

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY REPORT

Proposed 20m³ LPG Storage and Filling Plant on LR No. 27/Mwihoti/Githurai, Roysambu Sub-county, Nairobi County



PROPONENT

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FEBRUARY 2018

Certification

OikosVeritas Services was commissioned by Ameken Minewest Company Limited to undertake Environmental and Social Impact Assessment for the proposed installation of 20 cubic metres LPG storage and filling plant on plot LR. No. 27/Mwihoti/Githurai, Roysambu Sub-county, Nairobi County. The Report has been prepared in accordance with the Environmental Management and Coordination Act no. 8 of 1999 and The Environmental (Impact Assessment and Audit) Regulations, 2003 for submission to the National Environmental Management Authority (NEMA).

OikosVeritas Services submits this Environmental and Social Impact Assessment Report, to NEMA Kenya. To the best of our knowledge, all the information in this report is true and correct.

Proponent: Ameken Minewest Company Limited

Name of Officer

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Designation

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Signature / Official Stamp

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Acronyms and Abbreviations

BS	British Standard
dB(A)	Decibels on the A-Scale
EA	Environment Audit
EHS	Environment, Health & Safety
API	American Petroleum Institute
EIA	Environment Impact Assessment
EMCA	Environmental Management and Coordination Act
CEMP	Construction Environment Management Plan
ESM	Environmentally Sound Management
LPG	Liquefied Petroleum Gas
MSDS:	Material Safety Data Sheet
ESD	Emergency shutdown Device system
NEMA	National Environment Management Authority
NFPA	National Fire Protection Association – USA
FH	Fire hydrant
OSHA	Occupational Health and Safety
DHP	Designated Health Practitioner
HSEQ:	Health Safety Environment and Quality
TOR	Terms of Reference

Acknowledgements

We extend our special thanks to the management of Ameken Minewest Company Limited (the Proponent) for contracting OikosVeritas Services (ESIA/EA firm of experts) under leadership of Mr. Alfred O. Ochieng (ESIA/EA Lead Expert) to undertake and prepare this EISA study Report for their proposed installation of Liquefied Petroleum Gas storage and filling plant of 20 cubic meters on LR No. 27/Mwihoti/Githurai, Roysambu Sub-County, Nairobi County. We thank Mr. Lamuel and Mr. Evans for their valuable support during the study. Special thanks go to Githurai Location Chief, Mr. Romano K. Mikubu for his support during the study including mobilization of stakeholders for consultative meetings associated with this project. We further register our gratitude to the various stakeholders (too many to mention individually) consulted during public stakeholder consultation for their invaluable contribution, support and cooperation. Their input contributed enormously towards successful completion of this EIA study report.

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KRA PIN Certificate
Tax Compliance Certificate
Copy of Land documents (certificate of lease/title deed)
Copy Change of land user clearance from free-hold to light commercial
Copy of Architectural Plans and drawings
Copy DOSH – Certificate of registration of workplace
Copy of fire clearance certificate from Nairobi City County
Copy of letters and references from landowners and administrators in the area
Copies of public participation questionnaires
Copy of practicing licenses – Firm of experts and lead expert

Executive Summary

Ameken Minewest Company Limited (proponent) proposes to install a 20 cubic metres of LPG storage and filling plant on plot on LR No. 27/Mwihoti/Githurai, Roysambu Sub-County, Nairobi County with the main purpose of providing more LPG stock for sale. The ESIA study report was done by registered and licensed NEMA ESIA Expert (Alfred O. Ochieng, No. 6429) in accordance with Legal Notice (L.N.) 101: Environment (Impact Assessment and Audit) Regulations 2003 promulgated under the Environment Management and Coordination CAP 387. The proposed project is also expected to comply with the energy act and its subsidiary legislations. The proposed development activities will mainly involve civil, mechanical and electrical works associated with the installation of the LPG tank and filling point and thereafter operations of the facility. The main activities to be carried out in the development of the proposed project include excavations or earth works, installation of the tank and pump and pipe works. The proposed project is expected to start immediately this Study Report is approved by NEMA and EIA Licence is issued to the Proponent.

The project site is located in an agricultural land whose change of user from agricultural land to light commercial has been effected. The neighbourhood is characterized by small scale farming and residential, and is services by feeder roads from Thika Superhighway.

Project Objective

The proposed project aims to increase the availability of LPG to Githurai and surrounding areas in a bid to support Nairobi County and national government initiatives on use of clean fuel.

Project Description

Technical Description

The proposed project includes the:

- Installation of one (1) tank of 20 cubic metres LPG
- Construction of a cylinder filling isle;
- Pipe works LPG jetty
- Paint works
- Fire hydrant station
- Construction of an office

The proposed project will be designed, constructed, and operated in conformance with applicable national and international EHS guidelines and standards. Regarding safety at the facility the proponent will put in place all mechanisms, processes and procedures to

eliminate mitigate or control identified risks and promotes continuous improvement. Further to this the proponent will apply HSEQ considerations in all planning, decision making, processes and practices. Various measures have also been put in place to prevent leakages which include an electronic check scale and manual leak detector. An emergency shutdown system will also be installed to improve the safety situation at the facility. A hazardous operability study (HAZOP) will be carried out during the design phase of the facility to incorporate health, safety and environmental considerations.

Construction Phase

LPG tanks will be installed at the proposed site as per the architectural designs and layouts. Most raw materials and fittings required for the LPG facility will be sourced from Nairobi and locally. Construction activities are expected to generate noise levels to a limit of 85 decibels and other safety hazards.

Operational Phase

- A fire protection system will be provided. It will by means of two (2) Fire hydrant strategic points and 4 units of 250 metres cubic each of water storage tanks. The facility will be hooked to the existing electricity supply line of KP&LC while sewerage and liquid wastes will be channelled to the Nairobi Water and Sewer System. Other wastes shall be managed in accordance with the Environmental Management and Coordination (Waste Management) Regulations of 2006.
- Job opportunities will be generated through the operation of the LPG station. Skilled and unskilled labor will be required in technical fields as in operations and management. Local people will be employed wherever possible.
- Noise levels will be kept to a minimum by designing the facility according to the requirements of Kenyan legislation - The Environmental Management And Coordination (Noise And Excessive Vibration Pollution (Control) Regulations, 2009 and ISO: 15664:2001.
- Available data on air quality of the site indicate that the concentration of particulate matter, sulphur dioxide and nitrogen dioxide in air are generally within guideline limits stipulated under the Draft EMC (Air Quality Standards) Regulations, 2008.

- An environmental management plan has been prepared which describes the environmental protection strategies that will be employed at the site. The EMP contains the management programmes and plans for handling the adverse environmental impacts.
- The potential health and safety impacts of the proposed project include the occupational health and safety risks related to the project activities; risks to the public as a result of events of major disasters such as fire outbreaks and explosions. A number of activities anticipated to be undertaken during development of the proposed project have potential risks to health and safety of the workers. During the construction phase, the potential H&S risks the workers are likely to be exposed to include: Injuries resulting from falling from LPG tanks installation; Injuries resulting from operation of machinery, equipment, tools and construction vehicle, Exposure to diseases, including, typhoid etc. and road accidents.
- The potential occupational health and safety impacts during operation phase include injuries to workers from, routine monitoring and maintenance and deaths and injuries from major disasters e.g. explosions and fire outbreaks. During the operation phase, the workers may come in contact with liquid LPG and suffer from severe cold burns whereas during decommissioning, the potential H&S risks include injuries occasioned by dismantling of the facility. The proposed project could be of great public concern especially in the event of a major disaster such as explosions and fire outbreaks. Liquefied Petroleum Gas is a highly flammable product and can be detrimental to the public safety if measures are not put in place. The impact significance related to public safety is likely to be high during operation phase of the project.

Anticipated impacts and mitigation measures

Summary of anticipated impacts and proposed mitigations measures

Possible impact	Mitigation
Vegetation disturbance	<ul style="list-style-type: none"> • Only cut trees within the exact area of development • Restore cleared sites with vegetation upon completion of construction.
Dust and exhaust emissions	<ul style="list-style-type: none"> • Avoid excavation in extremely dry weather • Sprinkle water on open grounds to minimise dust emissions • Minimise idling of vehicle engines/avoid making unnecessary trips
Noise pollution	<ul style="list-style-type: none"> • Provide workers with noise safety equipment such as ear muffs • Use equipment that are quieter during construction
Oil spillage and gas	<ul style="list-style-type: none"> • Liaise with licensed waste oil handlers to manage oil spills

leakages	<ul style="list-style-type: none"> Carry out regular waste water analysis from the site during audits. Undertake regular inspection of LPG tank and other vessels
Fire risks	<ul style="list-style-type: none"> Install adequate fire fighting equipment with regular maintenance Install OF ESDs devices at the facility Train all workers in Fire safety procedures Engage fire auditors to undertake regular fire audits at the facility
Solid waste	<ul style="list-style-type: none"> Use only NEMA approved waste handlers for waste disposal Encourage use of recyclable materials at the facility Install adequate waste collection bins for different waste categories
Storm water run-off	<ul style="list-style-type: none"> Construct sediment traps to retain water Plant vegetation/grass at the facility to act as buffers Undertake cabro-paving of the entire facility grounds Construct and maintain storm water drains
High demand for water and raw materials	<ul style="list-style-type: none"> Install water conservation pipes Sensitize staff to conserve water Adopt rain water harvesting technology to supplement water Install adequate water storage tanks Source from local suppliers, accurate budgeting
Workers accidents& hazards	<ul style="list-style-type: none"> Workers to put on PPEs Undertake regular awareness/sensitization of staff on safety

Environmental management and impact mitigation

This report presents an environmental management plan which covers on the measures for mitigating the adverse potential environmental impacts of the proposed project. The EMP includes programmes and plans for addressing the adverse environmental impacts at different phases of the project. The proposed management programmes shall include:

- Air quality management programme
- Noise management programme
- Construction management plan;
- Construction control plan;
- Workplace health and safety plan;
- Community health and safety plan;
- Emergency management and response plan

The proposed programs 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.

Analysis of alternatives

Several alternatives for the proposed project were evaluated. The alternatives considered include: Location, process/activity/operation, layout, input, and no-go option. On the basis of these considerations, the proposed project satisfies the overall economic, technical, environmental and safety criteria used.

Public consultation

Public stakeholder consultation was undertaken in order to obtain the views and concerns of the stakeholders regarding the proposed project. The stakeholders perceived that the project will not generate adverse environmental impacts. Some of the pertinent issues which were raised have been addressed in the environmental management plan.

Conclusion and recommendations

- The project, including the construction and operation of the LPG tank and cylinder filling station is anticipated to provide sufficient stock of LPG. 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. In particular, the LPG facility will be designed, constructed and operated according to the latest industry norms and standards.
- Programs and plans developed and implemented through the EMP shall need to be monitored and regularly audited to ensure compliance.
- The mitigation measures proposed in this report should be included in the tender contract and tender documents so that the contractor who will be selected for the project will be bound to implement them.

Chapter 1: Introduction

1.1. Introduction

Ameken Minewest Company Limited (the proponent) is an upcoming LPG dealer in Kenya, which is hereinafter referred to as Proponent, incorporated under the Companies Act (Cap. 486) (Annex 1). It is proposing to install 20 metres cubic of LPG storage and filling plant at Githurai Area, Roysambu Sub-County, Nairobi County. The Legal Notice No. 101 of 2003 (EIA/EA Regulations, 2003) requires the Proponent to prepare EIA Study Report for approval by National Environment Management Authority (NEMA) prior to commencement of a new development. As such, Ameken Minewest Company Limited engaged OikosVeritas Services (EIA/EA firm of experts) under leadership of Mr. Alfred O. Ochieng (Lead ESIA/EA Expert) to undertake environmental impact assessment study for the proposed project. Copies of documents relating to the said piece of land including

The proposed LPG storage and filling plant on plot number LR 27/Mwihoti/Githurai will be designed to provide bulk LPG gas to Githurai and surrounding areas. The proposed facility is within an agricultural land with few neighboring settlements. The area is not categorized as ecologically sensitive. The proposed plant will include putting up LPG storage tank, LPG filling isle, staff offices, a parking lot and other supporting amenities such as sanitation systems. The plant is located within a one (1) acre plot with good road access. The proponent (Ameken Minewest Company Limited) shall strive to maintain the area as pristine as possible and comply with all the laws and regulations for the operation of such facilities.

1.2. Terms of Reference (TOR) for the EIA Process

The proposed installation of 20 cubic metres cubic of LPG storage and filling plant at Mwihoti Area of Githurai, Nairobi County by Ameken Minewest Company Limited (the proponent) will be done in accordance with the (EIA/EA Regulations, 2003) that requires the Proponent to prepare EIA Study Report for approval by National Environment Management Authority (NEMA) prior to commencement of a new development. The key objective is to mitigate conflicts with the environment at the vicinity; during implementation, operational and decommissioning phases. In addition, it is now mandatory for the proponents of such projects to carry out environmental impact Assessments (EIAs), to enhance sustainable environmental management (SEM) as well as controlling and revitalizing the much-degraded environment.

