

**ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FULL STUDY FOR PROPOSED 5 METRIC TONS LIQUEFIED PETROLEUM GAS SKID (STORAGE AND DISPENSING) SYSTEM, ON LR NO. E.BUKUSU/S. KANDUYI/22911, MUNYALI, BUNGOMA COUNTY**

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**DECLARATION**

Environmental Impact Assessment study for the above mentioned project has been prepared with due diligence and care by Irungu Maina and Lawrence Cheruiyot Ngeno registered EIA/Audit Experts with the assistance of other EIA experts. The Report was prepared in accordance with the Environmental Management and Coordination Act no. 8 of 1999 and The Environmental (Impact Assessment and Audit) Regulations, 2003 and the relevant Kenya Standards (KS, 1938-Parts 1, 2, 3, 4, and 5) for submission to the National Environmental Management Authority (NEMA).

I, Irungu Maina submit this Environmental Impact Assessment Report, for the 5 Metric Tons Liquefied Petroleum Gas Skid (Storage and Dispensing) System, on **LR NO. E.BUKUSU/S. KANDUYI/22911**, Munyali, Bungoma County. To the best of my knowledge, all the information in this report is true and correct.

**Signed** \_\_\_\_\_ **Date** \_\_\_\_\_  
**(NEMA Registered EIA/Audit Lead Expert Reg No. 1296)**

I, Lawrence Cheruiyot Ngeno submit this Environmental Impact Assessment Report, for the proposed 5 Metric Tons Liquefied Petroleum Gas Skid (Storage and Dispensing) System, **LR NO. E.BUKUSU/S. KANDUYI/22911** Munyali, Bungoma County. To the best of knowledge, all the information in this report is true and correct.

**Signed** \_\_\_\_\_ **Date** \_\_\_\_\_  
**(NEMA Registered EIA/Audit Associate Expert Reg No. 2882)**

I, ..... submit this Environmental Impact Assessment Report, for the proposed 5 Metric Tons Liquefied Petroleum Gas Skid (Storage and Dispensing) System on **LR NO. E.BUKUSU/S. KANDUYI/22911**, Munyali, Bungoma County. To the best of my knowledge, all the information in this report is a truthful representation of all findings as relating to the proposed project.

**Signed** \_\_\_\_\_ **Date** \_\_\_\_\_  
**For and Behalf of the Proponent**

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## **ACKNOWLEDGEMENT**

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We wish thank the neighboring industries and the neighboring community and various stakeholders consulted about the project for their immense contribution, support and co-operation. Their input contributed enormously towards successful authoring of this E.I.A report.

## ACRONYMS

Acronym	Description
AGOL	Africa Gas and Oil Company
API	American Petroleum Institute
ARV	Anti-Retroviral
BS	British Standard
dB(A)	Decibels on the A-Scale
EA	Environment Audit
EHS	Environment, Health & Safety
EIA	Environment Impact Assessment
EMCA	Environmental Management and Coordination Act
ESM	Environmentally Sound Management
GLPGP	The Global LPG Partnership
LPG	Liquefied Petroleum Gas
MSDS	Material Safety Data Sheet
NEMA	National Environment Management Authority
NFPA	National Fire Protection Association – USA
OMCs	Oil Marketing Companies
OSHA	Occupational Health and Safety Act
DHP	Designated Health Practitioner
HSEQ	Health Safety Environment and Quality

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## **Non-Technical Summary**

### **Overview**

This Environmental Impact Assessment (EIA) Full Study Report has been prepared for Topline Traders Limited (hereinafter referred to as the Proponent) for the proposed installation 5 Metric Tons Liquefied Petroleum Gas Skid (Storage and Dispensing) System, on **LR NO. E.BUKUSU/S. KANDUYI/22911**, Munyali, Bungoma County, Kenya. Topline Traders Limited is an established oil and gas marketing company with offices and stations in Kenya and East Africa in general. The company has developed a fundamental understanding of the local and regional markets. Their services and products range cover a critical cross-section of the regional market. They are at the forefront of delivering diverse, material and real solutions to meet Africa's needs for more and secure cleaner and affordable energy. The company provides term and spot LPG product distribution and supply services to commercial entities, government agencies and NGOs. The company's unparalleled reputation is based on consistently delivering large volumes safely, securely and on time, often in the most logistically challenging and complex environments of Kenya. This report has been prepared by Irungu Maina and Lawrence Cheruiyot Ngeno (C/o Tricos Solutions Limited) registered EIA/Audit Experts and Emmanuel Macharia Muriithi-EHS Associate.

### **Project Description**

#### **Introduction**

Topline Traders Limited has expressed interest in developing and installing a 5 Metric Tons Liquefied Petroleum Gas Skid (Storage and Dispensing) System, on **LR NO. E.BUKUSU/S. KANDUYI/22911**, Munyali, Bungoma County.

The proposed project involves the installation of 1X 5MT storage tank, bulkhead, valve package, piping package, pump with electric motor and shutdown system, all self-contained on a mounted skid or frame. The bulkhead will serve a dual-purpose by providing for transport unloading and bob-tail loading. The skid system is fitted with a pump and an electric motor for handling bob-tail activities and gas dispensing. The skid system is equipped is also equipped with gas leaks detectors and gas leakage alarm equipment for safety purposes.

The E.I.A for the project is being undertaken by Irungu Maina and Lawrence Ngeno; NEMA registered team of experts). The experts were appointed by the proponent to complete the EIA study in accordance with Legal Notice (L.N.) 101: Environmental (Impact Assessment and Audit) Regulations 2003 promulgated under the Environmental Management and Coordination Act, 1999, Energy Act No. 12 of 2006 and other acceptable Kenyan standards and Regulations e.g. LPG regulations of 2009 for the LPG industry.

The proposed development activities will mainly involve civil, mechanical and electrical works associated with the installation of the LPG storage tank, pump and filling points and thereafter operations of the facilities. 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.

NEMA have to first be satisfied with the mitigation and control measures of the project's impacts put in place by the proponent. Once the authority grants approval for the EIA process and issue a license, ERC will also have to be approached for the construction permit which will then allow the project to commence.

It is estimated that the project will cost approximately fifteen million and Kenyan Shillings (**Kshs 10,000,000.**) to completion.

### **Project Objectives**

The proposed project aims to increase the availability of LPG in Bungoma and the region. Bio-fuel is diminishing because of the decline in forest count while kerosene is unreliable in terms of availability, affordability besides being a major contributor to environmental pollution i.e. kerosene releases smoke and choking fumes.

This leaves LPG as the only clean and reliable source of energy with minimal human and environmental negative impacts as long as safety concerns on fire and spillages are adequately addressed.

### **Project Cost Estimate**

The proponent has undertaken a preliminary estimate of the total project cost using experienced consultants. The estimated total project cost is approximately **Kshs 10,000,000**

### **Project Description Technical Description**

The proposed project includes the:

- 1X 5MT storage tank mounted on a skid/frame,
- bulkhead,
- valve package,
- piping package,
- Filling system
- Operational office and main office
- Tanker Offloading and loading point with a deluge system.
- Controlled Trucks reversing parking area,
- Fire water tank with the required capacity,
- Recovery sump,
- LPG vapor containment and evaporation pan,
- Clear site drainage

- Construction of a perimeter fence and gate as per the required standards.

### **Safety Design, Engineering and Operation**

The proposed project will be designed, constructed, and operated in conformance with applicable national and international EHS guidelines and standards.

The applicable legislation and regulations include EMCA 1999, Energy Act No. 12 of 2006, Energy (Liquefied Petroleum Gas) Regulations of 2009, KS 1938-1-5: 2006 (Revised Edition KS 1938:2012), on Handling, Storage, and Distribution of LPG in Domestic, Commercial and Industrial Installations, KS 201:2007 on Unified Valves for LPG Cylinders for Domestic use- Specification (third edition), KS ISO 4706 on Refillable Welded Gas Cylinders and other subsidiary regulations.

Safety and health at the facility and protection of people and the environment is not optional but a core part of the process therefore the proponent will put in place all mechanisms, processes and procedures to minimize, 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, standalone gas leak detector and shut off valve system. 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.

An EMP has been prepared which describes the environmental protection strategies that will be employed at the site. The EMP contains the management programs and plans for handling the adverse environmental impacts.

### **Construction Phase**

The 5 Metric Tons Liquefied Petroleum Gas Skid (Storage and Dispensing) System will be installed and hydrostatically tested on site before loading with LPG gas. Most raw materials and fittings required for the LPG facility will be sourced locally. Heavy duty machinery including cranes, bulldozers, excavators, front-end loaders and electric welding machines will be used during construction.

Construction activities are expected to generate noise levels to a limit of 85 decibels and other safety hazards. Where noise is perceived to be above the occupational permissible limits; workers will be required to put on ear defenders.

Environmental noise will be mitigated through fixing of noise barriers on-site and silencers on the mobile plants.

### **Operational Phase**

An effective and state of the art fire protection system will be provided. Loose or piled combustible material, weeds and long grass will not be permitted at least within 3.0m of the storage vessel. The county fire department will be consulted at an early stage regarding the placing of storage vessels and any other guidance in respect to fire-fighting and fire protection facilities before any construction takes place.

Fire protection details will be made up fixed sprays, 3x 20mm hose reel and 2 x 9Kg Dry Chemical Powder extinguishers and a water sprinkler system. The sprinkler system will comprise of 1 1/2" main water line to tank and filling station, 1" and 3/4" cooling rings to storage tank complete with thermo spray sprinkler nozzles. There will be a fire water tank that will hold a 2 hr water supply and incase the storage vessel is threatened it will have an application rate of 10.5 m<sup>2</sup>/min over the whole surface of the storage vessel for at least 60 min non-stop.

The proponent will try his level best to provide jobs for the skilled and unskilled local resource personnel throughout the project lifecycle.

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 legal notice 61, Factories and other places of work (Noise Prevention and Control) Rules, LN 25 of 2005 and ISO: 15664:2001.Noise impacts shall not exceed the standards [Threshold Limit Values (TLV),] adopted by International Labor Organization (ILO), World Health Organization (WHO) and American Conference of Industrial Hygienist (ACGIH) 1989-guideline document.

Skilled and unskilled opportunities will be generated through the operation of the LPG station and in other technical fields as in operations and management. Local people will be employed wherever possible.

#### **Baseline Description of the Project Environment (Biophysical and Socio-economic)**

Bungoma County is home to an estimated 1.7 million people and sits on an area of 2,069 km<sup>2</sup>. Bungoma is the 3rd populous County after Nairobi and Kakamega. It borders three Counties: Kakamega on the South, Trans Nzoia on the North and Busia on the West. It also enjoys a vast shared international border with Uganda.

Bungoma County has 9 constituencies and 45 County Assembly wards. The 9 constituencies, which also serve as Sub-Counties, include Kanduyi, Bumula, Webuye East, Webuye West, Kabuchai, Sirisia, Tongaren, Kimilili and Mt. Elgon.

Bungoma is a melting pot of sub-tribes and cultures including the Bukusu, Teso, Sabaot, Tachoni, Batura, Bongomek and the Banubi. The fusion of the different cultures and traditions has boosted County's potential as a destination for cultural tourism. Still, even with the diverse cultures, Bungoma has remained the most peaceful County in the region even in the heat of politics – a fact that has seen many other communities pitch homes and businesses in the County and lifted its profile as an investment hub.

The proposed project area located in Munyali 300 meters from the main Pumzika-Siritani/Mawanda Road and is adjacent to G.K Bungoma Prison.

Bungoma County is strategically located as the gateway to Uganda and into other Eastern and Central Africa countries including Rwanda, Burundi and Southern Sudan. The County enjoys two shared (gazetted) border points with Uganda through Lwakhakha and Chepkube. Malaba in Busia is only 43km from the County's Central Business District. Its vantage position in the region makes it ideal for cross-border trade with Uganda and other countries on the Northern Corridor.

### **Pollution from Waste**

During construction phase, waste will be generated from construction activities, domestic waste from construction team, sewage, waste oil, treated timber, polythene and plastics packaging material and lubricants, containers of used construction materials and wastewater from hydrostatic testing.

During operational phase, waste to be generated include domestic waste generated by the operation staff, components/parts of the facility's infrastructure been removed during replacement; and redundant electronic equipment.

Whereas during decommissioning phase, the main waste generated will be from demolished parts of the facility which include; concrete boulders, scrap metals, plastics and rubber among others. The contractor should develop an integrated solid waste management system for the site.

### **Impacts on Ambient Noise Quality**

During the construction phase the proposed project will utilize machineries such as hydraulic excavator, mobile service crane, dumpster and tipper trucks which are likely to generate noise. The contractor at site will be expected to provide proper protective equipment and well planned programs for equipment usage.

During operation phase noise generation will be from the generator, compressor and the pumps. The amount of noise will depend on the size and the model of the pump to be used.

As will be the case with the construction phase, the sources of noise during decommissioning phase, will be mainly machinery and vehicles used in demolition of the facility and removing the materials from the site. The construction activities will be limited to daytime and the workers will be provided with personal protective equipment e.g. ear defenders.

### **Health and Safety 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 **BLEVE** (Boiling Liquid Expanding Vapor Explosion), fire outbreaks and explosions.

A number of activities 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 tank 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 (BLEVE) and fire outbreaks, severe cold burns upon contact with LPG. 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 proper safety measures are not put in place. The impact significance related to public safety is likely to be high during operational phase of the project compared to all the other phases.

### **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. The proposed management programmes includes:

- Air quality management programme
- Noise management programme

While the plans include:

- Construction management plan;
- Construction control plan;
- Workplace health and safety plan;
- Community health and safety plan; and
- 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 neighbors and 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**

### **Conclusion**

The project, including the construction and operation of the LPG tank and cylinder filling station is anticipated to provide sufficient stock of LPG to the Kenyan population and also lower CO<sub>2</sub> emissions to the atmosphere. 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 will be monitored and audited to ensure compliance.

### **Recommendation**

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.

## 1.0. INTRODUCTION

### 1.1. Project Background

Topline Traders Limited is an upcoming company registered in Kenya in accordance with the provisions of the Company Act (2015) with an interest in gaining a foothold into the untapped filling of gas market in Bungoma and its environs.

The company also operates mainly in Nairobi and Nakuru counties.

**Topline Traders Limited's vision** is to become a major player in LPG wholesaler and distribution covering Nairobi and the surrounding regions. The Company has the requisite competence and ability to compete and grow in the highly competitive LPG sector, whilst doing business fairly, and in accordance with its guiding principles.

**Topline Traders Limited's vision** is to establish a clear and emphatic company presence in the Kenya LPG market place as a Petroleum Products and Services distributor of choice, providing the highest levels of service to its Customers and Partners and adding value to the supply chain.

The company is firmly positioned as the principal Kenya African transporter, wholesaler and distributor of a selected range of world class LPG products and accessories, backed by a comprehensive range of Distribution Agreements with major global distributors.

#### **Topline Traders Limited's Aims and Objective**

- To serve the national interests in LPG and related sectors in accordance and consistent with Government policies.
- To ensure maintenance of continuous and smooth supplies of LPG products by way of LPG refilling, transportation and marketing activities and to provide appropriate assistance to consumers to conserve and use petroleum products efficiently.
- To enhance the country's self-sufficiency in LPG refilling and build expertise in laying of LPG refilling plants.
- To maximize utilization of the existing facilities for improving efficiency and increasing productivity
- To inculcate strong 'core values' among the employees and continuously update skill sets for full exploitation of the new business opportunities.
- To develop operational synergies with subsidiaries and joint ventures and continuously engage across the hydrocarbon value chain for the benefit of society at large.

