________________

ID. Number: _______________________________ Telephone No. _______________________________

Location: _______________________________ Date: _______________________________

Very much.

GENERAL MOTORS EAST AFRICA LTD.
P. O. BOX 30527, 00100 NAIROBI
Kenya Power

ENVIRONMENTAL IMPACT ASSESSMENT

Public Consultation Questionnaire for Proposed Villa Franca/AA 66/11 kV Substation

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Please respond to the following questions in relation to the proposed project.

1. What benefits do you expect from the construction and operation of the proposed 66/11 substation?

2. What Negative Environmental Impacts do you expect from the proposed project?

3. What actions should be taken to minimize /reduce the above negative impacts?

4. Do you think the project is beneficial if all precautions are taken? Yes-- / No--

5. If No Give your Comments

6. Do you support the proposed project? Yes / No (Tick as appropriate)

If no give reasons

Name of Respondent: 
ID. Number:
Location:
Signature:
Telephone No.:
Date:

Environmental Impact Assessment Project Report  Page 136
ENVIRONMENTAL IMPACT ASSESSMENT

Public Consultation Questionnaire for Proposed Villa Franca/AA 66/11 kV Substation

The Kenya Power and Lighting Company Limited intend to construct a 66/11 kV Substation in its Plot off Mombasa road Located next to International Christian Centre. The objective of the project is to reinforce and improve quality and reliability of power supply within Embakasi and its environs.

Please respond to the following questions in relation to the proposed project.

1. What benefits do you expect from the construction and operation of the proposed 66/11kv substation? Please indicate if it will improve power supply.

2. What Negative Environmental Impacts do you expect from the proposed project?

3. What actions should be taken to minimize /reduce the above negative impacts?

4. Do you think the project is beneficial if all precautions are taken? Yes ☐ No ☐

5. If No Give your Comments ____________________________

6. Do you support the proposed project? Yes ☑/No ☐ (Tick as appropriate)

If no give reasons ____________________________

Name of Respondent: ____________________________

ID. Number: ____________________________

Location: ____________________________

Signature ____________________________

Telephone No. ____________________________

Date ____________________________

1 | Page
Proposed Villa Franca 66/11 kV Substation in Nairobi

ENVIRONMENTAL IMPACT ASSESSMENT

Public Consultation Questionnaire for Proposed Villa Franca/AA 66/11 kV Substation

The Kenya Power and Lighting Company Limited intend to construct a 66/11 kV Substation in its Plot off Mombasa road Located next to International Christian Centre. The objective of the project is to reinforce and improve quality and reliability of power supply within Embakasi and its environs.

Please respond to the following questions in relation to the proposed project.

1. What benefits do you expect from the construction and operation of the proposed 66/11 kV Substation?
   - Rapid restoration of power in case of blackouts
   - Efficient emergency response in case of fire alarms
   - Consistent and reliable supply of power

2. What Negative Environmental Impacts do you expect from the proposed project?
   N/A

3. What actions should be taken to minimize/reduce the above negative impacts?
   N/A

4. Do you think the project is beneficial if all precautions are taken? Yes/ No
   Yes

5. If No Give your Comments
   ..................................................

6. Do you support the proposed project? Yes ....../No...... (Tick as appropriate)

If no give reasons

Name of Respondent: ERIK KIARA
ID. Number: 0738-008212
Location: MOMBASA ROAD

Signature: ...........................................
Telephone No. ...................................
Date: 13 FEB 2013
ENVIRONMENTAL IMPACT ASSESSMENT

Public Consultation Questionnaire for Proposed Villa Franca/AA 66/11 kV Substation

The Kenya Power and Lighting Company Limited intend to construct a 66/11 kV Substation in its Plot off Mombasa road Located next to International Christian Centre. The objective of the project is to reinforce and improve quality and reliability of power supply within Embakasi and its environs.

Please respond to the following questions in relation to the proposed project.

1. What benefits do you expect from the construction and operation of the proposed 66/11kv substation?
   - Consistent Power Supply
   - Improved Security

2. What Negative Environmental Impacts do you expect from the proposed project?

3. What actions should be taken to minimize/reduce the above negative impacts?
   - Minimize reduction/loss of Material
   - Improve Landscape and Vegetation

4. Do you think the project is beneficial if all precautions are taken? Yes ☑ No ______

5. If No Give your Comments ______________________________________________________________________

6. Do you support the proposed project? Yes ☑ /No...... (Tick as appropriate)

If no give reasons __________________________________________________________

Name of Respondent ____________________________ Signature ____________________________

ID. Number: ____________________________ Telephone No. ____________________________

Location: ____________________________ Date ____________________________
ENVIRONMENTAL IMPACT ASSESSMENT

Public Consultation Questionnaire for Proposed Villa Franca/AA 66/11 kV Substation

The Kenya Power and Lighting Company Limited intend to construct a 66/11 kV Substation in its Plot off Mombasa road Located next to International Christian Centre. The objective of the project is to reinforce and improve quality and reliability of power supply within Embakasi and its environs.

Please respond to the following questions in relation to the proposed project.

1. What benefits do you expect from the construction and operation of the proposed 66/11kv substation?

2. What Negative Environmental Impacts do you expect from the proposed project?

3. What actions should be taken to minimize /reduce the above negative impacts?

4. Do you think the project is beneficial if all precautions are taken? Yes       No

5. If No Give your Comments

6. Do you support the proposed project? Yes       /No       (Tick as appropriate)

If no give reasons

Name of Respondent

Signature

ID. Number

Telephone No.

Location

Date
Kenya Power

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Please respond to the following questions in relation to the proposed project.

1. What benefits do you expect from the construction and operation of the proposed 66/11kv substation?
   - Reliable power delivery
   - Reduced maintenance

2. What Negative Environmental Impacts do you expect from the proposed project?
   - Noise
   - Reduced beauty

3. What actions should be taken to minimize /reduce the above negative impacts?
   - Fencing of the boundary wall

4. Do you think the project is beneficial if all precautions are taken? Yes / No
   - Yes

5. If No Give your Comments
   - 

6. Do you support the proposed project? Yes / No
   - Yes
   - (Tick as appropriate)

If no give reasons.

Name of Respondent

ID. Number

Location

Signature

Telephone No.

Date
Proposed Villa Franca 66/11 kV Substation in Nairobi

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Name of Respondent: ________________________

Signature: ________________________

ID. Number: ________________________

Telephone No.: ________________________

Location: ________________________

Date: ________________________