1.3. Objectives and scope of ESIA

The Proponent is seeking to meet the growing demand of LPG consumers in Githurai area and the surrounding environs. The LPG filling plant will involve cylinders of 6kgs, 13 kgs, 40kgs sizes and bulk supply to retailers. The proposed 20 cubic metres LPG storage and filling will ensure the sufficient availability and accessibility of LPG.

The main objective of the ESIA study was to ensure the proposed development takes into consideration appropriate measures to mitigate any adverse impacts to the environment. The study was to identify existing and potential environmental impacts and possible concerns that interested and/or affected parties could have with the development, as well as the associated prevention and mitigation measures for the negative impacts to be outlined in the Environmental Management Plan (EMP) as part of this study.

The firm of experts on behalf of the proponent conducted the EIA study by incorporating all elements necessary for the scope of the study including:-

- The description of the proposed location including baseline information
- A concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project.
- The technology, procedures and processes to be used, in the project.
- The materials to be used in the construction and implementation of the project.
- Project description and layout plan. The location, size of land, leases and project site. Architectural designs for the overall project, piping, LPG storage tanks, filling station, hydrants stations and offices.
- A description of the potentially affected environment. Geological, hydrology, climate, and vegetation types, biological environment and demographic patterns and attitudes towards proposed project. Historical importance of the area.
- The environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated.
- To recommend a specific environmentally sound and affordable wastewater management system.
- Provide alternative technologies and processes available and reasons for preferring the chosen technology and processes.
- Analysis of alternatives including project site, design and technologies.

- 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 cause of carrying out development activities.
- Propose measures to prevent health hazards and to ensure security in the working environment for the employees, residents and for the management in case of emergencies.
- An identification of gaps in knowledge and uncertainties encountered in compiling the information.
- An economic and social analysis of the project.
- Such other matters as the Authority may require.

1.4. Study Methodology

The ESIA expert undertook relevant environmental screening and scoping to avoid unnecessary data and streamline the study according to the ToR. The Expert employed various approaches in collecting data and information for purposes of assessing the impacts of the proposed project. The data collection was carried out through questionnaires/standard interview schedules, use of checklists, observations and photography, site visits and desktop studies, where necessary in the manner specified in Part V (section 31-41) of the Environmental (Impact Assessment and Audit) Regulations, 2003. The following techniques were used:

1.4.1. Review of secondary data

A wide range of environmental and socio-economic data was sought to describe the baseline conditions at the project area. These included socio-economic, physical and environmental data and reports from government departments and on-line sources.

1.4.2. Interviews

Interviews were conducted during public stakeholder consultation exercises in order to obtain the views and concerns of the interested parties as regard to the proposed project. A semi structured interview checklist was used to capture the responses of the stakeholders. The structured questionnaires covering relevant aspects or issues related to the proposed project were administered by a team of trained enumerators in and around the project site.

1.4.3. Public meetings and barazas

The expert convened meetings with the area local chief, community elders and members of the public and obtain views and concerns of the public in regards to the proposed LPG storage and filling plant. The participants' views were to enable prediction of possible positive and negative impacts of the project to the natural and human environments. The public meetings were also used to highlight opinions of how negative impacts on the natural and human environments could be mitigated. The questionnaires, public meetings attendance list and meeting minutes are annexed to this report.

1.4.4. Baseline environmental survey

Baseline environmental survey is important in ESIA study as it enables proper understanding of the existing environmental conditions, and helps gauge the possible impacts of any proposed project in altering the existing conditions. The baseline surveys were undertaken during the study comprised of both primary data collection from field visits and secondary data of the area gathered from previous studies and reports.

1.4.5. Assessment of project impacts

The first stage of impact assessment was identification of environmental activities, aspects and impacts (negative and positive). The significance of the impacts was then assessed by rating each variable numerically. The purpose of the rating was to develop a clear understanding of influences and processes associated with each impact. The severity, spatial scope and duration of the impact together comprised the consequence of the impact and when summed can obtained a value. The frequency of the activity and impact together comprised the likelihood of the impact occurring. The values for likelihood and consequence of the impact were represented in values a rating matrix to determine whether mitigation was necessary or not.

1.5. Purpose of the Report

This report has been prepared in accordance with the EIA/EA Regulations, 2003 and environmental management and coordination act Cap 387. It presents detailed account of the project including legal/regulatory frameworks, identified impacts and the proposed mitigation measures, views and opinions from stakeholders regarding the project, analysis of alternatives and environmental management plan (EMP) among other key elements.

Chapter 2: Project description

2.1. Proposed project location

The proposed project will be developed on Plot No L.R. No. 27/Mwihoti/Githurai within Roysambu Sub-County of Nairobi County. The proponent has a lease agreement with the proprietor (lease agreement annexed). Geographically, the site is located on 1°12'19"S, 36°54'36"E, and is well served by a motorable road network and other support amenities – water and electricity.

2.2. The proposed project description

- (i) The proposed project will have one Liquefied Petroleum Gas above ground tank of 20 cubic metres, a filling station and perimeter fencing, hydrant location, jetty, piping and office. The project will occupy an area of approximately 0.4Ha. The main tasks in the setting up of the plant shall include among others: excavations, construction of a LPG tanks foundation storage for one 20 cubic metres capacity, construction of filling station, casting a reinforced concrete slab for LPG pump, LPG piping systems works, tankers loading and off loading stations, painting work, purge air from tank and pipelines and commission and perimeter fencing
- (ii) Copies of the site layout and drawings showing the respective features of the proposed project are annexed to this report.

2.3. General site layout and technology

- (i) The primary technologies used for the design, construction and operation of the LPG facility shall include various international codes of practice, Standards, Government Acts and Local Authority Regulations (Table 1). In Kenya there are a limited number of regulations covering the technology to be used in the design, construction and operation of LPG station. Subsequently the country relies on international codes of practice, standards and guidelines for the design, construction and operation of such facilities. The proposed project will be designed and constructed in alignment with the existing Kenya and international standards.

Table 1: Standards to be used for the Proposed LPG facility

Mechanical works	Description
KS 1938-1:2012	Kenya standards for handling, storage and distribution of liquefied petroleum gas in Domestic, commercial

	and industrial installations-code of practice.
KS 1938-2:2012	Part 1: Liquefied petroleum gas installations involving gas storage containers of individual capacity not exceeding 150 Land a combined water capacity not exceeding 3000L per installation second edition.
KS 1938-3:2012	Part 2: Transportation of LPG in bulk by road,rail and sea.code of practise second edition. Part 3: LPG handling, storage and distribution in domestic and commercial sectors
KS ISO 16486-3:2012	Plastic piping systems, unplastic polyanide for supply of gaseous, with fusion joining and mechanical joints fittings for purposes of the system
KS ISO 16486-6:2012	Plastic piping systems, unplastic polyanide for supply of gaseous,with fusion joining and mechanical joints: handling and installation.

- (ii) *LPG storage tank:* One (1) LPG tank of 20 cubic metres capacity will be installed at the proposed project site, and put on well laid above ground tank foundation. The design shall be as per BS 8110 Standard. During construction, the contractor will adhere to all relevant national and international standards and guidelines including NFPA 13,14,16,20,24,58 & 70 API 25, API 2410 and KS 1938. The filling station will be supplied with fire hydrants, water reservoir to be used in case of fire emergencies. The architectural design and layout are annexed to this report.
- (iii) *Cylinder filling station:* The cylinder filling area will be reinforced with a thick concrete slab for the LPG Pump. The pump will be installed according to Kenya standards on safety. The shed will be a shed, with a cast slab beneath. The filling process will take place in the cylinder filling area. The Plant's filling stock management system will be fully computerized. This will ensure that every single cylinder will be filled thoroughly and that instances such as over-filling, under-filling, and leakages do not occur. Before the LPG cylinders are filled, a pre-fill inspection of the cylinders will be undertaken to ensure that the cylinders are safe to fill. The cylinders that are found to be in good condition will be filled, sealed, weighed and taken back to the factory.
- (iv) *Perimeter fencing:* The project will have a perimeter fence. Chain links will be bound on the iron bars and will be fabricated and installed.

- (v) *Fire protection:* The facility will have a comprehensive fire fighting system covering all hazardous areas and the other areas of the facility. This ensures that any fire within the site is quickly surpassed and extinguished. It includes fire water sprinkler systems for the LPG tank, and also fire hydrants will be mounted strategically around the facility.

- (vi) *Site preparation:* The site preparation work will consist of the following; site clearing (relocation of pallets and machinery from site), excavation followed by backfilling and compaction. The waste generated from site clearing will be transported and dumped by the waste handlers. The Contractor will be in charge for the transport of raw materials to site during construction process. Some of the materials to be delivered to the site include aggregates, masonry stones, cement, iron sheets and other construction materials. Environmental protection during the construction phase will address management of hazardous materials, dust, erosion and sedimentation control. The site will be maintained in accordance with relevant erosion and sedimentation control standards for construction sites. Curbs will be incorporated in parking and process areas to allow for storm water from these areas to be drained to a collection area equipped with a sump where runoff can be checked prior to release and connected to properly designed oil water separators.

- (vii) *Materials:* The exact quantities of materials required for the construction of the proposed project are not known at this stage of the project. The Proponent will utilize several materials in the construction of the project most of these acquired from within Nairobi County.

- (viii) *Estimated project cost:* It is approximated that the construction of the proposed project will cost Kenya shillings twenty five million (Kshs 25,000,000)

2.4. Construction Phase

- (i) *Site preparation:* The site preparation work will consist of the following; site clearing (relocation of pallets and machinery from site), excavation followed by backfilling and compaction. The waste generated from site clearing will be transported and dumped by NEMA licensed waste handlers. The Contractor will be in charge for the transport of raw materials to site during construction process. Some of the materials to be delivered to the site include aggregates, masonry stones, cement, iron sheets

and other construction materials. Environmental protection during the construction phase will address management of hazardous materials, dust, erosion and sedimentation control. The site will be maintained in accordance with relevant erosion and sedimentation control standards for construction sites. Curbs will be incorporated in parking and process areas to allow for storm water from these areas to be drained to a collection area equipped with a sump where runoff can be checked prior to release and connected to properly designed oil water separators.

- (ii) *Materials:* The exact quantities of materials required for the construction of the proposed project are not known at this stage of the project. The Proponent will utilize several materials in the construction of the project. Some of the materials have been sourced locally whereas others have been obtained from sources outside Mombasa City. The materials to be used in the construction of the projects consist of the following: Concrete, sandstone, sand, steel rods, PVC pipes, water, paint, corrugated preprinted roofing and energy - Diesel and electricity
- (iii) *Product:* The final product after construction phase is LPG storage and filling plant which will comprise of 20 cubic metres aboveground storage tank, associated pipe work and a gas filling area.
- (iv) *By-products:* The Proposed project will generate several by-products during both construction and operation phases. 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 and excavated materials.
- (v) *Waste:* During construction the proposed project is anticipated to generate different wastes including: (i) *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; (ii) *Other forms of wastes* (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; (iii) *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; and packaging materials, etc.). The wastes will be segregated in accordance with Legal Notice 121: Waste Regulation, 2006 with recyclable material collected and transported to a

recycling facility. Non-recyclable wastes shall be transported offsite to a permitted landfill. Construction Environment Management Plan (CEMP), including plans for erosion and sediment control measures will be developed prior to commencement of construction activities and implemented to minimize impacts to water quality from construction activities.

- (vi) *Air emissions:* Air quality impacts associated with construction activities are generally related to the generation of dust especially during dry weather conditions and exhaust emissions from the operation of construction equipment. Control measures, such as use of dust suppression techniques, will be used in construction zones as required to minimize the impacts from fugitive dust. The air emissions from the construction equipment are expected to be more localized and temporary, lasting the duration of construction activities. Routine inspection and maintenance of construction equipment will minimize exhaust fumes.
- (vii) *Noise emissions:* The target noise levels during construction shall be set at 75dB (A) (BS 5228, 1997) during the day and 70dB during the night as appropriate.
- (viii) *Commissioning:* The final stage of construction is the start-up and commissioning of the facility. During the commissioning stage, air will be purged from the tank and pipelines.

2.5. Operation Phase

- (i) Once commissioned, the tank will be filled with LPG brought in by trucks. The proposed LPG will serve Githurai and surrounding areas targeting homes, hotels, institutions and other LPG retailers.
- (ii) *Products:* The primary product of the proposed project during the operational phase will be Liquid Petroleum Gas.
- (iii) *By-products:* During the operational phase of the project it is not expected that there will be any by-products generated.
- (iv) *Waste:* The following wastes are anticipated during operation phase of the project:
 - (i) *effluent waste* (wastewater will be generated during Project operations including storm water runoff, contaminated waste water from the truck parking area from

potential spills which together with the storm water will be directed through an oil water separator prior to discharge). The effluent water will be discharged through the Nairobi City County sewerage systems in the area; (ii) *sewage waste* (the employees of the Proponent who will be based within the project area are expected to generate sewage waste which will be channeled to the conservancy tank.

- (v) *Air emissions*: The proposed facility will be designed to international standards. Subsequently emissions from trucks and customers vehicles etc are expected to be low. The only emission sources of significance for the project emission inventory during normal operations shall include: (i) intermittent emissions from routine testing of backup power and trucks offloading LPG; (ii) emissions from trucks offloading the LPG gas; and (iii) emissions from trucks and other vehicles to be loaded with cylinders.