#### **Regions and Branch Offices**

The Company has its executive management, administrative services and call Centers based in its Headquarter Located at Industrial Area, Nakuru There are Sales Office and Support Centers in four major hubs, Kiambu, Embakasi, Nanyuki, Machakos. The Company operates with a transport (tanker) license for LPG Gas from Energy Regulatory Commission (ERC).

Our operations are supported by 5 branch offices in the key locations of, Nairobi, Kenya.

#### **Service Delivery**

This infrastructure of the four regional Hubs and various branch offices enable us to provide services delivery across 10 counties, this in association with our resellers and in support of multinational companies.

We strive to employ a business culture that not only considers the present requirements of our partners, but also the evolution of their requirements over time in support of their clients. Topline Traders Limited is responsive to the needs of its channel, and projects herself as part of a channel's success and an extension of their sales and support teams.

Topline Traders Limited was incorporated to tap into the developing Kenya LPG industry and therefore promote the use of clean energy especially among the low income populations.

In light the above, the proponent would like to develop and install a 5 Metric Tons Liquefied Petroleum Gas Skid (Storage and Dispensing) System on LR NO. E.BUKUSU/S. KANDUYI/22911, Munyali, Bungoma County, Kenya.

The Legal Notice No. 101 of 2003 (EIA/EA Regulations, 2003) requires the Proponent to prepare an EIA Study Report for approval by National Environment Management Authority (NEMA) prior to commencement of a new development. In light of this, Topline Traders Limited wholesaler and distributors Limited have committed themselves to undertaking environmental impact assessment for the proposed project through NEMA registered consultants.

## **1.2. Project Justification**

According to the GLPGP – Kenya Market Assessment Report; 87% of Kenyans use solid fuels as their primary fuel source for cooking while 5% use kerosene as a primary fuel. The heavy reliance on inefficient traditional biomass sources exacerbate forest degradation and climate change, and have not only detrimental impacts on health but also promote poverty in Kenya.

- Over 15,000 Kenyans die annually due to exposure to household air pollution from burning solid fuels
- >40% of childhood deaths are related to respiratory illness due to exposure to kerosene, wood and charcoal smoke
- Average Kenyan household of 4 family members emit 1.2 tons of CO<sub>2</sub> per year
- Kenya has experienced regional deforestation and degradation, with an overall 5% decline in its forest area since 1990.

There are a number of ways to reduce some or all of these negative impacts, including using improved biomass cook stoves and switching to modern fuels such as LPG. Different solutions will be appropriate for different user segments. Less than 5% of Kenyans use LPG as their primary cooking fuel, with 5% is using kerosene and less than 1% using improved biomass cook stoves. The following attributes make LPG an ideal current source of fuel.

- LPG represents a cleaner alternative to solid fuels and kerosene in the short-term, and a promising transition fuel for countries transitioning to more modern cooking technologies in the long-term<sup>1</sup>.
- LPG is particularly attractive for urban and peri-urban households given the lower availability of firewood, the purchase of cooking fuels with cash, and the ease and efficiency of LPG distribution and retail due to the greater population density.
- While kerosene is considered a modern fuel used primarily in urban areas, recent evidence highlighting its carcinogenic characteristics make it less attractive. The new campaign in the country for a “Kerosene free Kenya” should speed up the momentum to move away from kerosene.
- Opportunities in the short-term to increase LPG use in rural areas are more limited. 87% of rural households use firewood as a primary fuel, and 75% of households using firewood in Kenya are collectors, acquiring the fuel at no direct cost.

### 1.3. Project Objectives

Having been in the transport business of LPG for so long; the Proponent is seeking to expand its activities to include storage and refilling of gas thus increase its market shares in this dynamic and competitive LPG industry in Kenya's capital and other regions. The proposed 5 Metric Tons Liquefied Petroleum Gas Skid (Storage and Dispensing) System will therefore ensure the availability and accessibility of the gas; which will be filled in, 6kg 13kg, and 50kgs (where need be) branded cylinders conforming to the requirements of the KS 201: 2007 Unified Valves for LPG Cylinders for Domestic use- Specification (third edition) and the LPG Regulations of 2009. The proponent may have the liberty of purchasing cylinders from approved and certified suppliers. This will definitely save on the cost of importing cylinders.

The proponent will further comply during operations with the specifications set out in the KS 06-896 for periodic inspection, testing and maintenance of transportable gas containers.

### 1.4. Data Collection Methods

The team of Experts employed various approaches in collecting data and information for assessing the impacts of the proposed project. The following techniques were used:

#### 1.4.1. Review of secondary data

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

#### 1.4.2. Study of the bio-physical and the socio-economic environment

A thorough studying into the bio-physical and the socio-economic environment of the project area; aided in understanding the viability and the feasibility of bringing the project to the area. The studies ranged but not limited to the following:

Studying the topography of land, ecology and soils, drainage patterns, Land use zoning requirements, Population distribution and settlement patterns (so that proximity of the project to the people is properly determined).

### 1.5. Assessing significance of Impacts

The first stage of impact assessment is identification of environmental activities, aspects and impacts. The significance of the impacts is then assessed by rating each variable numerically according to defined criteria as outlined in **Table 1**.

The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The severity, spatial scope and duration of the impact together comprise the **consequence** of the impact and when summed can obtain a maximum value of 15. The frequency of the activity and the frequency of the impact together comprise the **likelihood** of the impact occurring and can obtain a maximum value of 10.

The values for likelihood and consequence of the impact are then read off a significance rating matrix (Table 2), and it is determined whether mitigation is necessary using Table 3. The definitions used in the impact assessment are given below:

An **activity** is a distinct process or task undertaken by an organization for which a responsibility can be assigned. Activities also include facilities or components of infrastructure that are owned by an organization.

An **environmental aspect** is an 'element of an organization's activities, products and services which can interact with the environment. The interaction of an aspect with the environment may result in an impact.

**Environmental impacts** are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality.

**Receptors** can comprise, but are not limited to, people or human-made structures or systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as aquifers, flora and paleontology. In the case where the impact is on human health or wellbeing, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is.

**Resources** include components of the biophysical environment.

**Frequency of activity** refers to how often the proposed activity will take place.

**Frequency of impact** refers to the frequency with which a stressor (aspect) will impact on the receptor.

**Severity refers** to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.

**Spatial scope** refers to the geographical scale of the impact.

**Duration** refers to the length of time over which the stressor will cause a change in the resource or receptor.

**Table 1: Criteria for assessing significance of impacts**

**Consequences**

<b>Magnitude of Impact</b>	<b>Rating</b>
Negligible	1
Minor	2
Marginal	3
Significant	4
Catastrophic	5
<b>Spatial Scope/Geographic Extent of</b>	<b>Rating</b>
Activity specific	1
Site specific	2
Local area (within 5km of the project site)	3
Regional	4
National	5
<b>Duration of Impact</b>	<b>Rating</b>
One day to one month	1
One month to one year	2
One year to ten years	3
Life of operation	4
Post closure/permanent	5

**Likelihood**

Frequency/duration of activity	Rating
Annually or less	1
6 monthly/temporary	2
Monthly/infrequent	3
Weekly/life of operation	4
Daily/permanent	5

Frequency of impact	Rating
Almost never/Impossible	1
Very seldom/highly unlikely	2
Infrequent/ unlikely seldom	3
Often/regularly/likely/possible	4
Daily/highly likely/definitely	5

**Table 2: Significance Rating Matrix**

Consequence (Magnitude+ Geographic extent + Duration of the impact)															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Likelihood (Frequency of Activity Frequency of Impact)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

**Table 3: Positive/negative mitigation ratings and associated color codes**

<b>Significance rating</b>	<b>Value</b>	<b>Color Code</b>	<b>Negative Impact Management Recommendation</b>	<b>Positive Impact Management Recommendation</b>
Very high	126-150		Propose mitigation measures	Maintain current management
High	100-120		Propose mitigation measures	Maintain current management
Medium high	77-105		Propose mitigation measures	Maintain current management
Low medium	52-75		Maintain current management	Improve current management
Low	25-50		Maintain current management	Improve current management
Very low	4-24		Maintain current management	Improve current management

### **1.6. Purpose of this Report**

This report addresses the requirement for preparation of EIA Study Report in accordance with EIA/EA Regulations, 2003. The report presents an overview of the proposed project and the environmental regulatory framework from which it operates. It identifies and assesses the significance of the impacts of the project as well as mitigation measures necessary to reduce or prevent impacts from occurring.

## 2.0. DESCRIPTION OF THE PROJECT

### 2.1. Proposed Project Description

The proposed project will have the installation of 1 x 5MT storage tank, bulkhead, valve package, piping package, pump with electric motor and shutdown system, all self-contained on a mounted skid. The bulkhead will serve a dual-purpose by providing for transport unloading and bob-tail loading. The skid system is fitted with a pump and an electric motor for handling bob-tail activities and gas dispensing. The skid system is also equipped with gas leaks detectors and gas leakage alarm equipment for safety purpose. The project will also entail the construction of a 300mm perimeter wall fencing with two emergency exits. The project will occupy a surveyed area of 0.15 Hectares. Standard LPG cylinders will be filled on site and transported in trucks approved by ERC.



**Figure 1:** Part of the plot to be developed for LPG Storage and Filling Plant with the construction of the perimeter wall ongoing.

The establishment will comprise of:

The surface area beneath the Liquefied Petroleum Gas Skid (Storage and Dispensing) System (as recommended by the standard) will be made of concrete material and will slope away from the storage vessel at a gradient of at least 1:50, to the edge of the appropriate safety distance limit. Excavation of the loam soil up to a depth not exceeding 3m to hard rock and cart away debris, upon which paving with concrete will be done: The tank will be covered by:



- Casting a concrete slab for the Skid (Storage and Dispensing) System
- Designation and marking of the trucks reversing and temporary parking area during offloading and loading activities. This area will have fully fledged deluge system to back up the fire water tank especially for the mobile equipment e.g. trucks.
- 3 chamber LPG vapor containment area, (10m by 9m by 2m thick) as a result of the sloping terrain.
- LPG piping work and mechanical works.
- Painting work.
- Purge air from the tank and pipelines and commission
- A 300mm thick Masonry block boundary wall to be constructed to a height of about 3m.

**Figure 2: A sketch of the proposed project site**

*A more detailed site layout showing the respective features of the proposed project are appended at the end of this report.*

## **2.2. Technical Requirements for the Mounted Skid**

### **2.2.1. Materials of Construction:**

The LPG tank shall be designed and built in accordance with recognized best engineering standards for the material of construction being used for only underground use. The tank shall be of steel or other approved non-combustible material and shall be compatible with the gas to be stored as per NFPA 30 standard.

### **2.2.2. Normal Venting for the Above Ground Storage Tank**

Tank venting systems shall be provided with sufficient capacity to prevent blowback of vapor or liquid at the fill opening while line tank is being filled. Vent pipes shall be sized in accordance with Vent diameter requirements as enshrined in the standard. However, the diameter shall not be less than 1.25 inch nominal inside.

Piping for normal and emergency relief venting shall be designed in accordance with the NFPA 30 standards for emergency relief.

### **2.2.3. Design of Storage Tank System Corrosion Protection**

Metal used to fabricate the tank shall be thick enough to compensate for internal corrosion expected during the design life of the tank or other approved means of corrosion protection shall be provided as stipulated in the appropriate provisions of SABS 1535.

### **2.2.4. Design and Technology Standards**

The recommended standards and technologies used for the design, construction and operation of the LPG facility include various international codes of practice, Standards, Government Acts and Local Authority Regulations.

In Kenya there are a limited number of regulations covering the technology to be used in the design, construction and operation of the LPG station.

Kenya Bureau of Standards (KEBS) through an ad hoc committee has developed standards to guide successful and safe development of Liquefied Petroleum Gas (LPG) installations. In this case therefore among other standards

already discussed in this report; KS 1938-1-5: 2006 (Revised edition is the KS 1938:2012 which has no major changes) on the Handling, Storage and Distribution of Liquefied Petroleum Gas in Domestic, Commercial and Industrial Installations. Subsequently the country also relies on international codes of practice, standards and guidelines for the design, construction and operation of such facilities.

In summary the proposed project will be designed and constructed in alignment with the standards quoted in table 4 below.

**Table 4: Standards to be used for the Proposed LPG facility**

<b>Mechanical Works</b>	
Kenya Standards KS 1938:2006(Revised Edition KS 1938:2012)	The handling, storage and distribution of liquefied petroleum gas in Domestic, commercial and industrial installations-code of practice. Part 1: Liquefied petroleum gas installations involving gas storage containers of individual capacity not exceeding 500L and a combined water capacity not exceeding 3000L per installation. Part 2: Transportation of LPG in bulk by road. Part 3: Liquefied petroleum gas installations involving storage vessels of individual water capacity exceeding 500L Part 4: Storage and filling sites for refillable liquefied petroleum gas(LPG) containers not exceeding 45 kg
National Fire Protection Association (NFPA) 30 Flammable and Combustible Liquid Code	NFPA 30 provides safeguards to reduce the hazards associated with the storage, handling, and use of flammable and combustible liquids.
KS 201: 2007	Unified Valves for LPG Cylinders for Domestic use- Specification (third edition)
KS ISO 4706	Refillable welded gas cylinders
KS 06-896	Periodic inspection, testing and maintenance of transportable gas containers.
BS 1414	Steel Wedge Gate Valves for the Petroleum, Petrochemical and Allied Industries
BS 1868	Steel Check Valves (Flanged and Butt-Welding Ends) for the Petroleum, Petrochemical and allied Industries
BS 5352	Steel Wedge Gate, Globe and Check Valves 50mm and smaller for the Petroleum, Petrochemical and Allied Industries.
ASME B 16.9 1P part 2	Factory Made Wrought Steel Butt Welding Fittings Marketing Safety Code (for all works)
<b>Electrical Works</b>	
BS 5467	Specification for XLPE Insulated Cables
BS 5486	Low Voltage Switchgear and Control Gear Assemblies
BS 5501	Electrical Apparatus for Potentially Explosive Atmospheres
BS 7430	Code of Practice for Earthing

BS 7671	Requirements for electrical Installations
IP Part 1	Electrical Safety Code
IEC 502	Specification for XLPE insulated Power Cables
<b>Instrumentation and Control</b>	
BS 381 C	Colors for Identification, Coding and special Purposes
BS 1363	1 3A plugs, socket-outlets and adapters
BS 4196	Sound Power Levels of Noise Sources
BS 5308	Instrument Cables
BS 6739	Code of Practice for Instrumentation in process Control Code of Practice for Earthing
BS 6739	Code of Practice for the Instrumentation of in Process Control Systems: socket outlets and couplers for industrial purposes
P Part 15	Area Classification code for Petroleum Installations
<b>Civil and Structural Standards</b>	
BS 8110	Structural use of concrete
BS 8004	Code of practice for foundations
BS 5328	Specification for concrete
BS 6032	Code of practice for earth works
BS 1881	Testing concrete
BS 812	Testing aggregates

The tank will be located at least 9m from the tanker filling point. During construction, the contractor will adhere to international and local standards including NFPA 30, API 25, API 2510A and KS 1938 Standards (both old and revised edition 1938:2012).

