ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) STUDY REPORT FOR 30,000 METRIC TONNES (MT) LIQUIFIED PETROLEUM GAS (LPG) MOUNDED STORAGE DEPOT ON PLOT NO. MN/VI/4794, CHAANI LOCATION, CHANGAMWE SUB-COUNTY, MOMBASA COUNTY, KENYA

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SEPTEMBER, 2020

REPORT AUTHENTICATION FORM

We the **WEEN Consult Limited** as a firm of experts to:

Proponent **AEVITAS INVESTMENT COMPANY LIMITED** on

Terms of Reference for an Environmental and Social Impact Assessment (ESIA) Study for 30,000 metric tons LPG Mounded Storage Depot on plot No. MN/VI/4794, KIBARANI-MOMBASA in Kipevu, Mombasa County, Kenya

Do hereby certify that these Terms of Reference have been prepared based on the information provided by **AEVITAS INVESTMENT COMPANY LIMITED** management as well as information collected from other primary and secondary sources and on the best understanding and interpretation of the facts by the environmental assessors. It is issued without any prejudice under the EMCA 2015 amendments.

Consultant

Mr. Steve Onserio Nyamori
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Signature……...
Date…….
NEMA Reg. Number **7854**

Project Proponent
Director: Mr. Mustafa M Dodh
AEVITAS INVESTMENT COMPANY LIMITED

Signature…….
Date…….

List of acronyms

Acronyms	Full Name
AGOL	Africa Gas and Oil Limited
API	American Petroleum Institute
BS	British Standards
EPRA	Energy and Petroleum Regulatory Authority
IEC	International Electro-technical Commission
ISO	International Organization for Standardization
KENGEN	Kenya Electricity Generation
KENHA	Kenya National Highway Authority
KETRACO	Kenya Electricity Transmission Company
KOT	Kipevu Oil Terminal
KPA	Kenya Ports Authority
KPC	Kenya Pipeline Company
KPLC	Kenya Power and Lighting Company
KRC	Kenya Railway Corporation
RECP	Resource Efficient and Cleaner Production
NEMA	National Environment Management Authority
SOT	Shimanzi Oil Terminal

EXECUTIVE SUMMARY

Aevitas Investment Company Limited is proposing to construct a 30,000 metric tons LPG Mounded Storage Depot on plot No. MN/VI/4794, KIBARANI-MOMBASA, in Chaani Location, Changamwe Sub County, Mombasa County, Kenya that shall be constructed in two phases whereby phase one will involve the construction of 25,750 metric tons (MT) capacity mounded storage tanks in the next two years and phase two that will involve the construction of 4,250 metric tons capacity mounded storage tanks. The second phase shall be commenced ones phase one is operational.

This mounded depot shall be constructed in part of the 7.796Ha (i.e. 19.3acres) of land registered as plot No. MN/VI/4794, KIBARANI-MOMBASA leased by the company from Kipevu Inland Container EPZ Limited (attached lease agreement and title). This project is located in an energy generating zone whereby the immediate neighbours are Kipevu 3 and Kipevu 1 (which are owned by KenGen) and Tsavo Power which is operated by Wartsila Eastern Africa Limited. These three plants are generating electricity using heavy furnace oil. This indeed makes the project site suitable for the proposed project. The GPS coordinates for the proposed project site are A (Latitude -4.03705, Longitude 39.63238), B (Latitude -4.03748, Longitude 39.63426) and C (Latitude -4.03530, Longitude 39.63349).

This Kshs 4 Billion project is aimed at m to developing an LPG storage depot near a common user terminal (CUM) in order to increase LPG storage for ease of distribution and onward use in Kenya and the region. This project is meant to contribute to the Big 4 Agenda as envisioned by His Excellency the President. The construction of this depot and subsequent operationalization shall employ over 250 people directly. Indirectly it is meant to employ over 1000 people.