2.6. Decommissioning Phase

- (i) Upon decommissioning of the proposed LPG storage and filling plant, rehabilitation of the project site will be carried out to restore the site to its original status or a better status than it was originally. This will include replacement of top soil and re-vegetation which will lead to improved visual quality of the area.
- (ii) *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 Pipe work infrastructure; and Foundation materials which can be donated to individuals for reuse
- (iii) *Waste*: During the Decommissioning phase of the proposed project, several waste products are expected to be generated. These shall include: metals from pipe work infrastructure, demolition wastes from the office block, dusts and fumes and scrap metals.
- (iv) *Air emissions*: The demolition 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. 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.

- (v) *Health and safety system:* The potential occupational health and safety impacts during construction phase will include injuries through the construction activities whilst during the operation phase they will include injuries to workers from, routine monitoring and maintenance and deaths and injuries from major disasters e.g. explosions and fire outbreaks . Whereas during decommissioning; the potential H&S risks include injuries occasioned by dismantling of the facility.

Chapter 3: Relevant legislative and regulatory framework

3.1. Environmental Management and Coordination Act (EMCA)

Cap 387

The EIA study for the construction of 20 cubic metres LPG storage and filling plant located at Mwihoti Settlement of Githurai Area, Roysambu Sub-County, Nairobi County was guided by reigning government policy and legislation on environmental management – the Environmental Management and Coordination Act (EMCA) cap 387 which enacted with a view to harmonizing environmental legislation previously scattered in 77 national laws. Section 58 of the Environmental Law requires that an Environmental Impact Assessment (EIA) study precede all development activities proposed to be implemented in Kenya. The Act further requires that EIA studies so designed, be executed in accordance with the Guidelines for Conduct of EIAs and Environmental Audits (Kenya Gazette Supplement No. 56 of 13th June 2003) as published by the National Environmental Management Authority (NEMA). Additionally, in order to mitigate and control environmental damage from on-going projects, Sections 68 and 69 EMCA require that all on-going projects be subjected to annual environmental audits as further expounded in Regulation 35 (1) and (2) of Legal Notice 101 of June 2003. Part V of the Legal Notice 101 defines the focus and scope of Environmental Audit studies including an appraisal of all the project activities, within the perspective of environmental regulatory frameworks, environmental health and safety measures and sustainable use of natural resources. In recognition that EMCA is an umbrella law coordinating diverse sectoral statutes all of which are still in force, Legal Notice 101 of EMCA requires that the respective sectors be consulted as Lead Agencies in making decisions pertaining to environmental assessment for projects in respective sectors. This is to ensure that NEMA does not approve projects that contradict sector policies and legislation.

Recommendations: *This study was conducted in compliance with the requirements of EMCA 387. The proponent shall further comply with sections 68 and 69 by undertaking regular annual audit and report to the NEMA accordingly.*

3.2. EMC (Water Quality) Regulations, 2006

These are described in Legal Notice No. 120 of the Kenya Gazette Supplement No. 68 of September 2006. These Regulations set the standards for diverse waters namely: - water for domestic use, water used for agricultural purposes, water used for recreational purposes,

water used for fisheries and wildlife and water used for any other purposes. The rules further stipulate the quality standards for water to be disposed either directly into nature or through the sewage network. These Regulations outline: Quality standards for 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. LN 120 requires that a Discharge Permit be obtained for all water disposed into the environment from any premises. The Regulation requires the proponent (Ameken Minewest Company Limited) to refrain from any activity which might cause water pollution, not to discharge any liquid, gaseous or solid into water resource as to cause pollution.

Recommendations: *The proponent is expected to install waste water pre-treatment facility at the proposed project as appropriate, install water saving devices and ensure efficient use of water during all the phases of the project.*

3.3. EMC (Waste Management) Regulations, 2006

The Regulations requires the project to among others: (i) segregate waste (hazardous and non-hazardous) by type and then disposes them in an environmentally acceptable manner; (ii) use only licensed Waste Carriers for collection of wastes; (iii) avoid littering during waste transportation; (iv) install anti-pollution technology for treatment of waste, and (v) label hazardous waste containers in accordance with section 24 of the Regulations.

Recommendations: *Segregate waste into hazardous and non-hazardous waste streams; and label hazardous waste containers in accordance with section 24 of the Regulations.*

3.4. EMC (Air Quality Standards) Regulations, 2008

These Regulations prohibit the project management from: (i) acting in a way that directly or indirectly cause or may cause air pollution to exceed levels set out in the second Schedule to the Regulations; (ii) allowing Particulates emissions into the atmosphere from any source not listed in the sixth schedule of the Regulations; (iii) causing ambient air quality in controlled areas (listed in Schedule Thirteen) to exceed those stipulated under second Schedule, and (iv) allowing emission of Particulate matter above the limits stipulated in second Schedule. There seems to be significant fugitive dust from unpaved services within the Station.

Recommendations: *Carry out regular air quality measurement and take necessary*

remedial actions.

3.5. EMC Noise Prevention and Control Rules 2009

Legal Notice No. 61, effected in November 2009 to regulate noise and vibrations across the spectrum of various activities. The regulations give the noise limits applicable at different times of the day and has provisioned for issuance of licences and permits for noise levels exceeding the stated standards. For regulation of noise at workplaces, these regulations have given reference to the Factories and other places of Work Act regulations on noise at workplaces. The Rules requires the proponent and the management to: (i) develop, rollout and implement a written hearing conservation program if the noise generated from their operations exceeds the permissible levels stipulated in the Rules; (ii) ensure that any equipment brought to a site in Kenya for use shall be designed or have built in noise reduction devices that do not exceed 90 dB (A); and (iii) medically examine those employees that may be exposed to continuous noise levels of 85 dB (A). The facility has minimal noise, except from the surrounding facilities.

Recommendations: *Supply employees with appropriate noise prevention gears to be used in incidences of noise levels exceeding 90dB (A).*

3.6. The Conservation of Biological Diversity (BD) Regulations

2006:

These regulations are described in Legal Notice No. 160 of the Kenya Gazette Supplement No. 84 of 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.

Recommendations: *Although no threatened or endangered species were observed at the proposed project site, some species of birds and insects were recorded at the site. The proponent needs to ensure that the site is maintained as pristine as possible to ensure that the fauna and flora in the surrounds of the site thrive.*

3.7. The Water Act No. 8 of 2002

While developing the National Water Policy, the Government also established a National Task Force to review the Water Act, Chapter 372 and draft a Bill to replace the Water Act,

Chapter 372. The Water Bill 2002 was published on 15th March 2002 and passed by Parliament on 18th July 2002. It was gazetted in October 2002 as the Water Act, 2002 and went into effect in 2003 when effective implementation of its provisions commenced. The legal framework under the Water Act 2002 provides the guidelines in line with the existing policy changes, four key institutions with separate functions and decentralized decision making systems. These are Water Service Boards (WSBs); Water Service Providers (WSPs); Water Resources Management Authority (WRMA) and Water Services Regulatory Board (WSRB). In furtherance to the Water Act 2002, the Ministry of Water and Irrigation and Water resources Management Authority (WRMA) in collaboration with other stakeholders has prepared a set of Regulations which have now been Gazetted under the Legal Notice No. 171 of 28th September 2007 to give guidelines on water permit acquisition and adherence to conditions attached and also enforcement of the user fee charges.

Recommendations: *The proponent shall undertake regular monitoring and recording to help understand the variations that may be caused by leaks or misuse to prompt action - a measure that ensures efficient use of water.*

3.8. The Public Health Act- Laws of Kenya, Chapter 242

This Act provides the impetus for a healthy environment and outlines regulations on waste management, pollution and human health. Part IX section 115 of the Act provides for any noxious matter or wastewater generated from any premise such as building nuisances including offensive smells, the Act therefore states that no person or institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires that local Authorities take all lawful necessary and reasonable practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to injuries or dangerous to human health. This is important in ensuring that the developments of any kind do not pose danger to the users and general public. The Public Health Act borrows heavily from the common law doctrine of nuisance. It makes it an offence for a property owner or project developer to allow nuisance or any other condition liable to be injurious or dangerous to health to prevail in his property. What constitutes nuisance is broadly described to include any obstruction, smell, accumulation of wastes or refuse, smoky chimneys, dirty dwellings or premises used without proper sanitation, smoke emissions and improperly crowded areas so long as it can be demonstrated that the situation endangers or is liable to endangering health. Under this Act the facility must be kept clean, daily removal of accumulated dust and waste from floors, free from effluvia arising from any drain, sanitary convenience or nuisance and without prejudice to the generality of the foregoing provisions.

Recommendation: *The proponent shall adhere to all the requirements of the Act as provided. This shall include amongst others: (i) ensuring site hygiene at all times in the three phases of the project; (ii) provision of clean sanitary facilities and clean drinking water supply to staff and customers at the facility; (iii) removal of wastes and general cleanliness at the facility to ensure that the operational activities are not a nuisance to the public and the workers.*

3.9. The Physical Planning Act Cap 286

Physical Planning Act is a fundamental Act of Parliament that provides for preparation of local-physical development plans giving the local authority power to prohibit or control development activities in their jurisdictions by checking on the content of the plans, process of preparation and ultimate approval. Section 30 states that any person who carries out development without development permission will be required to restore the land to its original condition. It also states that no other licensing authority shall grant license for commercial or industrial use or occupation of any building without a development permission granted by the respective local Authority. In principle, the Planning Act ensures that all developments and other changes to land are vetted and approved as to ensure order, harmony, health and economy of the different uses on any land. The Act also promotes public participation in the preparation of plans and requires that in preparation of plans proper, consideration be given to the potential for economic and social development. The proposed site is in an industrial area.

Recommendation: *The proponent shall adhere to all the requirements of the Act as provided including applying and complying with the change of user guidelines through the relevant physical planning authorities.*

3.10. Occupational Health and Safety Act, 2007

This act was enacted to give general and specific guidelines on management of Occupational Health and Safety in work places. Section 23 establishes the office of the Director of Occupational Safety and Health Services. The office of the Director is charged with the responsibility of coordinating the operations of the Occupational Health and Safety Department. In section 27, the Act establishes the National Council for Occupational Safety and Health. The act outlines several measures that need to be in place for the management of the Occupational Health and Safety, these measures include: (i) formulation and implementation of an occupational health and safety policy; (ii) establishment of the safety and health committees where there are at least 20 employees in an establishment. The

Director may direct establishment of a committee at any other workplace; (iii) reporting of accidents to the Director of Safety and Occupational Health; and (iv) a proponent is bound by the act by virtue of being an employer, and it is imperative that the Act be applied to safeguard the Safety and Health of workers at the construction site. This is especially so in matters related to working with mobile / moving parts equipment and other implements used in the construction sites. The Act requires the proponent to: (i) comply with general duties with respect to health and safety in the workplace. Such duties include Undertaking S&H risk assessments, S&H audits, notification of accidents, injuries and dangerous occurrences, etc.; (ii) register the facility with the DOSHS; (iii) maintain cleanliness in the facility, avoid overcrowding and provide ventilation; (iv) ensure safe operation of machinery and including all prime movers and transmission equipment; and (v) provide a General Register for recording amongst other things all incidents, accidents and Occupational injuries.

Recommendations: *The proponent shall ensure strict adherence to the provisions of the Act and all the accompanying regulatory requirements. Cleanliness and tidiness of the facility to be maintained to the highest acceptable standards. This will ensure that the welfare and hygiene of staff is taken care of. A first aider and first aid box need to be supplied and stocked adequately.*

3.11. Medical examination Rules, 2005

This legislation requires the proponent to mandatorily undertake medical evaluations of workers especially those who handle petroleum and fossil oil products. The workers are to undergo medical evaluations by a registered medical health practitioner duly registered by the DOSHS.

Recommendations: *The proponent shall institute and implement regular medical examinations for its staff at the facility.*

3.12. Fire Risk Reduction Rules, 2007

The Rules requires the proponent to: (i) ensure that all flammable materials are stored in appropriately designed receptacles; (ii) ensure that all flammable storage tanks or flammable liquid containers be labelled with the words “Highly Flammable” in English or Kiswahili; (iii) have spill prevention, response and countermeasures plan (SPRCC); (iv) ensure that electrical equipment is installed in accordance with the respective hazardous area classification system. It also requires that all electrical equipment is inspected after every six (6) months by a competent person and records of such inspections be kept; (v)

clearly delineate fire escape exits; (vi) appoint firefighting team and ensure they undergo a training course in firefighting provided by a DOSHS approved institution; (vii) mandatorily undertake fire drills at least once in a year; (viii) properly mark assembly points; (ix) display “No Smoking” signs wherever flammable vapours may be present; (x) install fire detection systems in their premises which must be connected to audible and visual flashing devices and be maintained regularly to ensure its integrity at all times; (xi) install and maintain firefighting systems in workplaces; (xii) mount fire extinguishers at least 60cm above ground while each fire hose reel must be located within a radius of 30m; (xiii) colour codes all their pipelines according to the product being conveyed by them; (xiv) have adequate fire water storage capacity. As a minimum this regulation requires Station Managements to have at least 10m³ of dedicated fire water storage capacity; (xv) develop, rollout and implement a comprehensive written Fire Safety Policy, and (xvi) undertake annual fire safety audits. The Station, complied with the Rules. In accordance with the Rules, the Station was observed to have: appointed firefighting team; displayed ‘No Smoking’ signs, formulated and implemented fire safety policy, has emergency response plan which covers on spill response; and undertaken fire drills

Recommendations: *The proponent to develop and implement EHS policy, and provide adequate fire fighting equipment at the facility.*

3.13. Hazardous Substances Rules, 2007

This legislation requires the proponent to: (i) ensure that where chemicals come into contact with employees, the exposure limits set out in the First Schedule of the Regulations are not exceeded; (ii) ensure that all employees exposed to chemicals in the workplace are protected adequately from exposure to hazardous substances that may be present in them using the hierarchy of hazard control methods; (iii) have a Hazard Communication program implemented at their workplace; (iv) maintain an inventory of all MSDSs for the chemicals stored in their workplace; (v) dispose of all unused, obsolete or expired chemicals in an environmentally sound manner; (vi) label appropriately all containers containing chemicals as indicated in the MSDS for that chemical; (vii) train employees on the hazards associated with Handling chemicals safely in the workplace, and (viii) monitor chemical exposure levels in the workplace annually by engaging a DOSHS registered Air Quality Monitor; and engage NEMA approved waste management firms for waste disposal from the facility.