### 2.5. Filling Process

The filling process will take place in the cylinder filling skid (part of the vessel) and cylinders will be stored in a perforated storage area before loading on to trucks. 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 do not occur, and leakages will be detected using the leak detection system.

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. Only cylinders that conform to the requirements of KS 201:2007- Unified Valves for LPG Cylinders for Domestic use- Specification (third edition) will be allowed in the facility.

### 2.7. Boundary wall

The project area is already surrounded by a 300 mm thick masonry boundary wall. Reinforcement if need be will be done for the wall to ensure maximum safety. Considering that the safety distances have been met; there will no need for a fire wall. The wall has one access gate which also serves as an emergency gate; one more gate will be constructed on the same side as existing one in order to meet the Kenyan standards requirements.

## 2.8. Emergency Response Preparedness.

The potential health and safety impacts of the proposed project that could call for the need to have a robust **emergency response and preparedness** include the occupational health 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. (Explosions are normally as a result of **BLEVE** Boiling Liquid Expanding Vaporization Explosion; i.e. LPG is stored as a liquid under pressure, leakage, especially of liquid can release large volumes of highly flammable gas; a gas-air mixture containing approximately 1.5% to 10% by volume of LP gas (mostly propane components) is flammable. If a large enough volume of gas is so dispersed in the atmosphere as to reach flammable proportions throughout, ignition of the mixture will result in a rate of combustion of near-explosive force. When explosion happens this is called **BLEVE**).

The potential occupational health and safety impacts requiring emergency care on site and beyond are discussed below as per project phases:

During construction phase will include injuries through the construction activities whilst during the operational 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.

The proponent has endeavored to mitigate the above potential cases of emergency as below.

**2.8.1. LPG filling skid Plant and Its Accessories Design and Installation**

The plant has been designed in accordance with the requirements of KS 1938:2006- Code of practice for handling, storage and distribution of LPG in domestic, commercial and industrial installations. Part 3: LPG installation involving storage vessels of individual water storage capacity exceeding 500L.

Other laws and industry practices will be adhered to as well as highlighted in the table below:

Legislation	Responsible Institution/Lead	Main Purpose	Relevance to the Proposed Project
KS 1938:2006	KEBS/ERC	Code of practice for handling, storage and distribution of LPG in domestic, commercial and industrial installations  Part 3: LPG installation involving storage vessels of individual water storage capacity exceeding 500L	The Standard provides guidelines for: Design pressure Fire protection Construction and initial (production) testing of storage vessel Filling ratio and volumes of storage vessel Storage vessel location Installation of LPG storage vessels Installation of vaporizers Periodic inspection and retesting; Electrical equipment and other sources of ignition. Filling point for bulk storage vessel; Filling of portable containers

<p>Physical Planning Act of 1986;  Copy of approved drawing  accordance with Local  Government Act, with  specifications and plans in  duplicate; A clearance  certificate from Chief Fire  Officer;  A declaration of the intended  use of LPG that is to be stored  A copy of certificate of  adherence to the KS 1938(1-  5) Transport LPG by road in  accordance with the Act and  terms and conditions of a  valid license issued by  the  Commission;</p>			
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**2.8.2. Risk Significance during Construction & Operational Phases.**

**2.8.2.1. Construction phase**

<b>Impact without mitigation: Risk of large scale incident</b>	<b>Significance</b>
<b>Consequence</b>	
Magnitude	5
Geographic extent	2
Duration of impact	1
<b>Total</b>	<b>8</b>

<b>Likelihood</b>	
Duration of activity	4
Frequency of impact	4
<b>Total</b>	<b>8</b>
<b>Results (Consequence * Likelihood)</b>	<b>- 64 (Low medium)</b>

*Comment/mitigation:*  
Mitigation measures for the potential Occupational Health and Safety impacts will be covered in the construction Safety Management Plan. The implementation of the proposed project to be done in accordance to the OSHA 2007 and any other relevant H&S legislation.

<b>Impact with mitigation: Risk of large scale incident</b>	
<b>Consequence</b>	
Magnitude	1
Geographic extent	1
Duration of impact	2
<b>Total</b>	<b>4</b>
<b>Likelihood</b>	
Duration of activity	2

Frequency of impact	1
<b>Total</b>	<b>3</b>
Results ( <b>Consequence * Likelihood</b> )	<b>- 12 (Very low)</b>

#### 2.8.2.2. Operation Phase

<b>Impact without mitigation: Risk of large scale incident</b>	<b>Significance</b>
<b>Consequence</b>	
Magnitude	5
Geographic extent	4
Duration of impact	4
<b>Total</b>	<b>13</b>
<b>Likelihood</b>	
Duration of activity	4
Frequency of impact	3
<b>Total</b>	<b>7</b>
Results ( <b>Consequence * Likelihood</b> )	<b>- 91( medium high)</b>
<i>Comment/mitigation:</i>	

Mitigation measures for impacts resulting from public safety are covered in the proposed EMP.

<b>Impact with mitigation: risks to public safety</b>	
<b>Consequence</b>	
Magnitude	3
Geographic extent	2
Duration of impact	2
<b>Total</b>	<b>7</b>
<b>Likelihood</b>	
Duration of activity	4
Frequency of impact	1
<b>Total</b>	<b>5</b>
Results ( <b>Consequence * Likelihood</b> )	<b>- 35 ( low)</b>



## 2.9. Emergency Response Programme

The aim of this programme is to ensure that the Safety and Health of the employees' and the surrounding neighbour's quality is maintained throughout construction, as well as operational phases. The emergency response programme will include the following: undertaking Safety & Health risk assessments, Safety & Health audits, Provision of adequate and appropriate firefighting equipment, Provision of Personal Protective Equipment to the workers and Issuing of work permit systems for hot jobs at the site, clearly marked escape routes on site, ensuring that there are Emergency contacts on site to be used in case of an emergency.

### 2.9.1. Preparedness & Response Site Plan (Summary)

- We will have site response plan that will enable rapid and effective response to all types of environmental emergencies in accordance with recognized national and international standards. The emergency plan shall include establishment of a network of communication between the Company and emergency services including police, ambulance services, and fire brigades among others.
- The following personnel will have their emergency contacts displayed on the ER site contact list in conveniently accessible location e.g. the main gate and site offices.
  - **Proponent Telephone Contacts- +254716648576**
  - **Kenya Police Headquarters (Vigilance House) 2240000/ 0726035455/ 02034114411**
  - **Bungoma Police Station: 020 30154**
  - **Bungoma County Fire Brigade: 0725571556**
  - **St John Ambulance 0706-777077**
  - **Red Cross- 0700-395395**
  - **AAR Ambulance 0729-933559**
- We will regularly test emergency preparedness with drill operations and shall review drills, conduct mock emergencies and remedy shortcomings to ensure a high level of emergency readiness to deal with environmental and third party incidents.
- There shall be at least two emergency exits one for exiting of trucks and one for public safety. We will also have designated trained fire marshals to assist during cases of emergencies muster point/ fire assembly point outside the plant.
- Clearly marked safety signage with the required coding will be installed on site e.g. **"NO SMOKING SIGNS"**
- All staff including the security personnel will be trained in basic firefighting skills, first aid, One Man Down stretcher bearers etc.
- No trucks will be allowed to park near the exits, fire assembly points as per the site layout drawings.
- No flammable materials e.g. lighters, torches, mobile phones, will be allowed near the filling plant except **ONLY** may be allowed under strict supervision in the offices and the security gates.

## **2.9.2. Fire Prevention and management.**

### **2.9.2.1. Construction Phase**

- We will take all necessary precautions to prevent fires caused either deliberately or accidentally during construction process.
- The proponent's site build contractor shall prepare a fire prevention and fire emergency plan as a part of the Environmental Plan to be submitted to the management of Topline Traders Limited.
- The site build contractor shall provide adequate firefighting appliances at specified localities on the worksite to meet any emergency resulting from ignition of a fire.
- The site build contractor shall ensure that hot works is prohibited under specified safety distances and meteorological conditions with high fire risks and that appropriate and adequate firefighting equipment would be required to be on standby at all times where hot work is being carried out.

### **2.9.2.2. Operational Phase**

- All the employees working will be required to be familiar with the facility's fire and emergency procedures.
- Provision of safety induction training to all new staff, site visitors and customers will be done by the SHERQ team and the security personnel.

The facility will have a comprehensive firefighting system covering all hazardous areas and the other areas of the facility. This will ensure that any fire within the filling plant is quickly surpassed and extinguished. Technically fire protection details will be made up fixed sprays and cooling rings, 20mm hose reel and two 9Kg Dry powder extinguishers and a water sprinkler system. The sprinkler system will comprise of 1 1/2" main water line to tank and filling station, 1" and 3/4" cooling rings to storage tank complete with thermo spray sprinkler nozzles. There will be a fire water tank that will hold a 2 hrs. Water supply and in case the storage vessel is threatened by it will have an application rate of 10.5m<sup>2</sup>/min over the whole surface of the storage vessel for at least 2 hours non-stop.

## **2.10. Construction Phase**

### **2.10.1. Site preparation**

Intensive site preparation work will consist of the following; site clearing (relocation of pallets and boxes), 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.

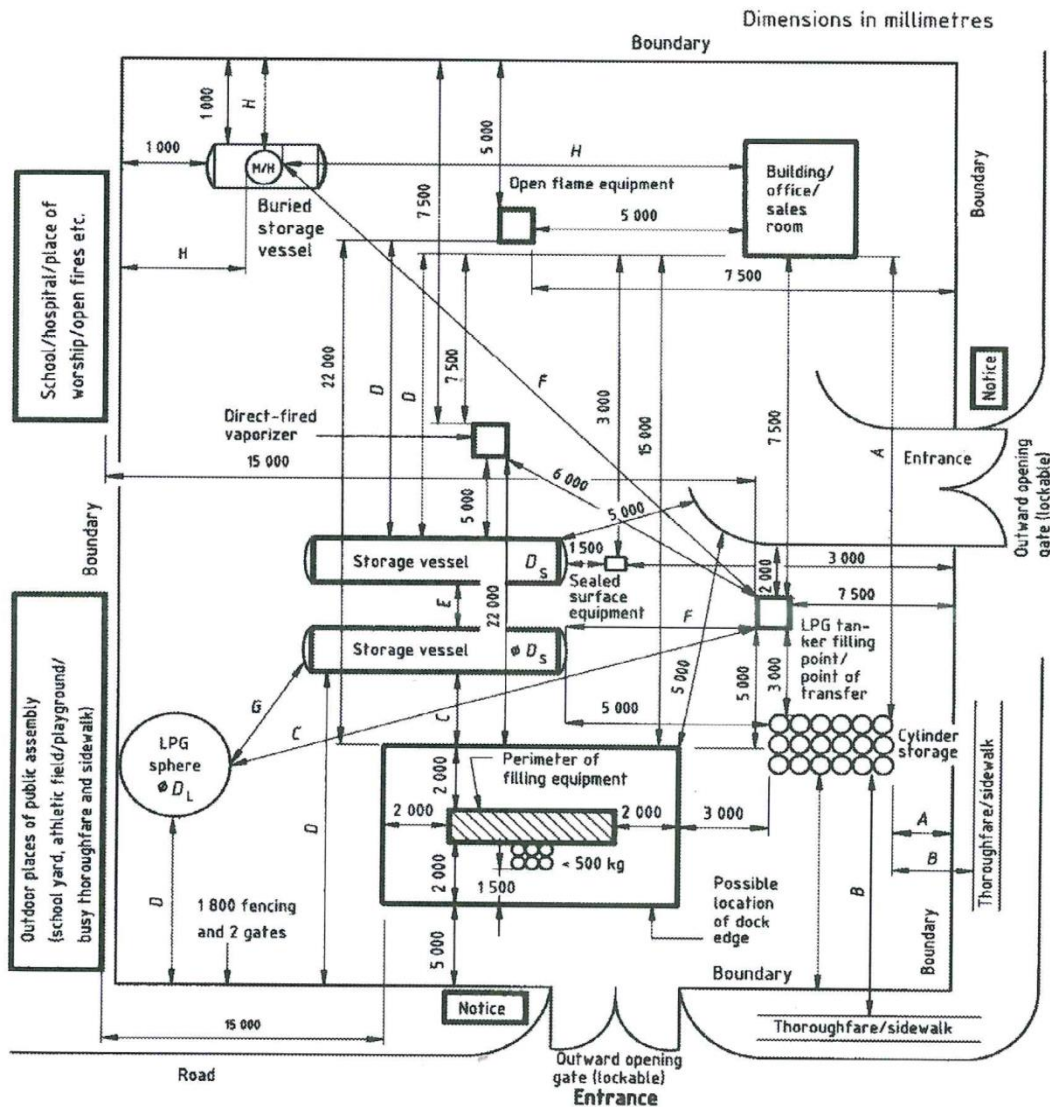
Environmental protection during the construction phase will address management of hazardous materials, dust, erosion and sedimentation control. The site will be maintained in accordance with relevant erosion and

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.

## 2.10.2. Safety Distances

The installation of the Gas Skid (Storage and Dispensing) System will be done as per NFPA standards as discussed above; safety distances guidelines for other ancillary facilities have been captured in the table below (an extract of KS 1938-3:2012).

**Table 5: Recommended Safety distances extract from the KS 1938-3:2006 (Revised edition KS 1938-3:2012).**



- $D_L$  = diameter (large)
- $D_s$  = diameter (small)
- M/H = manhole

**Figure 2a — Recommended safety distances for gas fuel installations**

Dimensions in millimetres

1	2	3	4	5	6	7	8	9	10	11	12
Total quantity of stored LPG kg	A	B	Above-ground vessels	Size of vessel litre water capacity	C	D	E	F	G	H	
500 – 3 000	3 000	3 000		500 – 2 250	5 000	5 000	$\frac{1}{4}$ of sum of diameters of adjacent storage	0	$\frac{D_L + \varphi}{4}$	Buried vessels	3 000
3 001 – 5 000	7 500	7 500		2 251 – 9 000	7 500	7 500		0			5 000
5 001 – 20 000	10 000	10 000		9 001 – 67 500	9 500	9 500	$\frac{1}{2}$ of sum of diameters for vertical vessels	3 000			7 000
> 20 000	15 000	15 000		67 501 – 135 000	15 000	15 000	6 000	15 000			
				135 001 – 265 000	15 000	22 500	9 000	15 000			
				> 265 000	15 000	30 000	9 000	$D_L$	15 000		

Figure 2b– Recommended safety distances for gas fuel installations (concluded)

### 2.10.3. Other Materials Required for Construction

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 will be sourced locally whereas others will be obtained from the quarrying areas Juja, Kakamega and Busia for building sand and sandstones. The materials to be used in the construction of the proposed project must be flame proof, fire retardant and resistant to corrosion. The said materials will be but not limited to the following.

- Sandstone
- Concrete
- Sand
- Steel rods
- PVC pipes
- Water
- Paint
- Corrugated pre-printed roofing.

### 2.10.4. Product

The final product after construction phase is LPG storage and filling which will comprise of a 5 MT Tank and Gas Skid (Storage and Dispensing) System. The gas must be stored as liquid under pressure. Gas leakage must be prevented as this can release highly flammable gases; this will be achieved by the installation of the leak detection system.

### **2.10.5. By-products/ Waste**

The Proposed project will generate several byproducts 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.
- Excavated material

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

#### **2.10.5.1. Domestic Waste from the Construction Area**

The workers will not be supplied with any forms of foodstuffs. They are expected to buy or carry their own food. Plastic bags and containers which the workers will use to carry their food are expected to increase within the site and in the immediate vicinity.

Other forms of waste include sanitary waste and therefore the provision of sanitary facilities will need to be considered both for the site construction workers and the visiting population.

#### **2.10.5.2. Site Construction Waste**

The project will generate waste from the site construction activities which includes:

- Excavated soils and vegetation;
- Construction equipment and maintenance wastes;
- Dust and fumes;
- Scrap metals;
- Packaging materials, etc.

The wastes will be segregated in accordance with Legal Notice 121: Waste Regulation, 2006 with recyclable material collected and transported to a recycling facility. An effort will be made to minimize the amount of waste generated by application of 4-R principles (reduce (from source), reuse, recycle, recover) to the extent practical. Non-recyclable wastes should be transported offsite to a permitted landfill. A Waste Management Plan (WMP) will be developed for all phases of the Project. The objective of this plan is to minimize waste discharges and emissions and identify appropriate waste reduction and other mitigating measures.

Additionally, a 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. Other measures that will be implemented include:

- Programming site activities to minimize the disturbance of the project surface area;
- Avoid maintaining open excavations for prolonged periods and compact loose materials;
- Compacting soils as soon as excavations, filling, or leveling activities are complete;

- Implementing measures to control against sedimentation and erosion, and to ensure that construction personnel are familiar with these practices and conduct them properly; and
- Control of runoff during the construction phase.

#### **2.10.5.3. 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 will be localized and temporary, lasting the duration of construction activities. Routine inspection and maintenance of construction equipment will minimize exhaust fumes.

#### **2.10.5.4. Noise Emissions**

The target noise levels during construction are set at 75dB (A) (BS 5228, 1997) during the day and 70 during the night. These levels are below the permissible limits i.e. 85dB (A) as per the Factories and other places of work (Noise Prevention) Rules of 2005.

#### **2.10.6. 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 with high standards of safety.

### **2.11. Operation Phase**

Once commissioned, the tank will be filled with LPG. The gas will be brought in by ERC Licensed transporters. The product will serve an already growing LPG market in Nairobi and other regions where the demand is high.

#### **2.11.1. Products**

The primary product of the proposed project during the operational phase will be Liquid Petroleum Gas (LPG). **Liquefied petroleum gas** or **liquid petroleum gas (LPG or LP gas)**, also referred to as simply propane or butane, are flammable mixtures of hydrocarbon gases used as fuel in heating appliances, cooking equipment, and vehicles.

It is increasingly used as an aerosol propellant and a refrigerant, replacing chlorofluorocarbons in an effort to reduce damage to the ozone layer. When specifically used as a vehicle fuel it is often referred to as autogas.

LPG is prepared by refining petroleum or "wet" natural gas, and is almost entirely derived from fossil fuel sources, being manufactured during the refining of petroleum (crude oil), or extracted from petroleum or natural gas streams as they emerge from the ground.

LPG is mainly used in the below activities:

### 2.11.1.1. Cooking

LPG is used for cooking in many countries for economic reasons, for convenience or because it is the preferred fuel source. According to the 2011 census of India, 33.6 million (28.5%) Indian households used LPG as cooking fuel in 2011, which is supplied to their homes in pressurized cylinders. LPG is subsidized by the government in India. Increase in LPG prices has been a politically sensitive matter in India as it potentially affects the urban middle class voting pattern.

LPG was once a popular cooking fuel in Hong Kong; however, the continued expansion of town gas to buildings has reduced LPG usage to less than 24% of residential units.

LPG is the most common cooking fuel in Brazilian urban areas, being used in virtually all households, with the exception of the cities of Rio de Janeiro and São Paulo, which have a natural gas pipeline infrastructure. Poor families receive a government grant ("Vale Gás") used exclusively for the acquisition of LPG.

LPG is commonly used in North America for domestic cooking and outdoor grilling.

The current market for LPG in Kenya is underdeveloped, with 5-7% of households relying on LPG as a primary cooking fuel – LPG penetration is much higher in urban areas at 21%; Only 1% of rural households use LPG as a primary fuel – As it is common for some households to use multiple fuels ("fuel stacking"), total LPG penetration may be closer to 7%-10% nationally – The greater Nairobi region accounts for 60% of the market, where penetration rates for LPG are estimated to be as high as 40%. Mombasa makes up 15% of the market, with the remaining market scattered throughout other growing urban centers, especially in Western Kenya.





Figure 3: A 13 kg LPG cylinder used in a household in Kenya

#### **2.11.1.2. Rural heating**

Predominantly in Europe and rural parts of many countries, LPG can provide an alternative to electricity and heating oil (kerosene). LPG is most often used in areas that do not have direct access to piped natural gas. This technology is yet to be adopted in Kenya and many African countries.

LPG can be used as a power source for combined heat and power technologies (CHP). CHP is the process of generating both electrical power and useful heat from a single fuel source. This technology has allowed LPG to be used not just as fuel for heating and cooking, but also for decentralized generation of electricity.

LPG can be stored in a variety of manners. LPG, as with other fossil fuels, can be combined with renewable power sources to provide greater reliability while still achieving some reduction in CO<sub>2</sub> emissions.

## **2.11.2. Waste**

### **2.11.2.1. Effluent Waste**

The area is connected to the Nzoia Water Services Company Ltd Sewer line; waste water from the sanitary facilities on the project site will be channeled to it once the proponent seeks connection to the line.

### **2.11.2.2. Domestic Waste**

Some of the domestic waste to be generated at the facility will include office waste such as paper, empty cans among others. The principle of the 4Rs methods of minimizing waste will be deployed.

### **2.11.2.3. Sanitary waste**

The employees of the Proponent who will be based within the project area are expected to generate sanitary waste which will be channeled to the conservancy tank.

### **2.11.2.4. Air Emissions**

The proposed facilities will be designed to international standards. Subsequently emissions from trucks and lifting machinery etc. are expected to be low.

The only emission sources of significance for the project emission inventory during normal operations include:

- Volatile Organic Compounds (VOCs) during filling and decanting of LPG gas from the tank and tanker respectively.
- Intermittent emissions from routine testing of diesel engine driven emergency generator for backup power;
- Emissions from trucks offloading the LPG gas
  
- Emissions from trucks and other vehicles to be loaded with cylinders.

## **2.12. Decommissioning Phase**

Upon decommissioning of the proposed LPG tank, 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.

### **2.12.1. Products**

During the decommissioning phase people may assume that there will be no product in the tank. However scientifically it is proven that a storage vessel that has held LPG and is deemed to be empty could be dangerous as well as. In this state the internal pressure in the vessel is approximately atmospheric and, if the valve leaks or is left open, air can diffuse into the storage vessel and form a flammable or explosive mixture. Furthermore, an empty storage vessel that does not yield gas when the valve is opened in fact might not be quite empty. In cold weather the heavier fractions of the liquid (dead stock) might not

vaporize and will remain in the storage vessel. All vessels that are (or appear to be) empty should be handled with the same care as used for a full storage vessel.

The following steps will/ should be considered during the decommissioning process.

- LP Gas liquid will be decanted as much as possible through the storage vessel liquid withdrawal connection
- The remaining LP gas vapor will be removed through the venting connection (the vapor will be vented to the open air at a safe location in an approved manner.) and
- Storage vessel will be purged in accordance with appropriate requirements given in KS 1938-1 & 3: 2006 (2012).

#### **2.12.2. By-products/ Waste**

The by-products during decommissioning phase will include:

- Metal generated from the decommissioning of pipe work infrastructure, scrap, demolition wastes from the office block, dust and fumes; and
- Foundation materials which can be donated to individuals for reuse

These will be handled with extra care to avoid any form of ignition that could lead to inflammatory situations.

#### **2.12.3. 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.

#### **2.13. Health and Safety System**

The potential health and safety impacts of the proposed project include the occupational health 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.

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.

#### **2.14. Employment**

The proposed project is anticipated to create both direct and indirect employment in both the construction and operational phases of the project.

## CHAPTER THREE

### 3.0. BASELINE ENVIRONMENT INFORMATION OF THE PROJECT AREA

The baseline environmental condition of the proposed project is described in terms of the existing physical, biological, and social environment.

#### 3.1. Project Location.

The proposed project will be developed on **LR NO. E.BUKUSU/S. KANDUYI/22911**, Munyi, 300 meters off the Pumzika-Sirityani-Mawanda Road, adjacent to the Bugoma G.K Prison.

Figure 4: Satellite Image showing the location of the proposed project site.



Source: **Google Earth**

The plot is under lease arrangement between Antony Maina Karuga and Topline Traders Limited.

Geographically, the site is approximately 300 metres off the Pumzika-Sirityani-Mawanda Road, adjacent to the Bugoma G.K Prison. Its defining coordinates are 0.564615, 34.556266. (Fig4). *(Copy of certificate of lease agreement and copy of the mother title have been appended at the end of this report).*

The project area can be accessed from the busy the Pumzika-Sirityani-Mawanda Road, adjacent to the Bugoma G.K Prison. The surrounding area is zoned for agricultural activities but the Proponent is in the process of acquiring a change of user to industrial set-up.



Figure 5: Access Roads to proposed project site.

## **3.2 Social Economic**

### **3.2.1 Demography**

The 2013 projected population for Bungoma County based on the growth rate of 3.1% was 1,557,236 (Male 760,564 Female 796,672). The projections for 2015 gave the County a population of 1,655,281 (Male 808,449, Female 846,832) and by 2017 the population was projected to stand at 1,759,499 (Male 859,350 and Female 900,149). The Male to Female ratio is 1: 1.2. The county has a growing population with varying demographics, which include fertility, mortality, birth rates, migrations, immigrations among others. Understanding population composition by age cohorts helps to plan for delivery of required needs and services.

### **3.2.3 Transportation and Infrastructure**

The bulk of the road network in Bungoma County is composed of earth surface. The road network is poor and lack overhead foot bridges, designated bicycle and pedestrian lanes. The Nairobi – Kampala railway line traverses through the County but is underutilized since many bulk transporters use roads. This contributes to wear and tear of County roads.

### **3.2.4 Land Tenure and Use**

Agriculture is the backbone of Bungoma County and most families rely on crop production and animal rearing. The main crops include maize, beans, finger millet, sweet potatoes, bananas, Irish potatoes and assorted vegetables. These are grown primarily for subsistence with the excess sold to meet other family needs. On the other hand, the main cash crops include sugar cane, cotton, palm oil, coffee, sun flower and tobacco. Most families integrate livestock production with farming. The main livestock kept include cattle, sheep, goats, donkeys, pigs, poultry and bees. Most of this is on a small scale but some farmers also produce milk and poultry products for commercial use. Milk farmers sell their milk through cooperative societies including Sang'alo, Kikai and Naitiri

## **3.3 Bio-Physical Environment**

### **3.3.1 Physical and Topographical Features**

The major physical features include; the extinct volcanic Mt Elgon, Mt. Elgon forest reserve, National park and mountain vegetation. The other physiographic features include hills (Chetambe, Sang'alo and Kabuchai), rivers, waterfalls such as Nabuyole and Teremi. Mt. Elgon and Sang'alo hill have attractive caves. The altitude of the County ranges from over 4,321m (Mt. Elgon) to 1200m above sea level. Mount Elgon is a 4,321m high extinct volcano, Kenya's second-highest mountain (after Mount Kenya). The County has only one gazetted forest, the Mt. Elgon forest reserve which measures 618.2Km<sup>2</sup>, and one National park, which 4 Integrating Social, Economic, Environmental, Spatial, Legal & Institutional Aspects of Development First Bungoma County Integrated Development Plan 2013- 2017 measures 50.683 Km<sup>2</sup>. It is the source of major rivers including the Nile, Nzoia, Kuywa, sosio, Kibisi and Sio-Malaba/Malakisi.

### **3.3.2 Climate**

The climate here is tropical. Most months of the year are marked by significant rainfall. The short dry season has little impact. The Köppen-Geiger climate classification is Am. The temperature here averages 21.1 °C. In a year, the average rainfall is 1628 mm. The County experiences two rainy seasons, the long-March to July and short rains-August to October. The annual rainfall in the County ranges from 400mm (lowest) to 1,800mm (highest). The annual temperature in the County vary between 0°c and 32°c due to different levels of attitude, with the highest peak of Mt. Elgon recording slightly less than 0°c. The average wind speed is 6.1 km/hr.

February is the warmest month of the year. The temperature in February averages 22.1 °C. The lowest average temperatures in the year occur in July, when it is around 20.0 °C.

There is a difference of 189 mm of precipitation between the driest and wettest months. The variation in temperatures throughout the year is 2.1 °C.

### **3.3.3 Geology**

The county is well drained due to the mountainous topography. The drainage pattern is radial to parallel on the upper and mid-slopes respectively. Flooding is not common and limited to the lower parts specifically at the boundaries with Teso County. However, drainage infrastructure is poor. Storm water flows freely carrying with it massive soils downstream. Water erosion is the major form of erosion in the county.

## CHAPTER FOUR

### 4.0. NATIONAL ENVIRONMENTAL LEGISLATIVE AND REGULATORY FRAMEWORK

This section of the report discusses the policy, applicable EHS legislations and institutional framework.

#### 4.1. National Policy

##### 4.1.1. National Environment Policy

Kenya is in the process of developing a National Environment Policy. During this study Draft No. 5 of the National Policy was reviewed. The Policy will provide for a holistic framework to guide the management of the environment and natural resources in Kenya. It will also ensure that the linkage between the environment and poverty reduction is integrated in all government processes and institutions in order to facilitate and realize sustainable development at all levels in the context of green economy enhancing social inclusion, improving human welfare and creating opportunities for employment and maintaining the healthy functioning of ecosystem.

##### 4.1.2. The Constitution

Kenya promulgated a new constitution in 2010. The new constitution is hailed as a green constitution as it embodies elaborate provisions with considerable implications for sustainable development. The provisions range from environmental principles and implications of multilateral environmental agreements (MEAs) to the right to clean and healthy environment enshrined in the Bill of Rights. Chapter V covers on land and environment. It also embodies a host of social and economic rights of an environmental character, such as the right to water, food and shelter – among others.

Article 69 on obligations in respect of the environment requires the Proponent to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

#### 4.2. Legal Framework

The execution of the proposed project will be done in accordance with all applicable legislation, regulations, approvals and relevant guidelines. **Table 5** provides legislations that are applicable to the proposed project.