Recommendations: *Consider carrying out annual monitoring of chemical exposure from the facility and ensure that the facility is provided with adequate hazardous wastes handling equipment.*

3.14. Energy Act, 2006

The Energy Act 2006 was enacted in 2006 and received Presidential assent on 30th December 2006. It is an Act of Parliament to amend and consolidate 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 upon commencement repealed the Electric Power Act, 1997 as well as the Petroleum Act, Chapter 116 of the Laws of Kenya.

Recommendation: *The proponent shall install energy saving bulbs to reduce electricity consumption. Monthly consumption shall also be monitored to identify areas in which unnecessary usage can be reduced. The facility also needs to be supplied with a standby generator.*

3.15. The Petroleum Act (Cap 116)

In this Act, safety of storage of petroleum products is provided for under Section 14 (1). Section 18 (2)-No license to store petroleum within a Sub County or township shall be granted unless the local authority has approved of the site. Section 19 (i) prohibits any person in or near any storage shed or installation from doing any acts that are likely to cause fire. Part (ii) of this section disallows smoking within a storage shed or possessing matches or other articles of highly inflammable or explosive nature except as permitted by this Act. This excludes smoking in offices and living quarters if so situated to preclude danger from fire. Part (iii) of this section states that; there shall be posted in a conspicuous place at the entrance to every installation a notice in English and Swahili to the effect that smoking and the possession of matches are prohibited. Part (v) indicates that an adequate supply of dry sand or dry earth shall always be kept ready for immediate use in an installation and in or near a storage shed for purposes of extinguishing fire. Part (vi) of the same section requires that an adequate supply of dry sand or dry earth shall always be kept ready for immediate use in an installation and in or near a storage shed for the purpose of extinguishing fire. Part VI outlaws any petroleum from escaping into any drain, sewer, harbour, and river or water course. Section 20 (6): An efficient fire service shall be provided in every installation and the employees shall be instructed periodically in the use of various fire appliances.

Recommendation: *The proponent shall ensure that all the regulations as outlined in different schedules of the Act are adhered to. These shall including securing the facility from external fires and putting appropriate cautionary signs around the facility especially during operation phase.*

3.16. Energy Regulatory Commission (ERC)

The ERC was established under Energy Act, 2006, to regulate energy sector in Kenya. The ERC's functions include the protection of consumer, investors and other stakeholder interests as well as monitoring the energy sector as a whole. Other functions include licensing, enforcement, dispute settlement and approval of power purchase and network service contracts. ERC on its part has continued to root out these unscrupulous business operatives and prosecute them. To further enhance its enforcement mandate, the Commission procured the services of an independent LPG inspector whose main role is to audit the entire LPG supply chain with the aim of bringing to the fore persons engaging in malpractices for purposes of prosecution by the Commission. The consumer plays a big role in the LPG supply chain in that they provide the necessary market especially for the cooking gas in cylinders. Consumers can thus play a major role in ensuring that illegal operatives are brought to a halt by ensuring that they only purchase LPG from licensed retailers. It is crucial for consumers to note that all licensed LPG dealers should have a license displayed at their location of business every time and that they should always issue an official receipt with the cylinder weight and serial number clearly indicated. For their own safety, consumers are advised to check on the cylinder's neck for the validity of the test dates for the cylinders that they intend to buy. LPG cylinders with test dates exceeding 8 years from the last date of test are deemed to be prone to material failure and hence explosions. Several explosions of such cylinders have been reported in the recent past some of which resulted in loss of life. Consumers should also know that in accordance to Legal Notice 121 of 2009, the only person authorized to fill an LPG cylinder is the person whose brand appears on the particular cylinder. Companies filling other companies' brands of cylinders are considered to be counter-feting the original brand and are thus culpable under the Anti-Counterfeit law. Energy act promulgated in 2006 contains EHS provisions for the environmentally sound management of petroleum sector. These include: (i) Section 91(1) the act requires the proponent to ensure compliance with the requirement of EMCA cap 387; (ii) Section 98(h) the act requires the proponent to comply with EHS standards set by ERC; and (iii) Section 102(h)(m)(v) empowers the minister responsible for the energy to promulgate regulations for the environmentally sound management of petroleum related facilities and infrastructure.

Recommendation: *The proponent shall ensure that all the ERC regulations on LPG are adhered to including all provisions and terms of the ERC license to operate the facility.*

3.17. The County Government Act

The County Government of Nairobi has By-Laws consistent with the County Government Act and provides for the necessary easements for the facility.

Recommendations: *Ensure strict adherence and compliance status with conditions for approval issued by various Nairobi County Government departments including ensuring that all the necessary licenses and permits to operate are up to date.*

3.18. Penal Code (Cap 63)

The Chapter on “Offences against Health and Conveniences” contained in the Penal Code strictly prohibits the release of foul air into the environment which affects health of other persons. Any person, who voluntarily violates the atmosphere at any place to make it noxious to human health in general dwellings or business premises in the neighbourhoods or those passing along public way, commits an offence.

Recommendations: *The proponent to ensure that the operation of the facility do not contravene the stipulations of Act.*

Chapter 4: Baseline Information

4.1. Introduction

This chapter of the report addresses the Environmental, Social and Economic profile of Githurai Area, Roysambu Sub-County, Nairobi County where the project is located. The proposed LPG storage and filling plant to be located on Plot No. LR 27/Mwihoti/Githurai is expected to bring changes that are more positive to the residents of Roysambu Sub-county and surrounding areas in terms of improving level of LPG energy supply, ease of access to LPG, improvement of businesses operating LPG supply, provision of employment and improvement of general economy of the area. Currently Githurai and the surrounding areas lack adequate LPG supply for an ever increasing population. Additionally, the proposed investment shall be of its kind in the area as there are few LPG storage and filling plants in the area.

4.2. Geographical location

The proposed project site is located at (1°12'19"S, 36°54'36"E) (Figure 1) in Mwihoti settlement, Githurai area, Roysambu Sub-county of Nairobi County. The proposed site is about 1km from Githurai Playground of Githurai within a parcel of land measuring 0.4Ha with all the necessary property ownership documents. The Githurai Location is located 12km northwest of central Nairobi, the capital city of Kenya. Githurai location is located at the border of Kiambu County and Nairobi County along Thika Superhighway Road. There are two Githurais namely Githurai 45 (also known as Githurai Kimbo) and Githurai 44. The proposed project is within Githurai 44 which is domiciled in Roysambu Sub-County of Nairobi County. Githurai 44 neighbors Kahawa West, Zimmerman and Njatha-ini Village.

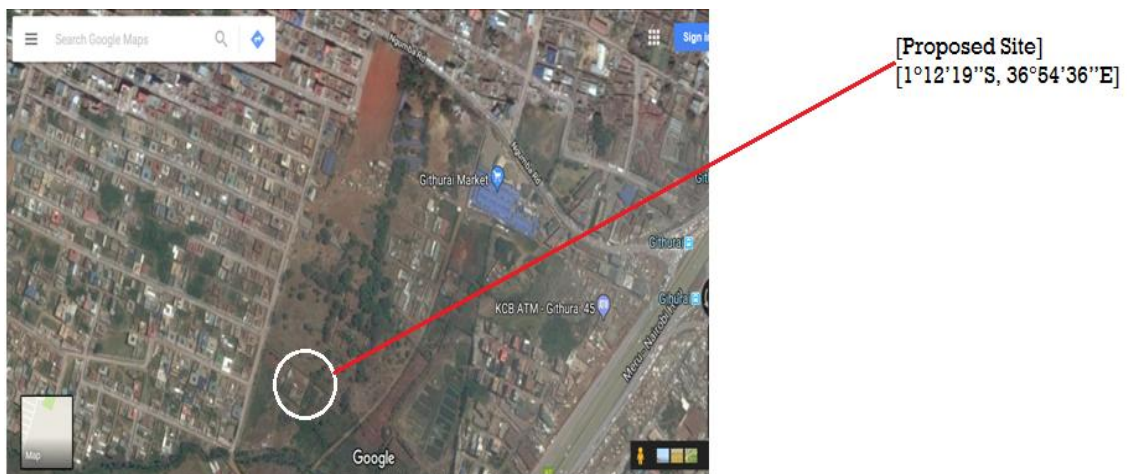


Figure 1: Location of proposed project site, Githura Area, Roysambu Sub-county, Nairobi County



Access road to the site and neighbourhood

4.3. Climate and hydrology

Githurai receives bimodal type of rainfall. The long rains are experienced from March to June while the short rainy period occurs from October to December. The average annual rainfall in Githurai and its environs ranges between 900 mm and 1,250 mm per annum. The mean annual rainfall in Kiambu County ranges between 800 mm and 1,300 mm per annum. The temperature is generally high, the mean annual temperature averaging between 18°C-20°C. The mean annual potential for evaporation ranges between 1550-2200mm. The project site is within Mwihoti area.

4.4. Topography

Topography of the Mwihoti area is relatively flat/level terrain (Figure 2); Slope is generally less than 16% and slightly sloping toward the southern part of the region.

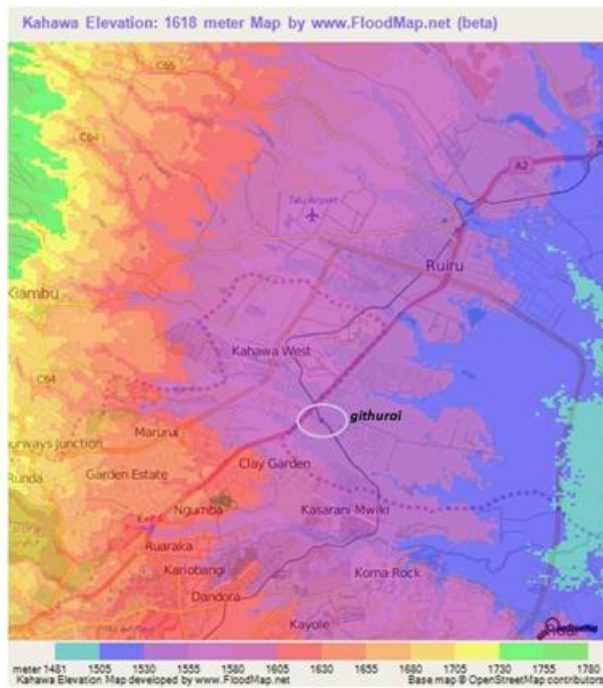


Figure 2: General topography and elevation of Githurai area

4.5. Geology and soils

The geology of Roysambu Sub-county comprises of tertiary volcanic rocks, the most important being what is termed as Nairobi Stone. The Nairobi stone is a tertiary volcanic rock used extensively for building purposes. Soils resulting from tertiary volcanic rocks are dark reddish brown, well drained, friable and very calcareous. The soils in the study area are derived from volcanic rocks that gradually occur on levels between 1200 to 2000m.a.s.l. The general nature of the soil ranges from shallow to red friable clays. The soils also support shrub vegetation and hence the area is zoned as medium potential and favourable for urban development.



Characteristic soil types and the proposed project site



Characteristic small-scale farming activities near the proposed project site

4.6. Biological environment (flora and fauna)

At the proposed site there are no existing tree plantation or forests. The biological environment of the site has been influenced by the neighbouring residential and commercial development of building and infrastructure. In the immediate surroundings of proposed site, small scale farming is common economic activity. Some species of fauna, especially birds and insects are common around the area. The following bird species were recorded at the site

- African Pied Wagtail
- House Sparrow

- Rufous sparrow
- Superb Starling
- White-browed Sparrow-weaver
- Little Swift
- Yellow Bishop

4.7. Land use

The area land use is mainly commercial and residential in nature. Most of the land is used for residential building to support the working population of Nairobi city. Another kind of land use includes small-scale farming and commercial buildings for shops.

Characteristic soil types and the proposed project site



Small-scale farming activities near the proposed project site

4.8. Roads and site access

The key access road to the project site is the A2 trunk road Nairobi to Thika Super Highway road then branch at Githurai 44 towards Githurai Primary School. The proposed project site

is at the intersection between Githuria Primary School and Mwihoti Settlement (Figure 3). The road network to the proposed site is motorable but not tarmacked.

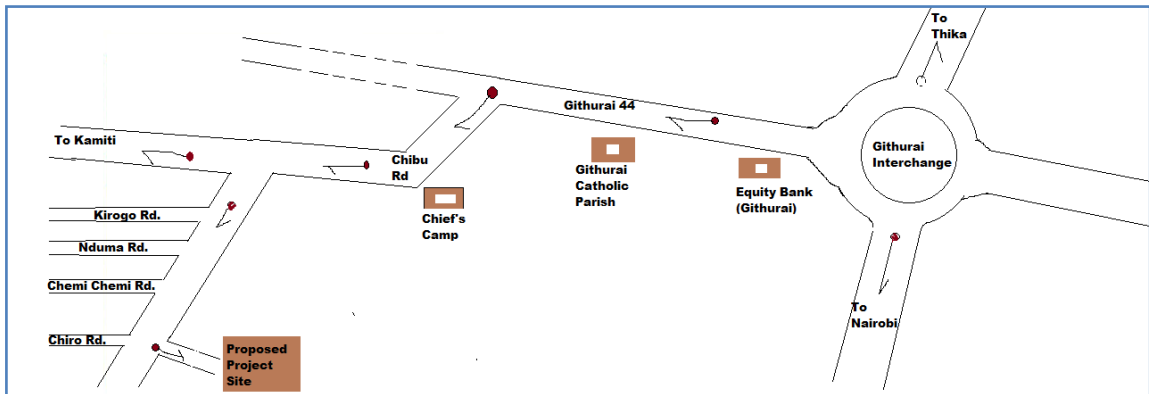


Figure 3: Sketch map for the proposed project location within Mwihoti area

4.9. Water and sanitation

A piped water supply network is existence in Githurai .The water supplied is currently inadequate to meet the current demand hence there are private water vendors and suppliers. Within the proposed coverage area, there is an existing wastewater reticulation system. In other few instances septic tanks are used.

4.10. Electricity

There is adequate electricity supply in the proposed project site. Residents in the area also mainly depend on electricity for lighting purposes.

4.11. Market centres

There is a trading centre in Githurai town with various economic activities being carried on such as fresh market for foodstuffs, presence of various banking halls and chain of supermarkets, mitumba traders (second hand) among others.

4.12. Health

Health, being a key factor in any society, has been given a great deal of consideration in this community. There are approximately 35 health facility providers within Githurai community. There are no Public (Government established) hospitals in Githurai, but there are Private established hospitals such as St. Mary's Health Hospital, Round About Medical Center and St. John's Hospital. Public Clinics and Dispensaries provide health care services at a subsidized cost as compared to private hospitals.

4.13. Education and literacy

The Roysambu Sub-county has a total population of 87,594 children falling within the age group of 3 to 5 (pre-school). This consists of 44,177 males and 43,417 females. The total number of early child education (ECD) teachers is 1,843 and the teacher to pupil ratio is 1:40.

4.14. Economy and livelihoods

In the proposed project area the most predominant source of livelihoods is small scale farming and business support activities like production of goods like shoes, clothes, furniture, bags, metal works etc. and also offer services which range from salons, barber shops, car wash, medical services, restaurants etc. In Githurai there are: consumer-oriented stores, agriculture businesses, financial businesses, information businesses, transportation businesses, real estate businesses and utilities. It was also evident that some of the residents are employed as casual workers while a few are permanent employees in the many businesses being operated, government offices and others own small businesses.

4.15. Housing and human settlements

The proximity of Githurai area to the city of Nairobi has seen transformation of large pieces of land into residential houses. The presence of good all weathered roads have given an opportunity to those working in Nairobi to reside within the area. This has led to the establishment of residential estates such as the Tatu city being one of the major housing projects currently under implementation. Most of the houses in the proposed project area consist of stone structures which are common in almost all households, with corrugated roofing materials could be observed. Settlements in the proposed project area are densely pullulated, but are densely distributed. It was evident that the availability of physical infrastructure and social services is evenly distributed or rarely non-existent in some scenarios. Climatic conditions are rarely harsh such as drought hence issues of inadequate food and water makes them sustainable.

Chapter 5: Public Participation

5.1. Introduction

This chapter gives views, comments and suggestions from different stakeholders consulted during the study. Public participation is an essential and a legislative requirement for environmental authorization. The firm of experts undertook the public stakeholder consultation (PSC) for the proposed project in accordance with the requirements for an EIA Study stipulated in the EMCA, cap 387 and EIA/EA Regulations 2003. The objective of public participation was to provide sufficient and accessible information to Interested and Affected Parties (I&APs) in an objective manner to assist them to identify issues of concern, and provide suggestions for enhanced benefits and alternatives.

5.2. Approach used

We consulted the neighbours of the Proponent, businesses and individuals in and around the proposed site. Additionally area administrators and government agencies were consulted during the exercise using structure questionnaires and consultative meetings. Copies of completed checklists are annexed to this report

5.3. Comments and responses

Generally, all the stakeholders consulted had no objections to the establishment of proposed projects, and that the proposed project will not generate any adverse environmental impacts. All approached parties (Table 2) signed the questionnaires and were very enthusiastic in giving their comments. They gave several reasons on why the project should start immediately, including creation of more employment opportunities for the youth, and the fact that gas would be available at a close range and at affordable costs. However, the neighbours had specific concerns such as smell of the gas, accidental leakages, fire break-outs and distance of the project work from residents. Their worries were explained to them and the measures to be taken. Moreover, the EMP provides for such impacts. Summary of comments and responses from stakeholders are shown in Table 3.

Table 2: Stakeholders (neighbours) and residents consulted during the study

Stakeholder Name	Stakeholder Type
Alex Maina	Retailer
Angel Linet	Business lady
Mr. Atanasio	Businessman
Athanas M. Musyimi	Neighbour/small scale farmer

Daniel Kamau	Businessman
Edwin Kongu	Businessman
Elizabeth B.	Retailer
Evans Ndichu	Salesman/driver
Francis Kinyua	Neighbour/small scale farmer
George Wachira	Retailer
Harriet Nahulo	Green grocer
Ian Mburu	Retailer
James Maina	Gas retailer
Jeremiah Ndubi	Local resident
Joan	Retailer
Joseph Kimani	Salesman
Joseph Ngumi	Business employee
Ms. Phenny	Business lady
Rasik Vakaria	Neighbour/small scale farmer
Romano K. Mikibu	Area chief (Githurai location)
Ruth Mwendwa	Saleslady
Simon Maitethia Kirima	Neighbour/small scale farmer
Mr. Wahome	Gas retailer

Table 3: Summary of comments and responses from stakeholders – proposed establishment of LPG storage and filling plant on LR. No. 27/Mwihoti/Githurai

Issue	Comments
Major environmental concerns regarding the proposed	<ul style="list-style-type: none"> • Air pollution and inhalation of toxic gases incase of leakages • Danger of access by resident children who may be exposed to danger. • Fire hazards from explosion that may cause damage and loss of lives • No environmental concerns brought about regarding the proposed plant. • Not sure whether there are any dangers posed on the environment. • Pressure on utilities including water and electricity • Site very close to residential houses. • The environmental issues that arise should be dealt with immediately. • Waste disposals from the plant
Anticipated economic benefits of the proposed plant	<ul style="list-style-type: none"> • Business development in the area. • Corporate Social Responsibility (CSRs) benefits from proponent. • Ease of access of gas and at a cheaper rate by locals and retailers

	<ul style="list-style-type: none"> • Ease of access of gas to local consumers since it is closer. • Gas is expected to be cheaper. • Growth of the area through infrastructural development. • Increased land rates. • Improvement in security in the area • Job opportunities for local residents • Public health concerns of inhalation of toxic fumes from the plant. • Tough business relations with local LPG retailers
<p>Residents' expectations on LPG plant management/proponent</p>	<ul style="list-style-type: none"> • The management to engage in corporate social responsibility programmes (construction of a health centre to help the local residents get medical care • If possible, the management should consider relocating to an area that is not densely populated. If not, they should have the required safety measures put in place. • Proper waste management around the site of the proposed plant. • Safety measures must be put in place to deal with the negative impacts on the environment and public health, for example means of preventing gas leakages that are extremely harmful. • Security measures should be put in place to avoid cases of vandalism in the facility, to ensure that storage tanks are not tampered with. • The management has expertise or can contract experts to deal with any environmental and public health concerns that may arise. • The management has the capacity to deal with the adverse effects that might be experienced. • The management should already have plans in place to improve the environment and public health before starting operations. • The management should consider proper waste management within and around the proposed site. • The management should ensure that there are no toxic fumes emanating from the facility • The management should have the measures put in place to deal with any negative impacts that may occur. • The management should put in place mitigation measures to handle hazards such as gas leakage and explosions. • The management will only focus on maximizing their profit, and won't put into consideration the environment and public health. • The waste generated from the plant should be adequately disposed.

Chapter 6: Analysis of project alternatives

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

6.1. No Project alternative

The No Project Alternative option in respect to the proposed project implies that things remain unchanged. The environment therefore won't be tampered with. Under the No Project Alternative, the proponent's proposal would not receive the necessary approval from NEMA. The proposed project would not be constructed and there would be no demand for such an LPG storage and filling project. This option will however, involve several losses to the proponent, landowner and the local community, a majority of whom have expressed positive . The certificate of lease holder will continue to pay rates on the land while the property remains idle. The No Project Option is the least preferred from the socio-economic and partly environmental perspective due to the following factors:

- The economic status of the local people in the area would remain unchanged.
- The local skills would remain under utilized.
- No employment opportunities will be created for Kenyans expected to work in the project.
- Increased urban poverty and crime in Kenya.
- Discouragement for investors willing to install LPG storage and filling plants
- Development of infrastructural facilities (roads, electrical etc. will not be undertaken)
- The Nairobi County and national governments will be denied the much needed revenue from taxes and rates associated with the proposed project.

In addition the anticipated insignificant environmental impacts resulting from construction, the proposed corporate social responsibility (CSR) as planned by the proponent would not occur, and this will have negative impacts on the local community. From the analysis above, it becomes apparent that the No Project alternative is no alternative to the local people, investors, Kenyans, and the government of Kenya.

6.2. The proposed development alternative

Under the proposed development alternative, the developers of the proposed project would be issued with an EIA License. In issuing the license, NEMA would approve the proponent's proposed development of the LPG storage and filling plant, provided all environmental

measures are complied with during the construction and operation phases. This alternative consists of the applicant's final proposal with the inclusion of the NEMA regulations and procedures as stipulated in the environmental impacts to the maximum extent practicable.

6.3. Alternative design and technology

The proposed project 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 architects, surveyors, engineers and environmental experts involved in the projects have vast experience in the LPG regulations and standards for both local and international and they settled for the best as a way of fostering best practice within the industry.

Chapter 7: Environmental and social impacts

7.1. Introduction

This section identifies both positive and negative impacts associated with the proposed project. These impacts are hereby identified at three distinct phases of the project i.e. – construction, operation and decommissioning phases but there might be need to undertake a separate specialized study during decommissioning phase.

7.2. Construction phase

7.2.1. Positive impacts

Boosting of informal sector

Several informal businesses shall benefit during construction periods. These include activities such as food vendors who benefit directly from the construction, staff members who buy food and other commodities from them. This will promote the informal sector in securing some temporary revenue and hence livelihood.

Employment opportunities

One of the main positive impacts during projects construction phase is the availability of employment opportunities especially to casual workers and several other specialised workers. Employment opportunities are of benefit both economically and in a social sense. In the economic sense it means abundant unskilled labour will be used in construction hence economic production. Several workers including casual labourers, masons, carpenters, joiners, electricians and plumbers are expected to work on the site from start to the end. Apart from casual labour, semi skilled and unskilled labour and formal employees are also expected to obtain gainful employment during the period of construction.

Improving growth of the economy

Through the use of locally available materials during the construction phase of the project including cement, concrete and ceramic tiles, timber, sand, ballast electrical cables etc, the project will contribute towards growth of the economy by contributing to the gross domestic product. The consumption of these materials, fuel oil and others will attract taxes including VAT which will be payable to the government hence increasing government revenue while the cost of these raw materials will be payable directly to the producers.

Market for building and construction materials

Several building materials will be required for construction of the facility and other associated infrastructure. The materials shall include sand, ballast, hard core, timber, cement, clay tiles, metal sheets, electrical gadgets, steel, plumbing materials, glass and paints among others. Most of these materials will be obtained locally within the surrounding areas, and through this, local businesses shall benefit immensely.

7.2.2. Negative impacts

Disposal of excavation materials

Some of the excavated materials will be rendered unusable and thus will have to be disposed of. This also applies to some of the soil/rocks which may not be reusable after excavation processes are complete. All these materials need to be collected, transported and disposed off appropriately in approved designated areas. It is encouraged that other alternative uses of these materials should be found.

Storm water

Storm water runoff either from the site or from the neighbouring compounds may run into the site thereby causing interference to the construction operation. Such storm waters are common mainly during rain seasons.