**Table 5: Summary of legislations applicable to the proposed project**

Legislation	Responsible Institution/Lead Agency	Main Purpose	Relevance to the Proposed Project
The EMCA, 1999	NEMA	A framework legislation that addresses major issues concerning the environment. The purpose of the Act is to provide for sustainable management of the environment.	Requires the Proponent to: submit EIA Study Report to NEMA before commencing any new project. engage NEMA approved experts in conducting EIA studies
Environment Impact Assessment/Environmental Audit Regulations, 2003	NEMA	Provides for the framework for carrying out environmental impact assessment in Kenya	Requires the Proponent to: Prepare EIA Study report in accordance with the format specified in Regulations and pay attention to issues specified in the second schedule of the Regulations Carry out corrective measures in the improvement order from NEMA Carry out corrective measures in the improvement order from NEMA

<p>L.N. 121: Environmental Management and Coordination (Waste Management) Regulations, 2006</p>	<p>NEMA</p>	<p>Formulated for managing various kinds of waste in Kenya</p>	<p>The Regulations requires the Proponent to: Acquire valid EIA license from NEMA prior to engaging in an activity that can generate hazardous substance</p>
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Legislation	Responsible Institution/Lead Agency	Main Purpose	Relevance to the Proposed Project
			<p>Environmentally acceptable manner.</p> <ul style="list-style-type: none"> <li>□ Transport waste using a vehicle that has an approved “Waste Transportation License” issued by the NEMA</li> <li>□ Dispose of waste in a licensed disposal facility</li> </ul> <p>Label hazardous wastes containers in accordance with the requirements provided in section 18 of the Regulation.</p>
<p>L.N. 120: Environmental Management and Coordination (Water Quality) Regulations, 2006</p>	<p>NEMA</p>	<p>Formulated for sustainable management of water used for various purposes in Kenya</p>	<p>The Regulation requires the Proponent to:</p> <ul style="list-style-type: none"> <li>Refrain from any activity which might cause water pollution.</li> <li>Not to discharge any liquid, gaseous or solid into water resource as to cause pollution.</li> <li>Acquire a valid effluent discharge license to discharge effluent into the environment.</li> <li>Acquire EIA license prior to abstracting ground water or any activity that is likely to have any adverse impact on the quantity and quality of the water</li> <li>follow the monitoring guide set out in the Third Schedule to the regulation when discharging effluent into the environment</li> </ul>

Legislation	Responsible Institution/Lead Agency	Main Purpose	Relevance to the Proposed Project
<p>and Coordination (Noise and Excessive Vibration Pollution) Regulations (Control) Regulations</p>	<p>NEMA</p>	<p>Promulgated for control of Noise and excessive vibration pollution</p>	<p>The regulations:</p> <ul style="list-style-type: none"> <li>Prohibits the Proponent from making or causing to be made noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment.</li> <li>Prohibits the Proponent from making or causing to be made excessive vibration which annoy, disturb, injure or endanger the comfort, response, health or safety of others and the environment</li> <li>Prohibits the Proponent from causing noise which exceeds any sound level as set out in the First Schedule to the Regulations</li> <li>Requires the Proponent (if wishing) to operate or repair any machinery, motor vehicle, construction equipment or other equipment, pump, fan air –conditioning apparatus or similar mechanical device or engage in any commercial or industrial activity which is likely to emit noise or excessive vibrations to do so within the relevant levels prescribed in the First Schedule of the Regulations.</li> <li>Prohibits the Proponent from operating a motor vehicle which produces any loud and unusual sound and exceeds 84 dB (A) when accelerating.</li> <li>Prohibits the Proponent from operating construction equipment or perform any outside construction or repair work so as to emit noise</li> </ul>

Legislation	Responsible Institution/Lead Agency	Main Purpose	Relevance to the Proposed Project
			<p>Identify natural resources; land uses or activities which may be affected by noise or excessive vibrations from construction or demolition;</p> <p>Determine the measures which are needed in the plans and specifications to minimize or eliminate adverse construction or demolition noise or vibration impacts</p> <p>Incorporate the needed abatement measures in the plans and</p>

Legislation	Responsible Institution/Lead Agency	Main Purpose	Relevance to the Proposed Project
<p><b>Hazardous Substances Rules, 2007</b></p>	<p>DOSHS</p>	<p>Protection of employees from exposure to hazardous substances in the workplace</p>	<p>This legislation requires the Proponent to:</p> <p>Ensure that where chemicals come into contact with employees, the exposure limits set out in the First Schedule of the Regulations are not exceeded.</p> <p>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</p> <p>Have a Hazard Communication program implemented at their workplace.</p>

Legislation	Responsible Institution/Lead Agency	Main Purpose	Relevance to the Proposed Project
The Public Health Act Cap 242	Ministry of Public Health	The Act regulates activities detrimental to human and environmental health and safety	The Act prohibits the Proponent from engaging in activities that cause environmental nuisance or those that cause danger, discomfort or annoyance to inhabitants or is hazardous to human and environmental health and safety.
Energy (Liquefied Petroleum Gas), Regulations 2009		The Regulation is a subsidiary of the Energy Act No.12 of 2006; it controls LPG trade and industry in order to ensure integrity and high safety standards for those handling, storing and distributing the product	Rule No.9 states that who wishes to operate an LPG storage facility shall make an application to the commission for a valid license. 9 (3) States that the applicant must present an environmental impact assessment license for a new facility and an environmental audit for an existing facility. The proponent seeks an environmental impact assessment license (EIA) considering this is a new and undeveloped site.
Physical Planning Act, 2012	The county government office; Department of Physical Planning.	An Act of Parliament to provide for the preparation and implementation of physical development plans and for connected purposes	If in connection with a development application a local authority is of the opinion that proposals for industrial location, dumping sites, sewerage treatment, quarries or any other development activity will have injurious impact on the environment, the applicant shall be required to submit together with the application an environmental impact assessment report.

The Local Government Act (Cap. 265)	Ministry of Local Government		The Act requires the Proponent to grant the Officers and servants of Local Authority access to their premises to inspect, maintain, alter or repair sewers, drains, pipes, ventilating shafts or other
The Penal Code (Cap. 63)	Judiciary	Formulated to define the penal system in Kenya. It outlines criminal offences and prescribes penalties to them	The Code Prohibits the Proponent from: Voluntarily corrupting or fouling water for public springs or reservoirs, rendering it less fit for its ordinary use Making or vitiating the atmosphere in any place to make it noxious to health of persons/institution in dwellings or business premises in the neighborhood or those passing along public way.
The Occupier Liability Act (Cap 34)			The Act Requires the Proponent to ensure that visitors to his premises will be reasonably safe in using the premises for the purposes for which he is invited or permitted by the Proponent to be there.



Legislation	Responsible Institution/Lead Agency	Main Purpose	Relevance to the Proposed Project
Occupational Health and Safety Act, 2007	DOSHS	Enacted to provide for the health, safety and welfare of persons employed in workplaces, and for matters incidental thereto and connected therewith.	It requires the Proponent to: <ul style="list-style-type: none"> <li>▫ undertaking S&amp;H risk assessments,</li> <li>▫ provide notification of accidents, injuries and dangerous occurrences, etc.</li> <li>▫ Provide first aid facilities at the workplace</li> <li>▫ provide PPEs to the employees</li> </ul>
Legal Notice No. 25: Noise Prevention and Control Rules	DOSHS	Promulgated for work related noise exposures	It requires the Proponent to: <ul style="list-style-type: none"> <li>▫ Comply with the following permissible noise levels: <p><i>Workplace Noise</i>- 90 dB (A) over an 8-hour TWA period over 24-hours; and 140 dB (A) peak sound level at any given time.</p> <p>Community noise level emanating from a workplace -50 dB(A) during the day; and 45 dB(A) at night.</p> </li> <li>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).</li> <li>Medically examine those employees that may be exposed to continuous noise levels of 85 dB (A) as indicated in Regulation 16. If found unfit, the</li> </ul>

Legislation	Responsible Institution/Lead Agency	Main Purpose	Relevance to the Proposed Project
			<p>Occupational hearing loss to the worker will be compensated as an occupational disease.</p> <p>It is not anticipated that there will be equipment that will generate noise exceeding the threshold levels of noise stipulated under the Rules. However, in case there will, it will be incumbent on the selected contractor to ensure that their equipment complies with the threshold noise values given above. Alternatively the selected contractor will be required to develop, rollout and implement a written hearing conservation program during the project period</p>

Legislation	Responsible Institution/Lead Agency	Main Purpose	Relevance to the Proposed Project
			Physical Planning Act of 1986;  Copy of approved drawing accordance with Local Government Act, with specifications and plans in duplicate; A clearance certificate from Chief Fire Officer; A declaration of the intended use of LPG that is to be stored A copy of certificate of adherence to the KS 1938(1-5) Transport LPG by road in accordance with the Act and
KS 1938:2006	KEBS/ERC	Code of practice for handling, storage and distribution of LPG in domestic, commercial and industrial installations  Part 3: LPG installation involving storage vessels of individual water storage capacity exceeding 500L	The Standard provides guidelines for: Design pressure Fire protection  Construction and initial (production) testing of storage vessel  Filling ratio and volumes of storage vessel Storage vessel location

Legislation	Responsible Institution/Lead Agency	Main Purpose	Relevance to the Proposed Project
			Installation of LPG storage vessels Installation of vaporizers Periodic inspection and retesting; Electrical equipment and other sources of ignition Filling point for bulk storage vessel; Filling of portable containers Container storage areas; Filling shed for portable containers

### **4.3. Institutional Framework**

#### **4.3.1. Ministry of Environment and natural resource**

Kenya's Ministry of Environment and Natural Resource is mandated to monitor, protect, conserve and manage environment and natural resources of the country. The Ministry is to achieve this task through sustainable exploitation of natural resources for socio-economic development geared towards eradication of poverty, improving living standards and maintaining a clean environment for present and future generations.

#### **4.3.2. EMCA 1999 Institutions**

The EMCA, 1999, make provisions for creation of environmental administrative structures under MENR. The institutions that have been created under the Act for environmental management in Kenya are:

NEMA - The principal government authority established under MENR to exercise general supervision and coordination over all matters relating to the environment in Kenya.

NEC- The apex body under the Act charged with the responsibility of developing the national environmental policy in Kenya as well as to set annual environmental goals and objectives.

PCC- Formed to investigate environmental complaints against any person, submit their findings/recommendations to the NEC and to submit periodic reports of its activities to the NEC.

SERC- Established to advise the NEMA on the criteria and procedures for the measurement of environmental quality in Kenya. Environmental quality relates to air quality, wastewater quality, waste quality, noise quality, land use quality, etc. Additionally, the SERC is required to recommend to the NEMA minimum environmental quality standards for all environmental parameters for which subsidiary legislation is or has been promulgated.

#### **4.3.3. Ministry of Energy**

The Ministry of Energy is responsible for the provision of clean, secure, sustainable and affordable energy services for socio-economic development while protecting the environment. The Minister of Energy is empowered by the Energy Act to make regulations/rules for managing energy sector. Since 2006, when the Energy Act was amended, the Minister has made several regulatory instruments for the energy sector. One of the rules applicable to the proposed development is the Draft Energy (Licensing of Petroleum Retail Business) Regulation 2011 which prohibits against construction or modification of petroleum dispensing site without except in accordance with the Act.

#### **4.3.4. Energy Regulatory Commission (ERC)**

The ERC was established under Energy Act of 2006; to regulate energy sector in Kenya i.e. Electricity, Petroleum and the Renewable subsectors. 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.

## CHAPTER FIVE

### 5.0. ENVIRONMENTAL IMPACT ASSESSMENT

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

#### 5.1. Assessment of impacts

Section **one** of this report presents the methodology used in assessing the potential impacts of the proposed project. The key impacts identified for the proposed project are highlighted according to the relevant project phases.

The team of Experts utilized precautionary principles to establish the significance of impacts and their management and mitigation.

#### 5.2. Potential impacts of the proposed project

The proposed project is anticipated to generate the following impacts; the significance of the impacts will however range from low to moderate before mitigation and will further reduce with mitigation measures:

- Soil and Geological Impacts
  - Contamination of soil
  - Soil erosion.
- Air quality Impacts
- Noise and vibration Impacts
- Impacts of waste generation
- Socio-economic impacts.
- Health and Safety Impacts.

##### 5.2.1. Soil and geology impacts

###### 5.2.1.1. Contamination of soil

The potential sources of soil contamination during construction phase are leaks or spills from machinery used in site preparation and demolition. Depending on the size and source of the spill, liquid and gaseous phase petroleum hydrocarbons may remain mobile for long periods of time, and can potentially pollute groundwater.

During operation phase soil contamination is not anticipated because of the presence of the concrete paved surface which will prevent any potential contaminant from reaching the subsurface layer and is thus not assessed. During decommissioning phase, soil contamination could occur especially with the use of machinery in demolition of the facility.

### Construction Phase

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Severity of Impact	Spatial scope/ Geographical extent	Duration	
5 Daily	4 likely	1 insignificant	1 site specific	1 One day to one month	Low negative impact
<b>score</b>	<b>9</b>	<b>3</b>			<b>27</b>

### Mitigation Measures for soil contamination

The Contractor shall prepare a hazardous materials and waste management plan. The plan shall include, but not limited to, measures to prevent: (a) contamination of soils; (b) pollution of water; (c) and safe siting and storage.

### Significance after mitigation

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Benefit/Severity of Impact	Spatial scope/Geographical extent	Duration	
5 Daily	3 unlikely	1 insignificant	1 site specific	1 One day to one month	Low negative impact
<b>score</b>	<b>8</b>	<b>3</b>			<b>21</b>



**Decommissioning Phase**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Severity of Impact	Spatial scope/Geographical extent	Duration	
5 Daily	4 likely	1 insignificant	1 site specific	1 One day to one month	Low negative impact
<b>score</b>	<b>9</b>	<b>3</b>			<b>27</b>

**Mitigation Measures**

The Proponent and contractor engaged in the demolition of the facility shall ensure machinery and vehicles used during demolition are adequately serviced to prevent any oil leakages.

Additionally, the Proponent shall undertake a further survey to identify any contaminated areas and remediate them accordingly.

**Significance after mitigation**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Benefit/Severity of Impact	Spatial scope/Geographical extent	Duration	
5 Daily	3 unlikely	1 insignificant	1 site specific	1 One day to one month	Low negative impact
<b>score</b>	<b>8</b>	<b>3</b>			<b>21</b>

**5.2.1.2. Soil erosion**

During construction phase, site preparation activities such as clearance of vegetation (though so minimal), excavation and demolition will expose the soils at the construction site to agents of erosions mainly wind and rain water.

During operation phase, soil erosion is not anticipated at the project site because the concrete surface to be constructed will protect the soil from agents of erosion.

During decommissioning phase, removal of concrete surface will expose the soil to the above erosion agents.

**Construction phase: Soil erosion without mitigation measures**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Benefit/Severity of Impact	Spatial scope/Geographical extent	Duration	
5 Daily	5 Daily	3 marginal	1 site specific	1 One day to	Low negative impact
	<b>10</b>	<b>5</b>			<b>50</b>

**Mitigation Measures for potential soil erosion**

The Proponent and Contractor shall implement soil conservation program described in **section 8.4.3.1.** of this report.

**Significance of potential soil erosion after mitigation**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Benefit/Severity of Impact	Spatial scope/Geographical extent	Duration	
5 Daily	2 Very seldom	1 Negligible	1 site specific	1 One day to one month	Low negative impact
<b>score</b>	<b>7</b>	<b>3</b>			<b>21</b>

**Decommissioning phase: soil erosion without mitigation**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Benefit/Severity of Impact	Spatial scope/Geographical extent	Duration	
4	5	1	1	1	Low negative impact
Daily	Daily	Negligible	site specific	One day to one month	
<b>score</b>	<b>10</b>	<b>3</b>			<b>30</b>

**Mitigation Measures**

The Proponent shall ensure that the site is restored as much as possible to its original state. This shall be accomplished through surfacing of denuded areas and planting of vegetation.

**Significance of soil erosion after mitigation**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Benefit/Severity of Impact	Spatial scope/Geographical extent	Duration	
5	2	1	1	1	Low negative impact
Daily	Very seldom	Negligible	site specific	One day to one month	
<b>score</b>	<b>7</b>	<b>3</b>			<b>21</b>

**5.2.2. Air quality Impacts**

**5.2.2.1. Decreased air quality due to dust emission**

During construction decommissioning phases, potential dust pollution will emanate from site preparation activities such as demolition, excavation, stockpiling and preparation of mortar for construction of substructure. During operation phase, dust pollution is not anticipated as the site will be covered by the proposed project. While during decommissioning phase, dust emission would be generated from debris and soil resulting from demolition process.