Noise pollution

The construction works on site will most likely have noise due to moving machines (mixers, tippers, communicating workers), incoming vehicles to deliver construction materials, workers to site and other normal construction activities. This may prove to be a potential source of disturbance to the surrounding neighbours and a health hazard to the workers themselves. Such noise emissions should be minimised as much as possible from the source point while workers should be provided with appropriate personal protective wear.

Dust emissions

Particulate matter pollution is likely to occur during the site clearance, excavation and loading and transportation of the construction waste. There is a possibility of PM10 suspended and settle-able particles affecting the site workers and even neighbours.

Increased water demand

Both the workers and the construction works will create an increased demand for water in addition to the existing demand. Water will be mostly used in the creation of aggregates for construction works and for wetting surfaces for softening or hardening after creating the formworks.

Generation of exhaust emissions

Exhaust emissions are likely to be generated during the construction period by the various construction machinery and equipment. Motor vehicles used to mobilise the work force and materials for construction would cause a potentially significant air quality impact by emitting pollutants through gaseous exhaust emissions.

High energy demand and use

The main sources of energy that will be required for construction of the project will include mains electricity and diesel. Electricity will be used for welding, metal cutting/grinding and provision of light while diesel will run material transport vehicles and building equipment/machinery. Although energy use may not be significant, the proponent shall promote efficient use of energy through proper planning to reduce economic and environmental costs of construction activities.

Generation of solid wastes

Large amounts of solid waste will be generated during construction of the project. These will include metal cuttings, rejected materials, surplus materials, surplus spoil, excavated materials, paper bags, empty cartons, empty paint and solvent containers, broken glass among others. Solid wastes if not well managed have a potential of causing disease outbreaks due to suitable breeding conditions for vectors of cholera and typhoid. Malaria outbreak could also be exacerbated by the presence of open water ditches for breeding of anopheles mosquitoes. The major vulnerable groups are children in the surrounding areas who could be exposed to these conditions. The construction workers will also generate faecal waste during their day-to-day operations. The generated wastes shall need proper handling to prevent diseases such as typhoid and diarrhoea outbreak on the site. Unless this is addressed, it can prove to be an environmental/health disaster. A pit latrine(s) or mobile toilets should be established on site to avoid such health risks.

Increased runoff from new impervious areas

Construction of offices and paved roads could result in additional runoff through creation of impervious areas and compaction of soils. Impervious areas and compacted soils generally have higher runoff coefficients than natural areas, and increased flood peaks are a common occurrence in developed areas.

Workers accidents and hazards during construction

During construction of the proposed project, it is expected that construction workers are likely to have accidental injuries and hazards as a result of accidental occurrences, handling hazardous waste, lack or neglect of the use of protective wear etc. All necessary health and

safety guidelines should be adhered to so as to avoid such circumstances. Workers are also likely to be exposed to diseases from contact with potentially harmful building materials. It is therefore recommended that before the construction activities, there is need for the materials to be well inspected and harmonised to the occupational health and safety standards.

7.3. Operation phase

7.3.1. Positive impacts

Collective waste management

The project is designed such that there will be provision of a designated spot for the dumping of garbage which shall be well protected from rain and animals. These wastes will thus be collected from the site in bulk and as one unit such that the careless disposal and hence proliferation of wastes within the surrounding areas will be curbed and minimized.

Employment opportunities

Employment opportunities are one of the long term impacts of the project that will be realised after construction and during the operation and maintenance of the facility. These will involve other sources of employment such as direct service provision to the domestic sector e.g. traders, office operators, engineers, security personnel, environmental, health and safety auditors, etc.

Improvement of infrastructure

The project shall open up the area as a hub for economic activities. This shall lead to more investment in infrastructure such as roads, water and electricity supplies by the Nairobi County Government. Economic growth of the Roysambu Sub-county of Nairobi County will thus improve in general.

Increase in revenue

There will be positive gain for the revenue system arising from the tax being paid by the proponent to the government and other lead agencies.

Increased LPG in Githurai location and surrounding areas

The proposed LPG storage and bottling plant by the proponent is one of major milestone of development when it begins its operations. The benefits associated with putting up the project will include: employment creation, individual investments, improved trade between

the developer and entire partners, gains in local and national economy, available and affordable gas among other benefits.

Optimal use of land

Optimal use of the available land by providing an LPG and filling plant at Mwihoti area of Githurai Location, Roysambu Sub-County can be considered a positive development for the area. Small commercial investment land is a scarce resource in Kenya, and Nairobi County in particular. Through construction of the proposed project, optimal use of available space for such investment will ensure optimal use of land.

7.3.2. Negative impacts

Increased pressure on infrastructure

The project will lead to increased pressure on existing infrastructure such as roads, service lines etc due to the increased number of people who will be using these facilities which will directly translate into increase in volume of the relevant parameter.

Electricity consumption

Upon completion, the project shall consume large amounts of electricity. Since electric energy in Kenya is generated mainly through natural resources, namely water and geothermal resources, increased use of electricity have adverse impacts on these natural resource bases and their sustainability.

LPG storage and filling plant solid waste

A lot of wastes such as waste from foodstuffs, empty plastic containers, cartons, papers etc will be generated during the operational phase of the project. Once the proposed project is complete and operational, they are expected to generate a large amount of solid waste on a daily basis whose composition will be dominated by organic waste.

Leakage of gas and air pollution

Leakage of LPG can cause serious health risk to humans. For this project, the technology applied will ensure that gas leakage risks are avoided.

Fire risk

Leakage of gas and fire can cause explosions and destruction of property and life. The technology applied will ensure that fire risks associated with LPG leakage is avoided.

Accidents

Accidents can occur due to increased traffic of Lorries bringing in LPG and customers buying LPG from the filling plant. The layout (see annexure) for the project has been designed to avoid any accidental occurrences from vehicles using the site

7.4. Decommissioning phase

7.4.1. Positive impacts

Rehabilitation

Upon decommissioning of the proposed project, 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 improved visual quality of the area.

Employment opportunities

For demolition to take place properly and in good time, 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 project.

7.4.2. Negative Impacts

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 project.

Solid waste generation

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

Dust

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

Chapter 8: Proposed impacts mitigation measures

8.1. Introduction

This section highlights the necessary mitigation measures for the expected negative impacts of the proposed project. The potential impacts and the possible mitigation measures have herein been summarized and mitigation measures proposed (Table 4). These are construction, operation and decommissioning Phase. References are made as to where decommissioning mitigation measures can be sought.

Table 4: Summary of negative impacts and their mitigation measures

Possible impact	Mitigation
Vegetation disturbance	<ul style="list-style-type: none"> Only cut trees within the exact area of development Restore cleared sites with vegetation upon completion of construction.
Dust and exhaust emissions	<ul style="list-style-type: none"> Avoid excavation in extremely dry weather Sprinkle water on open grounds to minimise dust emissions Minimise idling of vehicle engines/avoid making unnecessary trips
Noise pollution	<ul style="list-style-type: none"> Provide workers with noise safety equipment such as ear muffs Use equipment that are quieter during construction
Oil spillage and gas leakages	<ul style="list-style-type: none"> Liaise with licensed waste oil handlers to manage oil spills Carry out regular waste water analysis from the site during audits. Undertake regular inspection of LPG tank and other vessels
Fire risks	<ul style="list-style-type: none"> Install adequate fire fighting equipment with regular maintenance Install OF ESDs devices at the facility Train all workers in Fire safety procedures Engage fire auditors to undertake regular fire audits at the facility
Solid waste	<ul style="list-style-type: none"> Use only NEMA approved waste handlers for waste disposal Encourage use of recyclable materials at the facility Install adequate waste collection bins for different waste categories
Storm water run-off	<ul style="list-style-type: none"> Construct sediment traps to retain water Plant vegetation/grass at the facility to act as buffers Undertake cabro-paving of the entire facility grounds Construct and maintain storm water drains
High demand for water and raw	<ul style="list-style-type: none"> Install water conservation pipes Sensitize staff to conserve water

materials	<ul style="list-style-type: none"> • Adopt rain water harvesting technology to supplement water • Install adequate water storage tanks • Source from local suppliers, accurate budgeting
Workers accidents& hazards	<ul style="list-style-type: none"> • Workers to put on PPEs • Undertake regular awareness/sensitization of staff on safety

8.2. Construction phase

Construction waste

It is recommended that construction waste be recycled or reused to ensure that materials that would otherwise be disposed of as waste are diverted for productive uses. In this regard, the proponent is committed to ensuring that construction materials left over at the end of construction will be used in other projects rather than being disposed of. In addition, damaged or wasted construction materials including cabinets, doors, plumbing and lighting fixtures, marbles and glass will be recovered for refurbishing and use in other projects. Such measures will involve the sale or donation of such recyclable/reusable materials to construction companies, local community groups, institutions and individual residents or home owners. The proponent shall put in place measures to ensure that construction materials requirements are carefully budgeted and to ensure that the amount of construction materials left on site after construction is kept minimal. It is further recommended that the proponent should consider the use of recycled or refurbished construction materials. Purchasing and using once-used or recovered construction materials will lead to financial savings and reduction of the amount of construction debris disposed of as waste. Additional recommendations for minimization of solid waste during construction of the project include:-

- (i) Use of durable, long- lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time.
- (ii) Provision of facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements.
- (iii) Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste
- (iv) Use of construction materials containing recycled content where possible and in accordance with accepted standards.

Hydrology and water quality degradation

Several measures shall be put in place to mitigate the impacts that are likely to lead to surface and groundwater quality degradation. The proponent will prepare a hazardous

substance control systems and emergency response plans that will include preparations for quick and safe clean up of accidental spills. It will prescribe hazardous-materials handling procedures to reduce the potential for a spill during construction, and will include an emergency response programme to ensure quick and safe cleanup of accidental spills. The plan will identify areas where refuelling and vehicle maintenance activities and storage of hazardous materials, if any, will be permitted.

Increased runoff

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 or shall be directly channelled into storm water drains. 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.

Noise pollution

Significance of noise impacts depends on whether the project would increase noise levels above the existing ambient levels by introducing new sources of noise. Noise impacts would be considered significant if the project would result in the following:- (i) exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies; (ii) exposure of persons to, or generation of, excessive ground-borne vibration or ground-borne noise levels; (iii) a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project; and (iv) a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project. The proponent shall 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 substation construction activities in the residential areas.
- Install sound barriers for pile driving activity.
- Limit pickup trucks and other small equipment to an idling time of five minutes, observe a common-sense approach to vehicle use, and encourage workers to shut off vehicle engines whenever possible.

Air quality

Controlling dust during construction is useful in minimizing nuisance conditions and consequently health (respiratory and eye) complications. It is recommended that a standard set of feasible dust control measures be implemented for all construction activities. Emissions of other contaminants (Nitrogen oxides, Carbon dioxide, Sulphur oxides, and diesel related Particulate Matter PM10) that would occur in the exhaust from heavy equipment are also included. The proponent is committed to implementing measures that shall reduce air quality impacts associated with construction. All personnel working on the project will be trained 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. Construction vehicles drivers will be under strict instructions to minimize unnecessary trips, refill petrol fuel tanks in the afternoon, and minimize idling of engines. Dust emissions will be controlled by the following measures:

- (i) Watering all active construction areas when necessary.
- (ii) Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard.
- (iii) Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites.
- (iv) Sweep daily (with water sweepers) all paved access roads, parking areas and staging areas at construction sites.

Generation of exhaust emission

In order to control exhaust emissions the following measures shall be implemented during construction:

- (i) Vehicle idling time shall be minimized
- (ii) Alternatively fuelled construction equipment shall be used where feasible
- (iii) Equipment shall be properly tuned and maintained

Worker accidents and hazards when handling hazardous wastes

Necessary health and safety rules shall be enforced by the site foreman to ensure that all staff members adhere to these standards and are thus safe. Adequate collection and storage of waste on site and safe transportation to the disposal sites and disposal methods at designated areas shall be provided. In addition covers for refuse containers and appropriate personal protective equipments to be used by workers shall also be provided by the proponent. Workers accidents especially in deep trenching operations and from gas

accumulation in septic and other confined spaces shall be mitigated by enforcing adherence to safety procedures and preparing contingency plan for accident response in addition safety education and training shall be emphasized.

Disease vectors and exposure of workers to diseases

Well designed waste management system and storm water drainage systems have to be put in place so as to ensure that breeding grounds of disease carrying vectors such as rats, flies, mosquitoes, cockroaches etc are effectively controlled. Complete waste collection and handling service will be provided by the proponent. Possible exposure of workers to diseases from building materials at construction site shall be mitigated by occupational health and safety standards enforcement which encompasses the inspection of such raw materials to ensure required standards are met.

Oil spills

The proponent 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.

8.3. Operation Phase

Solid wastes

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

High energy demand and consumption

The proponent shall plan and install an energy-efficient lighting system at the facility. This will contribute immensely to energy conservation during the operational phase of the project. To complement these measures, it will be important to monitor energy use during the operation phase.