**Construction Phase: Significance of Impacts before Mitigation**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Severity of Impact	Spatial scope/Geographical extent	Duration	
5 Daily	5 Daily	1 insignificant	1 site specific	1 One day to one month	Low negative impact
<b>score</b>	<b>10</b>	<b>3</b>			<b>30</b>

**Mitigation measures for decreased air quality due to dust emission**

The Proponent and Contractor shall implement dust abatement measures which shall include:

- Sprinkling stockpile with water regularly or cover with a membrane to prevent them from being blown away and keep them for the shortest time possible;
- All loads entering or leaving the site should be covered
- Securely cover waste containers and minimize drop height
- Erect solid barriers to site boundary

**Significance of impact after mitigation**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Severity of Impact	Spatial scope/Geographical extent	Duration	
5 Daily	3 unlikely	1 insignificant	1 site specific	1 One day to one month	Low negative impact
<b>score</b>	<b>8</b>	<b>3</b>			<b>21</b>

**Decommissioning Phase**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Severity of Impact	Spatial scope/Geographical extent	Duration	
5 Daily	5 Daily	1 insignificant	1 site specific	1 One day to one month	Low negative impact
<b>score</b>	<b>10</b>	<b>3</b>			<b>30</b>

### 5.2.2.2. Air Pollution from Incidents

The proposed project will be designed and managed in accordance with the best industry best standards and practice. However, during operation phase unplanned or unforeseen fire or explosion incidents may occur as result of acts of vandalism or human error. Such incidents may generate emissions that have several implications on the human health and visibility of the site and its environs.

#### Operation phase potential air pollution incidents before mitigation

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Benefit/Severity of Impact	Spatial scope/Geographical extent	Duration	
4	3	4	2	4	Medium low
Life of operation	of unlikely	harmful	site specific	Life of operation	
<b>score</b>	<b>7</b>	<b>10</b>			<b>70</b>

#### Mitigation Measures for air pollution from incidents

The Proponent need to develop, implement and monitor environment, health and safety measures and procedures, including an emergency preparedness and response plan.

#### Significance after mitigation

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Benefit/Severity of Impact	Spatial scope/Geographical extent	Duration	
4	3	1	2	4	Low negative
Life of operation	of unlikely	Non harmful	site specific	Life of operation	of impact
<b>score</b>	<b>7</b>	<b>7</b>			<b>49</b>

### 5.2.2.3. Exhaust emissions

During construction phase exhaust emissions from construction and demolition vehicles (used in transporting materials) are the only source of gaseous pollutants from the proposed project

During operation phase exhaust emission from trucks entering and exiting the site will be source of gaseous pollutants.

**Construction and Decommissioning phases: Significance of exhaust emissions without mitigation measures**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Severity/Magnitude of Impact	Spatial scope/Geographical extent	Duration	
5 Daily	5 Daily	2 Minor	1 site specific	1 One day to one month	Low negative impact
<b>score</b>	<b>10</b>	<b>4</b>			<b>40</b>

**Mitigation Measures for impacts of exhaust emission**

The Proponent should ensure that:

Engines and exhaust systems of construction and demolition vehicles and machinery should be regularly serviced according to manufacturer’s recommendations and maintained to meet statutory limits/opacity tests; no machinery or vehicle is left idling unnecessarily.

**Construction and Decommissioning phases: Significance of exhaust emissions with mitigation measures**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Severity of Impact	Spatial scope/Geographical extent	Duration	
5 Daily	5 Daily	1 Negligible	1 site specific	1 One day to one month	Low negative impact
<b>score</b>	<b>10</b>	<b>3</b>			<b>30</b>

**Operation phase: Significance of exhaust emissions without mitigation measures**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Severity/Magnitude of Impact	Spatial scope/Geographical extent	Duration	
4	5	2	1	1	Low negative
Life of operation	Daily	Minor	site specific	One day to one month	impact
<b>score</b>	<b>9</b>	<b>4</b>			<b>36</b>

**Mitigation Measures for impacts of exhaust emission**

The Proponent should ensure that:

Engines and exhaust systems of construction vehicles and machinery should be regularly serviced according to manufacturer’s recommendations and maintained to meet statutory limits/opacity tests; no truck is left idling unnecessarily at the parking bay

**5.2.3. Noise and vibration**

**5.2.3.1.Deterioration in ambient noise quality**

The construction machinery and vehicles will generate noise of varying magnitude. The proposed project will utilize machineries such as wheel loading shovel; 30 to 40 Ton tracked Excavator, Mobile service crane, Dump Truck and Tipper lorry

From the predictions of the specialist study on ambient noise quality measurements it can be seen that all the above activities are predicted to be largely within the target noise levels, although highest levels are expected when using pneumatic drills to break hard rock for foundation when the noise levels would peak at about 68dB (A).

A summary of the predicted noise levels is presented in the table below:

Reception Point	Operation (dB A)	Excavation works	General
South East Corner of proposed construction site.	50	68	58

As will be the case with the construction phase, the sources of noise during decommissioning phase, will be mainly machinery and vehicles used in demolition of the facility and removing the materials from the site.

**Pre-construction and Construction Phase**

<b>Unmitigated Impact: Noise above 75 dB (A)</b>	<b>Significance</b>
<b>Consequence</b>	
Magnitude	2
Geographic extent	1
Duration of impact	1
<b>Total</b>	<b>4</b>
<b>Likelihood</b>	
Duration of activity	1
Frequency of impact	1
<b>Total</b>	<b>2</b>
<b>Results (Consequence * Likelihood)</b>	<b>- 8 (Very low)</b>
<i>Comment/mitigation:</i>	
Follow the rules and regulations set out in the relevant codes of practice and instructions contained in the Environmental Management Plan (EMP) and construction Environmental Plan(CEP)	
2. Use protective equipment	
3. Site the noisy equipment and plant away from occupied building.	
4. Maintain equipment and plant.	
<b>Mitigated Impact: Noise above 75 dB (A)</b>	
<b>Consequence</b>	
Magnitude	1
Geographic extent	1
Duration of impact	1
<b>Total</b>	<b>3</b>
<b>Likelihood</b>	
Duration of activity	1
Frequency of impact	1
<b>Total</b>	<b>2</b>
<b>Results (Consequence)</b>	<b>- 6 (Very low)</b>



**Likelihood (Comment/mitigation)**

1. Carryout lagging of the generator or site the power generator away from the occupied building.
2. Maintenance personnel to use ear defenders.
3. Maintain equipment and plant.

**Operation phase and decommissioning**

<b>Unmitigated Impact: Noise above 85 dB(A)</b>	<b>Significance</b>
<b>Consequence</b>	
Magnitude	2
Geographic extent	1
Duration of impact	1
<b>Total</b>	<b>4</b>
<b>Likelihood</b>	
Duration of activity	1
Frequency of impact	1
<b>Total</b>	<b>2</b>
<b>Results (Consequence * Likelihood)</b>	<b>- 8(very low)</b>
<i>Comment/mitigation:</i>	
The Proponent to ensure that the booster pumps to be used during operation phase complies with national and international noise quality standards. Noise abatement measures will be covered in	
<b>Impact with mitigation : Noise above 85 dB(A)</b>	
<b>Consequence</b>	
Magnitude	2
Geographic extent	1
Duration of impact	1
<b>Total</b>	<b>4</b>
<b>Likelihood</b>	
Duration of activity	1
Frequency of impact	1
<b>Total</b>	<b>2</b>
<b>Results (Consequence * Likelihood)</b>	<b>- 8 (very low)</b>

## Decommissioning Phase

<b>Impact without mitigation : Deterioration in ambient noise quality</b>	<b>Significance</b>
<b>Consequence</b>	
Magnitude	1
Geographic extent	1
Duration of impact	1
<b>Total</b>	<b>3</b>
<b>Likelihood</b>	
Duration of activity	2
Frequency of impact	1
<b>Total</b>	<b>3</b>
<b>Results (Consequence * Likelihood)</b>	<b>- 9 (Very low)</b>
<i>Comment/mitigation:</i>	
The Proponent to ensure that the machinery and vehicles used during demolition comply with Noise Quality Standards. Noise abatement measures will be included in construction management programme.	
<b>Impact with mitigation : Deterioration in ambient noise quality</b>	
<b>Consequence</b>	
Magnitude	1
Geographic extent	1

Duration of impact	1
<b>Total</b>	<b>3</b>
<b>Likelihood</b>	
Duration of activity	1
Frequency of impact	1
<b>Total</b>	<b>2</b>

Results (**Consequence \* Likelihood**) - 6 (**Very low**)

#### 5.2.4. Impacts of waste generation

Several wastes are anticipated to be generated throughout the project cycle (**Section 2.12.2** of this report provides a description of the waste to be generated). During construction phase, wastes anticipated from demolition and construction activities will comprise: concrete waste, excavated soil, and metal and timber cuttings among others.

During operation phase, the expected waste from the project will include domestic and medical waste from the clinic. Medical wastes are potentially dangerous and present a high risk of infection to the general population and to the staff.

Whereas during decommissioning phase, demolition waste generated will be mainly concrete boulders, and scrap metals.

#### **Construction phase: Significance before mitigation**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Benefit/Severity of Impact	Spatial scope/Geographical	Duration	
4	5 daily	4 significant	2	1	Low
Daily			site specific	One day to one month	Medium
<b>score</b>	<b>9</b>	<b>7</b>			<b>63</b>

#### **Mitigation Measures**

The Contractor in collaboration with the Proponent will prepare and maintain site waste management plan which estimate the quantity of each type of waste expected to be produced and track their recovery and destination throughout the construction phase of the project. Waste streams could be recovered, segregated and either re-used on site (e.g. crushed concrete aggregate) or disposed offsite in line with the Proponent's **Go Green Initiative**.

**Construction phase: Significance after mitigation**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Benefit/Severity of Impact	Spatial scope/Geographical	Duration	
4	5	2	2	1	Low
Daily	daily	minor	site specific	One day to one month	Medium
<b>score</b>	<b>9</b>	<b>5</b>			<b>45</b>

**Operation phase**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Benefit/Severity of Impact	Spatial scope/Geographical	Duration	
4	4	2	2	4	Medium low
Life operation	Life operation	Minor	site specific	Life of operation	
<b>score</b>	<b>8</b>	<b>8</b>			<b>64</b>

**Mitigation Measures**

The Proponent will manage waste in accordance with the existing procedures and relevant legislations. Waste streams could be recovered, segregated and either re-used on site (e.g. crushed concrete aggregate) or disposed offsite in line with the Proponent’s Go **Green Initiative**. Medical waste will be collected disposed offsite by NEMA approved waste handler.

**Operation phase: Significance of Impacts of waste after mitigation**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Benefit/Severity of Impact	Spatial scope/Geographical	Duration	
4	4	1 negligible	2	4	Medium low
Life operation	Life operation		site specific	Life of operation	
<b>score</b>	<b>8</b>	<b>7</b>			<b>56</b>

**Decommissioning phase: Significance of Impacts of waste before mitigation**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Benefit/Severity of Impact	Spatial scope/Geographical	Duration	
4	5	2 minor	2	1	low
Daily	Daily		site specific	One day to one month	
<b>score</b>	<b>9</b>	<b>5</b>			<b>45</b>

**Mitigation Measures**

The Contractor selected for undertake demolition work will in collaboration with the Proponent will prepare and maintain site waste management plan which estimate the quantity of each type of waste expected to be produced and track their recovery and destination throughout the decommissioning phase of the project. Waste streams could be recovered, segregated and either re-used on site (e.g. crushed concrete aggregate) or disposed offsite in line with the Proponent’s **Go Green Initiative**.

**Decommissioning phase: Significance of Impacts of waste after mitigation**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Benefit/Severity of Impact	Spatial scope/Geographical	Duration	
4 Daily	5 Daily	1 negligible	2 site specific	1 One day to one month	low
<b>score</b>	<b>9</b>	<b>4</b>			<b>36</b>

**5.2.5. Health and safety**

**5.2.5.1. Occupational health and safety**

The development of the proposed facilities involves a number of activities that pose potential health and safety risks to the workers. The workers are potentially exposed to risks as a result of working a height, operating tools and equipment and exposure to dust.

During the construction phase, the potential H&S risks include:

- Exposure to silica dust
- Hazards of falling objects;
- Occupational hazards when working at height such as the roofs and walls;

The potential occupational health and safety impacts anticipated for operation phase include: injuries to workers from preventive and corrective maintenance especially of electrical equipment, work at height especially renewing coat of paint on the roofs and walls and handling of medical wastes.

During decommissioning phase, the potential H&S risks include hazards of falling objects; work at height hazards, injuries from operating tools and equipment.

**Construction phase: Health and Safety Risks before mitigation**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Benefit/Severity of Impact	Spatial scope/Geographical	Duration	
5	5	4 significant	1	1	Low
Daily	Daily		Activity specific	One day to one month	Medium negative
<b>Score</b>	<b>10</b>	<b>6</b>			<b>60</b>

**Operation Phase: Health and Safety Risks before mitigation**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Benefit/Severity of Impact	Spatial scope/Geographical	Duration	
4	5 likely	2 small	1	4	Medium- low
Life of operation			Activity specific	Life of operation	negative impact
<b>score</b>	<b>9</b>	<b>7</b>			<b>63</b>

**Decommissioning phase: Health and Safety Risks before mitigation**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Benefit/Severity of Impact	Spatial scope/Geographical	Duration	
5	5	2 small	1	1	Low
Daily	Daily		Activity specific	One day to one month	negative impact
<b>score</b>	<b>10</b>	<b>4</b>			<b>40</b>

**Mitigation Measures**

The Proponent is advised to enforce the existing H&S operation procedures for minimizing potential health and safety impacts. During construction phase, the Proponent is recommended to ensure that tool box talks are done every day. Toolbox talks address actual and anticipated safety concerns for scheduled project work. The talks provide an opportunity to relate specific safety concerns with the jobs to be performed.

**Construction phase: Health and Safety Risks after mitigation**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Benefit/Severity of Impact	Spatial scope/Geographical	Duration	
5	5	1 negligible	1	1	Low
Daily	Daily		Activity specific	One day to one month	negative impact
<b>score</b>	<b>10</b>	<b>3</b>			<b>30</b>

**Operation Phase: Health and Safety Risks after mitigation**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Benefit/Severity of Impact	Spatial scope/Geographical extent	Duration	
4	5	1	1	4	Medium-low
Life operation	of likely	negligible	Activity specific	Life operation	of negative impact
<b>score</b>	<b>9</b>	<b>6</b>			<b>54</b>

**Decommissioning phase: Health and Safety Risks after mitigation**

Likelihood		Consequence			Rating
Frequency of Activity	Frequency of Impact	Benefit/Severity of Impact	Spatial scope/Geographical extent	Duration	
5	5	1	1	1	Low
Daily	Daily	negligible	Activity specific	One day to one month	negative impact
<b>score</b>	<b>10</b>	<b>3</b>			<b>30</b>

**5.2.5.2.Risk of Large Scale incident**

The proposed project could be of great public concern especially in the event of major disaster such as major fire outbreak and explosion (BLEVE). The product to be stored is highly flammable hence incidents fire or explosions can be detrimental to the public.

The impact significance related to public safety is likely to be low during the rehabilitation and closure of the facility.

**Construction phase**

Impact without mitigation: Risk of large scale incident	
Consequence	
Magnitude	5
Geographic extent	2
Duration of impact	1
<b>Total</b>	<b>8</b>

Likelihood	
Duration of activity	4
Frequency of impact	4
<b>Total</b>	<b>8</b>

Results ( <b>Consequence * Likelihood</b> )	- <b>64</b> (Low medium)
<i>Comment/mitigation:</i> Mitigation measures for the potential Occupational Health and Safety impacts will be covered in the construction Safety Management Plan. The implementation of the proposed project to be done in accordance to the OSHA 2007 and any other relevant H&S legislation	
<b>Impact with mitigation: Risk of large scale incident</b>	
<b>Consequence</b>	
Magnitude	1
Geographic extent	1
Duration of impact	2
<b>Total</b>	<b>4</b>
<b>Likelihood</b>	
Duration of activity	2
Frequency of impact	1
<b>Total</b>	<b>3</b>
Results ( <b>Consequence * Likelihood</b> )	- <b>12</b> (Very low)

#### Operation Phase

<b>Impact without mitigation: Risk of large scale incident</b>	<b>Significance</b>
<b>Consequence</b>	
Magnitude	5
Geographic extent	4
Duration of impact	4
<b>Total</b>	<b>13</b>
<b>Likelihood</b>	
Duration of activity	4
Frequency of impact	3
<b>Total</b>	<b>7</b>
Results ( <b>Consequence * Likelihood</b> )	- <b>91</b> (medium high)
<i>Comment/mitigation:</i>	

Mitigation measures for impacts resulting from public safety is covered in the emergency management and response plan presented in the EMP.

<b>Impact with mitigation: risks to public safety</b>	
<b>Consequence</b>	
Magnitude	3
Geographic extent	2



Duration of impact	2
<b>Total</b>	<b>7</b>
<b>Likelihood</b>	
Duration of activity	4
Frequency of impact	1
<b>Total</b>	<b>5</b>
<b>Results (Consequence * Likelihood)</b>	<b>- 35 ( low)</b>

## 5.2.6. Socioeconomic

### 5.2.6.1. Compatibility with existing and proposed land uses

The proposed project site area consists is purely industrial with oil and gas being the main activity in the area. The proposed project is therefore compatible to the existing as well as future land-uses. Since the proposed project will not conflict with the existing and perhaps future developments, impacts were therefore not assessed.

### 5.2.6.2. Creation of employment opportunities

The proposed project will generate job opportunities (skilled and unskilled Labor) during construction and operation phases. It is anticipated that proposed project will provide opportunities for local employment and service provision, such as the use of local transport companies and sourcing of some construction materials locally. There also likely to be trickledown effect results from the employment opportunities as well as services provided by the facility.

<b>Constructions, Operations</b>				
<b>Benefits without enhancement:</b> Employment provided by the proposed project				
Magnitude	Geographic Extent	Duration of impact	Duration of activity	Frequency of impact
2	2	2	2	4
Result: LOW (+ 36)				
<b>Benefits with enhancements</b>				
Magnitude	Geographic Extent	Duration of impact	Duration of activity	Frequency of impact
3	3	4	4	4
Results: MEDIUM HIGH (+ 80)				
Mitigation/Comments: Communication and information programs should be used to manage expectations and target local service providers including those registered through the Public Participation process. Management and enhancement measures for local employment to be included In Labor and human resources plan. Local authorities and employment hubs should be consulted when recruiting local workers and service providers.				

### 5.2.6.3. Improved Security

The proposed project is expected to improve the security situation in the area in that the project will have physical form of security which will range from: employing security guards installing security lights and installing alarm systems.

Apart from physical security there will also be procedural security; where visitors to the site have to log in and log out when arriving and leaving site respectively.

Construction and Operations				
<b>Benefits without enhancement: Improved Security</b>				
Magnitude	Geographic Extent	Duration of impact	Duration of activity	Frequency of impact
2	2	4	4	4
Results: LOW-MEDIUM(+ 64 )				
<b>Benefits with enhancements</b>				
Magnitude	Geographic Extent	Duration of impact	Duration of activity	Frequency of impact
3	2	4	4	4
Results: LOW MEDIUM (+ 72 )				
Mitigation/Comment: Installation of security facilities which includes hiring of security guards, installing an alarm system will improve the security of the area.				

#### 5.2.6.4. General economic growth and increased land value

Due to the proposed project there will be an influx of people searching for jobs.

An increase in economic activities will increase the demand for housing, communication transport and financial services will significantly increase and thus present a likelihood of increasing the land values.

Constructions and Operations				
<b>Benefits without enhancement: General economic growth and increased land value</b>				
Severity	Spatial scope	Duration of impact	Duration of activity	Frequency of impact
2	3	4	4	3
Result: LOW MEDIUM (+ 63 )				
<b>Benefits with enhancements</b>				
Severity	Spatial scope	Duration of impact	Duration of activity	Frequency of impact
2	3	4	4	4
Results: LOW-MEDIUM(+ 72 )				
Mitigation/Comments: The direct project workforce will be accommodated within the nearby Utawala and Ruiru area. Choice of the site will increase value of land in the area and promote overall development of the area.				

### 5.2.6.5 LPG Provision

In the operational phase, Topline Traders Limited perceived that there will be increased LPG supply.

Operations Phase				
<b>Benefits without enhancement: LPG Provision</b>				
Severity	Spatial scope	Duration of impact	Duration of activity	Frequency of impact
2	5	4	4	4
Result: MEDIUM HIGH (+ 88 )				
<b>Benefits with enhancements</b>				
Severity	Spatial scope	Duration of impact	Duration of activity	Frequency of impact
3	4	4	5	4
Results: MEDIUM- HIGH(+ 99 )				
Mitigation/Comments: The proposed project will ensure that there is plenty of LPG which will meet the increasing demand for LPG in Nairobi and other regions.				

### 5.2.7 Cumulative impacts

Cumulative impacts are impacts of an activity that in themselves may not become significant but may become significant when added to the existing and potential impacts resulting from similar or diverse activities or undertakings in the area.

The concrete paving will affect permeability of storm water into the subsurface and underground water.

The soil once excavated and moved within the site loses its original physical and chemical composition, structure, arrangement of soil horizons and the transition between those horizons. These changes cumulatively alter the biological, physical and chemical properties of the soil and consequently the reaction patterns with pollutants.

### 5.3 Summary of Impacts

Table 6: Summary of Identified Impacts

Impact	Significance Rating					
	Construction Phase		Operation phase		Decommissioning phase	
	Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
<b>Air Quality</b>						
Dust generation	low negative impact	Very low negative impact	Not anticipated	Not anticipated	Very low negative impact	Very low negative impact
Fugitive Emission	Very low negative impact	Very low Negative impact	Low Negative impact	Low Negative impact	Very low Negative impact	Very low Negative impact
<b>Health and Safety</b>						
Occupational Health and Safety	Low medium negative impact	Very low negative impact	Very low negative impact	Very low negative impact	Very low negative impact	Very low negative impact
Risk of large incident fire explosion and fire outbreak	low medium negative impact	Very low negative impact	low medium negative impact	Low Negative impact	Not anticipated	Not anticipated
<b>Noise and Vibration</b>						
	Very low negative impact	Very low Negative impact	Low Negative impact	Low Negative impact	Very low Negative impact	Very low Negative impact

Impact	Significance Rating					
	Construction Phase		Operation phase		Decommissioning phase	
<b>Socioeconomic</b>						
Employment	low	Medium High	low	Medium High	Very low	High
LPG Provision	-	-	Medium High	Medium High	-	-
General Economic Growth and increased land value	Low Medium	Low Medium	Low Medium	Low Medium	-	-
Improved Security	Low	Medium	Low	Medium	-	-

## CHAPTER SIX

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### 6.0. ANALYSIS OF ALTERNATIVES

The following alternative aspects were considered for the proposed project: No Project Scenario, design and site alternative. Evaluation of the alternatives is governed by a “rule of reason,” which requires the evaluation of alternatives “necessary to permit a reasoned choice.”

#### 6.1. No Project Scenario

The no Project Scenario is where the proposed project should not be developed. The site will remain as it is; covered by grass and shrubs and it will imply that anticipated benefits from the project would not be realized and similarly the potential adverse impacts associated with the project will not be experienced. The Project is part of Topline Traders Limited's Green Economy Initiative ‘which is geared towards reducing impacts of their operations on the environment. By implementing the project, the Proponent will be able to provide and promote clean energy and reduce the use of environmentally degrading source like charcoal burning, illuminating kerosene etc. These sources are prone to release pollutant gases in the form of greenhouse gas emissions (GHG). Sticking to these old sources and adopting the “No Project Scenario” is therefore not considered as a viable option.

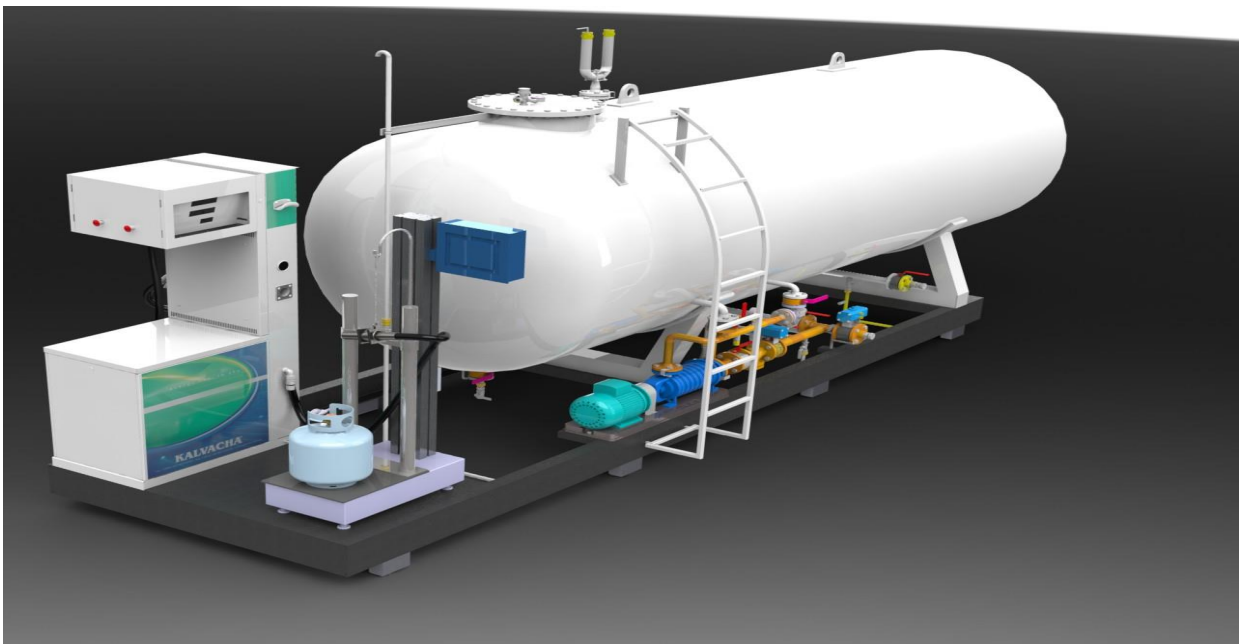
#### 6.2. Location Alternative

The Proponent has only one proposed site for the storage and distribution of Liquefied Petroleum Gas. The alternative site which had been initially approved by NEMA is located Off Northern By-pass however due demand for more land space the proponent had to source for a bigger site in Eastern By-pass thus leaving the current proposed site as the best option.

#### 6.3. Design Alternatives

##### 6.3.1. Proposed Option

The Proponent has proposed to install a 5 Metric Tons Liquefied Petroleum Gas Skid (Storage and Dispensing) System and will be filling cylinders as required by the standard i.e. 6kg, 13kg and 50 (if there is demand). The Skid system is shown below:



The proposed design will largely improve the safety of storage and handling of LPG at the site and will create a steady supply/stock of LPG gas to the Kenyan population.

### **6.3.2. LPG spheres**

LPG can also be stored in LPG sphere tank, shown by figure 6 below. The sphere offers the maximum volume for the least surface area and the required thickness of a sphere is one-half the thickness of a cylinder of the same diameter. However, they are less safe since its weight is not distributed evenly on a larger area thus increasing chances of collapse as compared to LPG tank described in the previous sections, especially in areas prone to earth quakes.



**Figure 5:** An image of LPG Sphere

### **6.4. Input alternatives**

The proposed facility will handle Liquefied Petroleum Gas. The amount of LPG stored will be dependent on the requirements of Topline Traders Limited. The input alternatives are thus dictated by the market demand for gas; however, the developer will mainly be filling gases for the retail market starting with quantities from 3kg to 6kg up to 13kgs. The design does not allow storage of other products other than Liquefied Petroleum Gas.

### **6.5. Conclusion**

In light of these alternatives, the team of Experts can conclude that the proposed project satisfies the overall economic, technical, environmental considerations. Topline Traders Limited Ltd will have adequate stock of LPG; will not incur extra cost of land acquisition and will reduce the cost of daily transportation of LPG to the site.

As experts we are of the view that the 'No-go option' will not compete with the benefits of proceeding with the project.

## **CHAPTER SEVEN**

### **7.0. PUBLIC STAKEHOLDER CONSULTATION**

Public participation is an essential and legislative requirement for environmental authorization. The team 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, 1999 and EIA/EA Regulations 2003.

#### **7.1. Interviews**

Interviews were conducted during public stakeholder consultation in order to obtain the views and concerns of the interested parties in relation to the proposed project. A semi structured interview checklist/ questionnaire was used to capture the responses of the stakeholders.

The nearby industries having been consulted welcomed the project and emphasized that safety measures must be taken to ensure that the project impacts were under control and minimized.

#### **7.2. Overall Objective of Public Stakeholder Consultation**

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



## CHAPTER EIGHT

### 8.0. ENVIRONMENTAL MANAGEMENT PLAN

This section presents the environmental management plan (EMP) for the proposed 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.

#### 8.1 Approach to environmental impact management

The proposed EMP will be the responsibility of the proponent and his team; Table 9 presents the range of approaches that will be used to manage potential impacts of the proposed project.

**Table 9: Approach used 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 project
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 cycle has five broad components:

- Planning and design
- Project implementation (covering the construction and operation phases);
- Checking and corrective action; and
- Management review

## **8.2 Responsibility and Accountability**

### **8.2.1 Environmental Management Structure**

The Proponent, Topline Traders Limited will utilize the existing arrangements in the implementation of the EMP during planning and design, construction, operation and decommissioning/closure. The Proponent is accountable for ensuring that resources are made available to effectively implement the EMP and necessary environmental management measures arising from the project.

### **8.2.2 Management of Contractors**

The Contractors will be responsible for implementation of some of the EMP commitments. However, the Proponent fully recognizes that she 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: Contractors will have certain key environmental line functions included in their job descriptions and performance criteria. Critical among these is the Construction Manager.

- The Construction Manager will be accountable for environmental (including social) management during the construction phase. Specific responsibilities for the Construction Manager will include Regular performance reviews and undertake corrective and/or remedial action where this may be required.
- Meetings will be held to 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.
- A code of practice for construction teams will be prepared and implemented. This code will guide the management and behavior of construction teams. The code will include items relating to health safety and community relations.
- 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.

### **8.2.3 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.

#### **8.2.4 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: 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 as an incident and will be subject to the requirements of the authorities.