High water demand and use

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

Workers' health and safety

The proponent will provide all employees PPEs Based on PPE evaluation. In addition, continuous awareness creation for employees by the proponent on health and safety matters. The proponent will provide PPEs to all employees

Fire risks and emergencies

The proponent will develop and implement a sound emergency response plan. It will commence with a complete fire safety systems adequate enough for the envisaged worst case scenario.

- The fire fighting system will comprise of a clear design plan and the fire extinguishers will be serviced accordingly and regularly.
- The emergency shutdown (ESDs) will be installed in strategic locations to enable quick power cut off from the operations in case of an emergency.
- An adequate stocked first aid kits boxes will be provided for and the employees will be properly trained on how to administer first aid.

8.4. Decommissioning phase

Decommissioning refers to the final disposal of the project and associated materials at the expiry of the project life span.

Solid wastes

Efficient solid waste management will be employed by the proponent in demolishing the site and remediating the soil. Solid waste resulting from demolition or dismantling works will be managed as described above

Dusts

High levels of dust concentration resulting from demolition or dismantling works will be minimized. Excavated soil and debris will be properly disposed of by backfilling or dumping in grounds approved by the Nairobi County council.

Noise and vibration

Significant impacts on the acoustic environment will be mitigated as already described above (construction and operation phases).

Workers' safety

Capacity voiding of the workers and staff involved in the decommissioning exercise will be done to create awareness towards potential risks and recommended incident/accident preventive measures. This will ensure safety process.

Alteration of site physical features

The proponent in consultation with NEMA will remediate the resultant soil and the whole site as a whole to the initial status.

Chapter 9: Environmental Management Plan (EMP)

9.1. Introduction

This section presents the environmental management plan (EMP) for the proposed LPG storage and filling project. The EMP 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 EMP 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.

9.2. Approach and strategies for EMP implementation

The proposed EMP will be the responsibility of the Health Safety Environment department of the Proponent. However, it will have links with other departments such as operation and maintenance. Table 5 shows the range of approaches that will be used to manage potential impacts of the proposed project.

Table 5: Proposed approaches to manage potential impacts

Approach	Description
Avoidance	Avoiding activities that could result in adverse impacts and/ or resources or areas considered sensitive
Prevention	Preventing the occurrence of negative environmental impacts and/ or preventing such an occurrence having negative impacts
Minimization	Limiting or reducing the degree, extent, magnitude or duration of adverse impacts through scaling down, relocating, redesigning and or realigning elements of the project
Mitigation	Measures taken to minimize adverse impacts on the environment
Enhancement	Magnifying and/ or improving the positive effects or benefits of a
Rehabilitation	Repairing affected resources
Restoration	Restoring affected resources to an earlier (possibly more stable and productive) state, typically 'background or pristine' condition

The environment, health and safety management cycles have five broad components namely planning, design implementation (covering the construction and operation phases, checking and corrective action and management review.

9.3. Management structure and responsibility for implementation of EMP

9.3.1. Environmental management structure

- (i) The Proponent will utilize the existing arrangements in the implementation of the EMP during planning and design, construction, operation and decommissioning/closure.
- (ii) The Proponent will be accountable for ensuring that resources are made available to effectively implement the EMP and necessary environmental management measures arising from the project.
- (iii) The proponent will develop organizational structure for the proposed Project, showing the reporting lines of staff (Table 6) to be involved in environmental management of the project. The Project Manager will take responsibility for the day to day running of the project and will oversee the detail of implementation of the EMP during construction phase while during operational and decommissioning phases. The two managers, QEHS Manager, HSE will also be responsible in implementation of the EMP.
- (iv) Environmental monitoring will be undertaken regularly, and independent audits of environmental performance conducted from time to time by independent NEMA approved environmental expert.

Table 6: Proposed organizational structure and staff in implementation of EMP

Position	Responsibility
Engineering Manager	performing technical and organizational role of construction works overseeing Implementation of EMP
Project Manager	Schedule preparation, work supervision and resource forecasting for engineering and other technical activities relating to the project.
Contractor(s)	<ul style="list-style-type: none"> • Undertake development of LPG facility in accordance with contract signed with the Proponent; • Adhere to Proponent HSE policies, procedures and other requirements while undertaking the Project Implement aspects of EMP assigned to them
Construction Manager	<ul style="list-style-type: none"> • Effective implementation of the EMP. • Regular performance reviews Corrective and/or remedial action where this may be required.
QHSE Manager	<ul style="list-style-type: none"> • Conducting monitoring and review of EMP implementation by contractors • Develop policies and procedures on the environmental, social, health and safety issues oversee implementation of

	<p>the EMP</p> <ul style="list-style-type: none"> • Inspecting the constructed facilities after completion • Oversee inspection of the constructed facilities after completion of construction works. • Overseeing annual environmental, health and safety and fire audits • Overseeing of construction process and ensuring the implementation of avoidance and mitigation measures • Planning of training programs for personnel in accordance with relevant laws e.g. OSHA 2007 • Preparation of environmental monitoring reporting and any permit applications • Review and analysis of monitoring results and preparation of short reports to Project Manager • Running of day-to-day requirements for EMP implementation
NEMA Registered & licensed EIA/EA Expert	<ul style="list-style-type: none"> • Periodically commissioned to undertake statutory environmental audits Guide the Proponent during implementation of the Environmental management plan
DOSHS Approved H&S advisor	<ul style="list-style-type: none"> • Carry out statutory health and safety audit of the LPG storage and filling plant
DOSHS Approved Fire auditors	<ul style="list-style-type: none"> • Carry out statutory Fire safety audit of the LPG storage and filling plant

9.3.2. Management of contractors

The Contractors will be responsible for implementation of some of the EMP commitments. However, the Proponent fully recognizes that it is not absolved from those management responsibilities. Ultimate responsibility for meeting all commitments lies with the Proponent. The Proponent will commit contractors to meeting the relevant responsibilities by means of specific conditions in the contracts of appointment. Where there is concern over the capacity of contractors to undertake specific activities according to the system stated here, the Proponent will provide additional training to improve the capacity of the contractors. Activities of contractors will be overseen by the Project Manager and staff as appropriate. The Proponent will put in place the following construction phase contractor arrangements to support EMP implementation:

- (i) Contractors will have certain key environmental line functions included in their job descriptions and performance criteria. Critical among these is the Construction Manager.

- (ii) The Construction Manager will be accountable for environmental (including social) management during the construction phase.
- (iii) Specific responsibilities for the Construction Manager will include Regular performance reviews and undertake corrective and/or remedial action where this may be required.
- (iv) Regular (at least monthly) liaison between the Construction Manager, the Project Manager and the HSE Manager and his/her team must be carried out. At the commencement of the construction phase, weekly meetings shall occur. Such meetings shall among other review implementation of EMP requirements, highlight issues of concern, identify required interventions and prescribe corrective actions and schedule, and allocate budget and appoint responsible parties. The plant Manager should receive minutes of meetings and should be invited to attend meetings at least once in a month.
- (v) A code of practice for construction teams will be prepared and implemented. This code will guide the management and behaviour of construction teams. The code will include items relating to health safety and community relations.
- (vi) Information on the implications of construction will be disseminated before construction starts. Contracts will be key tools in managing many potential negative impacts such as transport related incidents. They will specify required environmental and social practices.

9.3.3. Training, awareness and capacity building

The Proponent will ensure that all contractors' staff is inducted on health and safety, environmental and emergency response procedures. The Proponent will use written (newsletter/posters/toolbox talks) and verbal (as part of routine briefings) communication methods to raise awareness on a range of health, safety and environmental issues. This will be done in both Kiswahili and English languages (as appropriate) to ensure that all members of the workforce are made aware.

9.3.4. Monitoring and compliance assessment

During the construction phase, the Proponent will monitor and inspect contractors' written records to demonstrate compliance with the EMP. This compliance monitoring will verify that the responsible parties are implementing the specifications contained in the EMP. Compliance will mean that the contractor is fulfilling contractual obligations. To determine the effectiveness of the EMP, the Proponent will use a series of internal and external inspections and audits including:

- (i) EHS Manager, will arrange for initial and subsequent environmental audits and will provide relevant information required by relevant authorities including NEMA. The audit will be carried out in accordance with EMCA, CAP 387 and its subsidiary legislation, EIA/EA Regulations, 2003. Any negative findings arising from the audits will be addressed accordingly.
- (ii) Internal environmental, health and safety inspections carried out once every week.
- (iii) Minor non-conformances will be discussed during the inspection and recorded as a finding in the inspection report. Major non-conformances will be formally reported.

9.3.5. Incident handling and reporting

- (i) An incident can arise from the following: (i) significant non-conformance with the EMP identified during an internal inspection; (ii) any non-conformance identified by either the authorities or an external audit; (iii) accidents or spills resulting in potential or actual environmental harm; (iv) accidents or near misses that did or could result in injury to staff, visitors to site or the surrounding communities, and (v) significant complaints received from any source.
- (ii) All incidents will be formally recorded and noted in the General Register in accordance with requirements of OSHA 2007.

9.3.6. Checking, corrective action and reporting

- (i) **Checking:** Checking and if necessary implementing corrective action, to ensure that required EMP management activities are being implemented and desired outcomes are achieved. As such this component includes four key activities namely: monitoring selected environmental quality variables as defined in the objectives and targets; ongoing inspections of the operational controls and general state of the operations; internal audits to assess the robustness of the EMP or to focus on a particular performance issue; and external audits to provide independent verification of the efficacy of the EMP.
- (ii) **Corrective action:** There are several mechanisms for implementing corrective action, both during the construction and operational phases. The main mechanisms to address transgressions include verbal instruction (in the event of minor transgressions from established procedure, usually following a site inspection); written instruction (identifying source(s) of problems, usually following an audit) and contract notice (following possible breach of contract).
- (iii) **Reporting:** The findings of all of the above will be structured into instructive reporting that provides information to all required parties on EHS performance, together with

clearly defined corrective action where this is seen to be required. Both the monitoring and inspections are to be reported continuously.

9.3.7. Management review and liaison

- (i)** The Proponent will organize for formal management review at defined intervals both during the construction and operational phases. The purpose of the management review is for senior project management to review the environmental management performance during the preceding period and to propose measures for improving that performance in the spirit of continuous improvement.
- (ii)** Throughout the project cycle, the Proponent will liaise with authorities especially NEMA Kenya to ensure ongoing feedback on the environment performance of the project.

9.4. Proposed project and the EMP context

The EMP (Table 7) addresses the planning and design, pre-construction and construction, operational and closure phases of the proposed project.

9.4.1. Planning and design

Planning and design is necessary to ensure that mitigation and impact management can be effectively implemented in the context of the HSE approach. Planning involves the following activities: identifying and defining the various environmental aspects and related potential positive and negative impacts that can result from the company's activities; establishing a procedure to identify legal and other requirements to which the organisation is subject; identifying and defining appropriate mitigation and management measures, including those reinforcing positive impacts; and establishing and maintaining documented, scheduled environmental objectives and targets at each relevant function and level within the organisation. In the case of the proposed Project the environmental aspects and potential impacts will mainly emanate from the site preparation and construction activities. The proposed project will comprise 20 cubic metres of LPG storage and filling plant. Detailed plans and designs are annexed to this report.

9.4.2. Construction Phase

The EMP contains measures to avoid and mitigate impacts and optimize benefits arising from activities during the pre-construction (e.g. clearing of the construction site) and construction phase (e.g. construction of required infrastructure) of the Project. The principal focus of Project management for construction will include: personnel and contractor management and training; conduct and site management; maintenance of complaints

register; emergency preparedness; and management and mitigation of impacts such as surface runoff, noise, dust, safety and pollution. Assignment of responsibility and contractor management is especially important during the construction phase. Contractors will be held to the highest HSE performance requirements to ensure they meet Proponent's, national and international standards.

- (i) **Impact mitigation and management:** This study identified potential impacts of the proposed project. The subsequent sections provide description of the management plans and programmes within which management and mitigation measures will be implemented.
- (ii) **Impacts and mitigation/ management measures:** The information presented addresses the dual objective of the EMP, namely to fully disclose the commitments undertaken by the Proponent, and to provide the Proponent's as well as Contractor(s) staff with a clear framework for EMP implementation. In addition, the EMP provides a schedule for the implementation of management/mitigation activities, sub-divided by project phase. The schedule shows at a glance, the timing of the many actions required under the EMP. It is particularly useful where management/mitigation measures extend across phases.

9.4.3. Operation phase EMP

- (i) The operation phase of the proposed project will be mainly receipt, storage and delivery of LPG to the customers. For the purpose of the EMP there are three principal mechanisms for the implementation of management and mitigation measures: facilities - these can be either specific facilities that have a dedicated HSE management functions or additions to facilities that are central to the proposed project activity; and procedures- in a similar vein, procedures can be stand-alone procedures with a dedicated; and HSE function (such as a waste management procedure) or can be a modification to an existing activity process to affect the HSE management.
- (ii) 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
- (iii) **Impacts and mitigation/ management measures:** The information presented addresses the dual objective of the EMP, namely to fully disclose the commitments to be undertaken by the Proponent to provide managers and staff with a clear framework for EMP implementation. In addition, the EMP provides a schedule for the implementation

of management/mitigation activities, sub-divided by project phase. The schedule shows at a glance, the timing of the many actions required under the EMP. It is particularly useful where management/mitigation measures extend across phases.