#### **8.2.5 Incident handling and Reporting**

All incidents and accidents arising from the project will be handled and reported respectively as per section 98 and 117 of the Energy Act No. 12 of 2006.

An incident can arise from the following:

- Significant non-conformance with the EMP identified during an internal inspection
- Any non-conformance identified by either the authorities or an external audit
- Accidents or spills resulting in potential or actual environmental harm
- Accidents or near misses that did or could result in injury to staff, visitors to site or the surrounding communities
- Significant complaints received from any source.

Note: All incidents will also be formally recorded and noted in the General Register in accordance with requirements of OSHA 2007.

#### **8.2.6 Checking and corrective action**

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.
- External audits to provide independent verification of the efficacy of the EMP.

#### **8.2.7 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).

### **8.2.8 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.

### **8.2.9 Liaison**

Throughout the project cycle, the Proponent will liaise with authorities especially NEMA Kenya to ensure ongoing feedback on the environment performance of the project.

**Table 11: Mitigation and Management measures for the identified Impacts**

Aspect	Impact	Mitigation Measure/Enhancement measures	Objective	Performance Indicators or Acceptance Criteria	Monitoring	Timing of Mitigation/Enhancement	Cost Estimate	Responsibility
Air Quality	Degradation of Air Quality	<ul style="list-style-type: none"> <li>Relevant legislative and Kenya Standard design requirements will be adhered to where appropriate.</li> <li>Vehicles and machinery will be regularly maintained.</li> <li>Maintenance activities requiring purging of gas will be minimized and conducted under favorable Meteorological conditions (to facilitate rapid atmospheric dispersion).</li> <li>Install standard leak</li> </ul>	<ul style="list-style-type: none"> <li>To achieve air quality objectives of the Draft Air quality Regulations 2008 during construction and operation.</li> <li>To minimize the potential for construction, operation and decommissioning activities to adversely affect sensitive receptors.</li> <li>To maintain</li> </ul>	<ul style="list-style-type: none"> <li>No receipt of air quality-related complaints from neighboring sensitive receptors.</li> <li>Documentation of regular servicing/maintenance of all vehicles and plant components.</li> </ul>	<ul style="list-style-type: none"> <li>Non-compliance and incident reporting will be closed out to ensure prompt rectification and change management as required.</li> <li>Neighbors' complaints will be recorded and closed out.</li> <li>Regular reporting and audits will be undertaken by the Production Manager in accordance with the</li> </ul>	Throughout project cycle	No significant material additional cost	Proponent, Contractor and User (Topline Traders Limited Ltd)

Aspect	Impact	Mitigation Measure/Enhancement measures	Objective	Performance Indicators or Acceptance Criteria	Monitoring	Timing of Mitigation/Enhancement	Cost Estimate	Responsibility
		<p>Detectors for hazardous area installations.</p> <p>Any detected leaks will be repaired as a high priority.</p> <p>Best practice measures are implemented to minimize the potential for dust to be generated and escape off-site.</p>	<p>Acceptable limits of vehicular and machinery operating emissions.</p> <p>To minimize gaseous and dust emissions.</p>		<p>requirements of the LPG (Safety)</p> <p>The results of leaks detection and estimates of the volume of any gas vented, and recommendations and corrective actions shall be implemented.</p> <p>Audit of vehicle servicing records.</p> <p>Audit of the plant maintenance records for leaks detection and repair.</p>			
Noise Quality	Noise Pollution from Incidents	Construction activities	To minimize the	No noise related	Landholder	Construction, Operation and	60,000 monitoring	Proponent and User

Aspect	Impact	Mitigation Measure/Enhancement measures	Objective	Performance Indicators or Acceptance Criteria	Monitoring	Timing of Mitigation/Enhancement	Cost Estimate	Responsibility
		<p>near sensitive places shall be restricted to normal working hours (typically 7.00 am to 6:30 pm, 7 days a week) unless otherwise agreed with the potentially affected stakeholder(s).</p> <p>Relevant legislative and Kenya Standard design requirements will be adhered to where appropriate.</p> <p>adequate community notice of any scheduled, atypical noise events will be provided.</p> <p>Equipment will be fitted with noise control devices where possible</p>	<p>potential for noise to adversely affect sensitive receptors during project cycle.</p> <p>To achieve relevant environmental acoustic quality objectives of the Legal Notice No. 61 of 2009, during project cycle.</p>	<p>complaints received from residents and landholders.</p> <p>Documentation of repair and replacement of faulty equipment as soon as possible.</p> <p>Documentation of consultation and planning for atypically noisy events. No noise related complaints received from residents and landholders.</p>	<p>complaints relating to noise will be recorded and closed out.</p> <p>regular audits and will be undertaken, and recommendations and corrective actions shall be implemented.</p> <p>Noise survey(s) will be undertaken as appropriate and upon request from the administering authority.</p> <p>noise surveys at relevant nearest local residences will</p>	<p>Decommissioning phases</p>	<p>cost per schedule</p>	

Aspect	Impact	Mitigation Measure/Enhancement measures	Objective	Performance Indicators or Acceptance Criteria	Monitoring	Timing of Mitigation/ Enhancement Measures	Cost Estimate	Responsibility
		and appropriate.		<ul style="list-style-type: none"> <li>□ Documentation of repair and replacement of faulty equipment as soon as possible.</li> <li>□ Documentation of consultation and planning for atypically noisy events.</li> </ul>	be undertaken as appropriate.			



Waste	Pollution from waste generation	<ul style="list-style-type: none"> <li>Develop strategies (waste management plan) for management of specific waste streams prior to construction phase.</li> <li>stockpile and salvage reusable and recyclable wastes, such as timber</li> </ul>	<ul style="list-style-type: none"> <li>To minimize any negative impacts associated with waste generation through adoption of the waste</li> </ul>	<ul style="list-style-type: none"> <li>No evidence of Uncontrolled waste (i.e., not in appropriate containers) at above ground facilities during inspections.</li> <li>Record of</li> </ul>	<ul style="list-style-type: none"> <li>Housekeeping checks to ensure waste is being stored correctly and no litter is occurring.</li> <li>Regular audits and reviews will be undertaken, and</li> </ul>	Construction, operation and Decommissioning phases	No material additional costs are anticipated above general budgets for responsibilities of EHS Manager for the implementation of the plan.	Proponent, Contractor and User
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Aspect	Impact	Mitigation Measure/Enhancement measures	Objective	Performance Indicators or Acceptance Criteria	Monitoring	Timing of Mitigation/Enhancement Measures	Cost Estimate	Responsibility
		<p>Skids, fiber/nylon rope spacers, pallets, drums and scrap metals.</p> <p>Store hazardous wastes in banded areas away from watercourses.</p> <p>Collect and remove (via NEMA approved waste handler) waste from site for recycling, reuse or disposal at facility licensed to accept such wastes.</p> <p>All personnel will be instructed in project waste management practices as a component of the environmental induction process.</p>	<p>Management hierarchy to spills of hazardous waste fluids (e.g., oil).</p> <p>Safe and proper disposal of waste.</p>	<p>regulated waste disposal.</p> <p>Number of Waste Spill Reports.</p>	<p>Recommendations and corrective actions shall be implemented.</p> <p>Waste will be tracked and appropriately recorded.</p> <p>Report hazardous waste spills.</p> <p>Review of operations waste management procedures, and quantity of regulated wastes generated.</p>			

Aspect	Impact	Mitigation Measure/Enhancement measures	Objective	Performance Indicators or Acceptance Criteria	Monitoring	Timing of Mitigation/Enhancement Measures	Cost Estimate	Responsibility
		<p>Where practical, wastes (e.g., scrap metal) will be segregated and reused/recycled.</p> <p>All litter and general waste disposal will be at a local municipal landfill utilizing an approved waste contractor.</p> <p>Records of all controlled wastes stored, and removed from site will be maintained.</p> <p>safety and response training will be provided for all personnel.</p> <p>Materials and equipment for responding to</p>						

Aspect	Impact	Mitigation Measure/Enhancement measures	Objective	Performance Indicators or Acceptance Criteria	Monitoring	Timing of Mitigation/Enhancement	Cost Estimate	Responsibility
		hazardous spill incidents will be provided and						
Soil Quality	Degradation of soil	Minimizing the areas to be excavated and re-vegetating disturbed areas once construction and demolition works are completed; during construction and decommissioning phases respectively; ensuring that vehicles/equipment used during construction and decommissioning phases are serviced	To avoid or minimize soil disturbance/contamination.	Documentation of regular servicing/maintenance of all vehicles and plant components. The extent of excavated area	Non-compliance and incident reporting will be closed out by senior management to ensure prompt rectification and change management as required. Neighbors' complaints will be recorded and closed out. Regular reporting and inspections will	Construction phase	No material additional costs are anticipated above general budgets for responsibilities of EHS Manager for the implementation of the plan.	Proponent and Contractor

Aspect	Impact	Mitigation Measure/Enhancement measures	Objective	Performance Indicators or Acceptance Criteria	Monitoring	Timing of Mitigation/Enhancement	Cost Estimate	Responsibility
					be undertaken Audit of vehicle servicing records.			
Water Quality	Degradation of water quality	<p>Develop strategies for Management of water resources.</p> <p>Regular checking and maintenance of all plant and machinery to minimize the risk of fuel or lubricant leakages</p> <p>Storing hydrocarbons, fuels, lubricants and chemicals to be used in bunded and lockable oil storage tank, with hoses and gauges kept within the bund.</p>	To minimize any negative impacts on water resources during construction, operation and decommissioning phases.	<p>No evidence of uncontrolled waste (i.e., not in appropriate containers) at above ground facilities during inspections.</p> <p>Record of regulated waste disposal.</p> <p>Number of Waste Spill Reports.</p>	<p>Housekeeping checks to ensure waste is being stored correctly and no litter is occurring.</p> <p>Regular audits and reviews will be undertaken, and recommendations and corrective actions shall be implemented.</p> <p>Waste will be tracked and appropriately</p>	Construction, operation and decommissioning	No material additional costs are anticipated above general budgets for responsibilities of EHS Manager for the implementation of the plan.	Proponent, Contractor and User

Aspect	Impact	Mitigation Measure/Enhancement measures	Objective	Performance Indicators or Acceptance Criteria	Monitoring	Timing of Mitigation/Enhancement	Cost Estimate	Responsibility
		<p>Leaving vegetation <i>in-situ</i> wherever possible, and re-vegetation of bare soil before the next rainy season.</p> <p>Exposed ground and stockpiles will be minimized to reduce silty runoff, and if necessary measures such as geotextiles will be used to shield spoil mounds.</p> <p>Preventing wet concrete and cement from entering watercourse;</p> <p>Stockpiles to be kept away from watercourses</p>			<p>Recorded.</p> <p>Report hazardous waste spills.</p> <p>Review of operations waste</p> <p>Management procedures and quantity of regulated wastes generated.</p>			
Health and Safety	Occupational health and safety impacts	Development and implementation of occupational health and safety plan. The Plan will	To minimize impacts on health and safety during construction,	Occupational Injury and illness incidents.	Workplace inspection to ensure	Construction, operation and decommissioning phases	No material additional costs are anticipated	Proponent and Contractor

Aspect	Impact	Mitigation Measure/Enhancement measures	Objective	Performance Indicators or Acceptance Criteria	Monitoring	Timing of Mitigation/Enhancement Measures	Cost Estimate	Responsibility
		<p>cover on the following:</p> <p>formulation of EHS Management system</p> <p>Development of health and safety programmer</p> <p>Risk assessment and health monitoring for workers</p> <p>Contractor selection criteria in relation to health and safety</p> <p>Job description to include health and safety requirements</p>	<p>Operation and decommissioning phases.</p>	<p>Workforce health</p> <p>Process safety</p>	<p>operations/activities are being undertaken in accordance with the safe operating procedures, standards and regulations</p> <p>Regular audits and reviews will be undertaken, and recommendations and corrective actions shall be implemented.</p> <p>Personnel will be trained on health and safety.</p>		<p>General budgets for responsibilities of EHS manager for the implementation of the plan. Additionally, the health and safety audit of the facility will not be carried out in isolation, instead it will be audited together with other facilities onsite during annual</p>	

Socio-economic	Creation of employment	During construction	Maximize impacts on local economy	Kenya Labor Laws	Compliance with	Construction, operation and	no additional cost is	Proponent, and Contractor
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Aspect	Impact	Mitigation Measure/Enhancement measures	Objective	Performance Indicators or Acceptance Criteria	Monitoring	Timing of Mitigation/Enhancement	Cost Estimate	Responsibility
	and supply of goods and services opportunities	<p>will be encouraged to source where possible labor from the local community;</p> <p>During operation phase, the Proponent will utilize their existing human resource policy in hiring personnel required to operate the plant. The Proponent will ensure that hiring of personnel follows the Kenya Labor Laws and that there will be no discrimination on the grounds of race, ethnicity, religion, gender, and political affiliation. The</p>	and employment during project phases		Kenyan Laws	decommissioning phases	anticipated	

Aspect	Impact	Mitigation Measure/Enhancement measures	Objective	Performance Indicators or Acceptance Criteria	Monitoring	Timing of Mitigation/Enhancement	Cost Estimate	Responsibility
		<p>Contractors will similarly</p> <p>Be required to apply the same policy.</p> <p>The Proponent will utilize their existing procurement policy and ensure that where possible goods and services are sourced from the local area.</p>						

## CHAPTER NINE

### REFERENCE

The following list of references was referred to in preparing this EIA Report:

1. **Government of Kenya:** *The Environment Management and Coordination Act 1999*
2. **Government of Kenya:** *The Environment (Impact Assessment and Audit) Regulations 2003*
3. **Government of Kenya:** *The Physical Planning Act 1996.*
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6. **Government of Kenya: KS 201:2007** Unified Valves for LPG Cylinders for Domestic use- Specification (third edition) and the LPG Regulations of 2009.
7. **Government of Kenya:** Energy (Liquefied Petroleum Gas) Regulations of 2009.
8. **Government of Kenya:** KS ISO 4706 on Refillable Welded Gas Cylinders
  
9. **Government of Kenya:** *Occupational Safety and Health Act, 2007*
10. **Government of Kenya:** *Factories and Other Places of Work (Safety and Health Committee) Rules 2004*
11. **Government of Kenya:** *Factories and Other Places of Work (Medical Examination) Rules 2005*
12. **Government of Kenya:** *Water Quality Regulations, 2006*
13. **Government of Kenya:** *Waste Management Regulations, 2006*
14. **Government of Kenya:** *The Occupational Safety and Health Act, 2007*
15. **Government of Kenya:** *The Safety and Health Committee Rules 2004*
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19. **Government of Kenya:** *Hazardous Substances Rules, 2007*
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22. **British Standard (BS) 8233:1999:** *Sound Insulation and Noise Reduction for*
  
23. *Buildings.*
24. **British Standard (BS) 5228 Part 1, 1997:** *Noise and Vibration Control on Construction and Open Sites*
25. **British Standard (BS) 5228 Part 4, 1997:** *Noise Control on Construction and Open Sites: Code of Practice for Noise and Vibration Control applicable to piling operations*
26. **Wikipedia-** *Liquefied Petroleum Gas (LPG)*
27. **GLPGP – Kenya Market Assessment Report-**, 2013.

## **Appendices**

Sketch Map of proposed project location

Land Ownership/Lease Documents

Sample Questionnaires

Appendix 1: Sketch Map of proposed project location



Plot to be developed for the project