9.4.4. Decommissioning Phase EMP

The EMP addresses how the actions and activities for decommissioning phase are to be dealt with including the rehabilitation and closure plans.

Table 7: Environmental Management Plan for the proposed LPG storage and filling plant on Plot No. 27/Mwihoti/Githurai, Roysambu Sub-county, Nairobi County

Project Phase	Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost(Ksh)
Construction	1. Minimize extraction site impacts and ensure efficient use of raw materials in construction				
	High Demand of Raw material	1. Source building materials from local suppliers who use environmentally friendly processes in their operations.	Proponent & Contractor/engineer	Throughout	20,000
		2. Ensure accurate budgeting and estimation of actual construction material requirements to ensure that the least amount of material necessary is ordered.	Proponent & Contractor/engineer	Throughout	50,000
		3. Ensure that damage or loss of materials at the construction site is kept minimal through proper storage.	Proponent & Contractor/engineer	Throughout	50,000
		4. Use at least 5%-10% recycled, refurbished or salvaged materials to reduce the use of raw materials and divert material from landfills	Proponent & Contractor	Throughout	35,000
	2. Reduce storm-water, runoff and soil erosion				
	Increased storm water, runoff and soil erosion	1. Surface runoff and roof water shall be harvested and stored for reuse.	Engineer/Proponent/QHSE/N EMA expert/contractor	3 months	35,000
	3. Minimize solid waste generation and ensure efficient solid waste management during construction				
	Increased solid waste generation	1. Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3.Composting and reuse 4. Combustion 5. Sanitary land filling.	Engineer/Proponent/QHSE/N EMA expert	Throughout	3,500
		2. Through accurate estimation of the sizes and quantities of materials required, order materials in the sizes and quantities they will be needed, rather than cutting them to size, or having large quantities of residual materials.	Engineer/Proponent/construct ion manager/project manager	One-off	-
3. Ensure that construction materials left over at the end of construction will be used in other projects rather than being		Engineer/Proponent/construct ion manager/project manager	One-off	18,000	

Project Phase	Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost(Ksh)	
		disposed of.				
		4. Ensure that damaged or wasted construction materials including pipes, doors, plumbing and lighting fixtures, marbles will be recovered for refurbishing and use in other projects	Engineer/Proponent/construction manager/project manager	One-off	1,000	
		5. Donate recyclable/reusable or residual materials to local community groups, institutions	Proponent	One-off	-	
		6. 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	Proponent & Contractor	Throughout	2,000	
		7. Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements	Proponent & Contractor	One-off	3,000	
		8. Use building materials that have minimal or no packaging to avoid the generation of excessive packaging waste	Proponent & Contractor	Throughout	-	
	4. Reduce dust emissions					
	Dust emission	1. Ensure strict enforcement of on-site speed limit regulations	Engineer/construction manager/QHSE	Throughout	-	
		2. Avoid excavation works in extremely dry weathers	Contractor/Engineer/construction manager/QHSE	Throughout	15,000pm	
		3. Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles	Engineer/construction manager/QHSE	Throughout	15,000pm	
		4. Personal Protective equipment to be worn	Proponent	Throughout		
		5. construction materials on site to be covered to prevent to be blown off by wind	Contractor	Throughout		
	5. Minimization of exhaust emissions					
	Exhaust emission	1. Vehicle idling time shall be minimised	Proponent & Contractor	Throughout	-	
		2. Alternatively fuelled construction equipment shall be used	Proponent & Contractor	Throughout	-	

Project Phase	Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost(Ksh)	
		where feasible equipment shall be properly tuned and maintained				
		3. Sensitise truck drivers to avoid unnecessary racing of vehicle engines at loading/offloading points and parking areas, and to switch off or keep vehicle engines at these points	Engineer/construction manager/QHSE/	Throughout	-	
	6. Minimization of Noise and vibration					
	Noise and vibration	1. Sensitise construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used.	Proponent & Contractor/Engineer/construction manager/QHSE	Throughout	-	
		2. Sensitise construction drivers to avoid gunning of vehicle engines or unnecessary hooting especially when passing through sensitive areas such as churches, mosques, residential areas and schools	Proponent & Contractor/Engineer/construction manager/QHSE	Throughout	-	
		3. Ensure that construction machinery are kept in good condition to reduce noise generation	Proponent & Contractor	Throughout	12,500	
		4. Ensure that all generators and heavy duty equipment are insulated or placed in enclosures to minimize ambient noise levels.	Proponent & Contractor	Throughout	1,000	
		5. The noisy construction works will entirely be planned to be during day time when most of the neighbours will be at work.	Proponent & all site foreman	Throughout	1,000	
	7. Minimization of Energy Consumption					
	Increased energy consumption	1. Ensure electrical equipment, appliances and lights are switched off when not being used	Proponent & contractor	Throughout	11,000	
		2. Install energy saving fluorescent tubes at all lighting points instead of bulbs	Proponent & contractor	Throughout	22,000	
	8. Minimize water consumption and ensure more efficient and safe water use					
	High Water Demand	1. Promptly detect and repair of water pipe and tank leaks	Proponent	Continuous	1,000pm	

Project Phase	Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost(Ksh)	
		2. Ensure taps are not running when not in use	Proponent	Continuous	500pm	
		3. Install a discharge meter at water outlets to determine and monitor total water usage	Proponent/construction manager	One-off	1,000	
		4. proper recycling of water from other uses for sprinkling dusty pavements	Contractor/construction manager	Continuous	-	
	9. Minimize occupational health and safety risks					
	Personal Protective Gear PPE		Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the premises.	Proponent/QHSE manager	Continuous	20,000
			Construction of a perimeter wall around the project area	Contractor/Engineer/construction manager	On commencement	50,000
			Suitable overalls, safety footwear, dust masks, gas masks, respirators, gloves, ear protection equipment etc should be made available and construction personnel must be trained to use the equipment	Proponent & Contractor/QHSE manager	Once off	20,000
	Health and safety		Implement all necessary measures to ensure health and safety of workers and the general public during operation of the housing project as stipulated in OSHA, 2007	Proponent & Contractor/QHSE manager	Continuous	-
			Well stocked first aid box which is easily available and accessible should be provided within the premises	Proponent & Contractor	One-off	5,000
			Provision must be made for persons to be trained in first aid, with a certificate issued by a recognised body.	Proponent & Contractor	One-off	10,000
			Fire fighting equipment such as fire extinguishers should be provided at strategic locations such as stores and construction areas.	Proponent & Contractor	One-off	20,000
Fire protection		Regular inspection and servicing of the equipment must be	Proponent & Contractor/	Every 3	10,000	

Project Phase	Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost(Ksh)
		undertaken by a reputable service provider and records of such inspections maintained	Proponent & /QHSE manager/fire & safety expert	months	
		Fire escape routes and assembly point to be marked	Proponent & Contractor/ Proponent & /QHSE manager/fire & safety expert	Continuous	15,000
		Signs such as “NO SMOKING” must be prominently displayed within the premises, especially in parts where inflammable materials are stored	Proponent & Contractor	One-off	12,000
Operation	1. Minimization of solid waste generation and ensuring more efficient solid waste management				
	Solid waste generation	1. Provide solid waste handling facilities such as waste bins and skips	Proponent	One-off	10,000
		2. Ensure that solid waste generated at the offices and LPG plant is regularly disposed of appropriately at authorised dumping sites	Proponent	Continuous	13,000pm
		3. Ensure that staff at DRY docks logistic ltd manages their waste efficiently through recycling, reuse and proper disposal procedures.	Proponent	Continuous	-
		3. Donate redundant but furniture to charities and institutions	Proponent	Continuous	-
	2. Minimise risks of sewage release into environment				
	Sewage disposal	1 connect the premises to sewer line	Proponent & Contractor	One-off	300,000
		2. Conduct regular inspections for drainage pipe blockages or damages and fix appropriately	Proponent & Contractor	Continuous	500pm
		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	Proponent	Continuous	5000pm
	3. Minimize energy consumption				
Energy Resource	1. Switch off electrical equipment, appliances and lights when not	Proponent	Continuous	-	

Project Phase	Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost(Ksh)	
	Utilisation	being used				
		2. Install occupation sensing lighting at various locations such as storage areas which are not in use all the time	Proponent	One-off	15,000	
		3. Install energy saving fluorescent tubes at all lighting points within the facility instead of bulbs which consume higher electric energy	Proponent	One-off	15,000	
		4. Monitor energy use during the operation of the project and set targets for efficient energy use	Proponent	Continuous	7,000pm	
		5. Sensitise occupants to use energy efficiently	Proponent	Continuous	5,000	
	4. Minimize water consumption and ensure more efficient and safe water use, fire risks, spillages and leaks					
	Water consumption	1. Promptly detect and repair water pipe and tank leaks	Proponent	Continuous	10,000pm	
		2. Users to conserve water e.g. by avoiding unnecessary toilet flushing.	Proponent	Continuous	5,000pm	
		3. Ensure taps are not running when not in use	Proponent	Continuous	5,000pm	
		4. Install water conserving taps that turn-off automatically when water is not being used	Proponent	One-off	5000pm	
		5. Install a discharge meter at water outlets to determine and monitor total water usage	Proponent	One-off	12,000	
	Fire risks, minimization, health and safety	Implement all necessary measures to ensure health and safety of the workers and the general public during operation of the project as stipulated in OSHA, 2007, Train all workers of fire safety procedures, install ESD at strategic point of the LPG plant	Proponent Fire and safety auditor	Continuous	-	
	Gas leakage and oil spillage risks	Ensure regular monitoring of LPG tanks, install leakage detectors, get services regularly of oil waste handlers, ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the premises.	Proponent,	Continuous	10,000pm	

Project Phase	Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost(Ksh)
Decommissioning	1. Minimize solid waste generation and ensure efficient solid waste management during decommissioning				
	Solid wastes	used building materials and other waste from decommissioning must be transported and dumped in NEMA licensed carriers and Mombasa county council approved sites	Proponent and contractor	Throughout	-
	2. Reduce dust emissions				
	Dust emission	1. Ensure strict enforcement of on-site speed limit regulations	Engineer/QHSE	Throughout	-
		2. Avoid demolitions works in extremely dry weathers	Contractor/Engineer//QHSE	Throughout	15,000pm
		3. Sprinkle water on graded access routes when necessary to reduce dust generation by machines	Engineer/QHSE	Throughout	-
		4. Personal Protective equipment to be worn	Proponent	Throughout	-
		5 demolished materials on site to be covered to prevent to be blown off by wind	Contractor	Throughout	-
	3. Minimization of exhaust emissions				
	Exhaust emission	1. Vehicle idling time shall be minimised	Proponent & Contractor	Throughout the decommissioning period	-
		2. Alternatively fuelled construction equipment shall be used where feasible equipment shall be properly tuned and maintained	Proponent & Contractor	Throughout	-
		3. Sensitise truck drivers to avoid unnecessary racing of vehicle engines at loading/offloading points and parking areas, and to switch off or keep vehicle engines at these points, using mufflers	Engineer/construction manager/QHSE/	Throughout	-
	4. Minimization of Noise and Vibration				
Noise and vibrations	Sensitise machinery drivers and machinery operators to switch off engines of vehicles or machinery not being used.	Proponent & Contractor/ Engineer/construction manager/QHSE	Throughout	-	

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Project Phase	Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost(Ksh)
5 Rehabilitation of project site.					
	Vegetation disturbance	1.Implement an appropriate re-vegetation programme to restore the site to its original status	Contractor, Proponent	One-off	20,000
		2.Consider use of indigenous plant species in re-vegetation	Contractor, Proponent	One-off	-
		3. Trees should be planted at suitable locations so as to interrupt slight lines (screen planting), between the adjacent area and the development.	Contractor, Proponent	Once-off	-

Chapter 10: Conclusions and recommendations

From the findings of this EIA study project report, the following conclusions and recommendations are made:

- (i) The project location does not fall in categories of ecologically sensitive sites, and has insignificant negative impacts;
- (ii) The project will be designed, constructed, and operated according to the acceptable industry norms and standards;
- (iii) The proposed installation of LPG storage and filling plant has the support of the stakeholders;
- (iv) The proposed project will generate socio-economic benefits which would not be realized if the no development of option is considered. Positive implications of the project emanate from its potential to provide employment opportunities, increase availability of cooking gas, and conservation of forests;
- (v) Though there are potential impacts associated with it, it is possible to mitigate them successfully. Successful implementation of the proposed EMP will help to minimize or reduce the environment impacts to the acceptable levels.

It is our opinion that NEMA does consider approving the proposed project subject to adherence of the proposed EMP.

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Annexes

Copy of Certificate of Incorporation for Ameken Minewest Co. Ltd

Copy of Certificate of KRA PIN for Ameken Minewest Co. Ltd

**Copy of Certificate of Tax Compliance Certificate for Ameken
Minewest Co. Ltd**

Copy of Land documents (certificate of lease/title deed)

Copy Change of land user clearance

Copy of Architectural Plans and drawings

Copy DOSH – Certificate of registration of workplace

Copy of fire clearance certificate from Nairobi City County

Copy of letters and references from landowners and administrators in the area

Copies of public participation questionnaires

Copy of practicing licenses – Firm of experts and lead expert