Based on studies to inform policy development on use of LPG, in Kenyan households, firewood, charcoal and kerosene are widely used as the home heat source mainly for cooking. This has made the Kenyan government to recommend LPG use as a restraint on deforestation and the countermeasure against pollution (smoke/air pollution). The government of Kenya is also developing policies like exemption of the value added tax and cylinder purchase subsidy to entice the populace to embrace the use of LPG. With such an enticement, the use of LPG is growing in Kenya and in 2017 there was a 59% increase in the use of LPG from the year 2003. There is a projected increase of 14% of LPG use. With the projected increase in the use of LPG,

AEVITAS Investment Company Limited with the technical and financial ability plans to construct a 30,000 metric tons LPG mounded depot that shall be sold in bulk to the local and regional LPG dealers. For such a project, it is a mandatory requirement that it undergoes an environmental and social impact assessment study in order for it to be given an EIA License from the National Environment Management Authority (NEMA). It is with this reason that the proponent commissioned WEEN Consult Ltd to develop terms of reference (ToR) and subsequent environmental and social impact assessment (ESIA) study as guided by the Environmental Management and Co-Ordination Act amendments of 2015. It is important to note that the terms of reference were submitted (NEMA/TOR/5/2/143) and accepted by NEMA on 7th August 2020.

With the approved TORs by NEMA, the consulting firm (WEEN Consult Limited) set out to undertake the full study Environmental and Social Impact Assessment (ESIA) with the aim of assisting the Proponent to ensure environmental concerns are integrated and accounted for in all stages of the project development and implementation activities. The specific objectives being:

i) To comply and fulfil the legal requirements as outlined in section 58 of the Environmental Management and Coordination Act,(EMCA), 2015 and Section 3&4 of Environmental (Impact Assessment / Audit) Regulation, 2003 as well as other relevant regulations.

ii) To examine the location of the proposed 30,000MT LPG mounded depot and establish the key environmental concerns associated with the project to be addressed at the ESIA stage

iii) To identify whether or not the project is likely to have significant impacts, and if yes, identify potential significant environmental impacts, analyze significance of the adverse impacts, determine whether adverse impacts can be mitigated and recommend mitigation measures

iv) To establish the stakeholders to be involved in the community/public participation process, methods of reporting the project to the public, procedures to be used for community participation and aspects to be considered in the community participation plan during the development and review of the study.

v) To develop an Environmental and Social Management Plan for the project outlining anticipated impacts and their mitigation measures.

vi) To generate baseline data for monitoring and evaluation of how well the proposed mitigation measures shall be implemented during the project cycle.

vii) To provide a description of the proposed project activities with a potential focus on potential adverse impacts in the design, construction and operation phases caused by the inputs, waste generated and disposal and social economic aspects.

viii) To establish the legal and regulatory aspects, administrative frame of reference, to identify Legal and Industry Standards as well as Best Practices standards, legislation and guidelines, and to determine permits and authorizations which will be required for the different sectors agencies and institutions involved in this project

ix) To describe the area of influence, and select methods of measuring the environmental aspects of concern including physical (water, air, soil and noise), biotic environment (vegetation, flora and fauna), chemical, socioeconomic (socio and economic structure, demographic, and socioeconomic background), cultural (aspects of cultural, archaeological, or anthropological interest) and landscape

x) To establish scales to be used for required maps and characteristics of baseline and other data required and the reliability or deficiency level stipulated for such data.

xi) To establish the methods to be used in identifying and quantifying environmental impacts, methodologies for predicting those impacts and how those impacts will be described in terms of; character (negative or positive), condition (reversible or irreversible), period (short, medium, or long-term), scope (cumulative, synergistic, direct, indirect) and establishing what standards will be used for the EIA.

xii) To establish at what stages of the project the mitigating, corrective, compensatory and other measures will be used to eliminate, minimizing or mitigating adverse/significant impacts and how these measures will be selected.

xiii) To define a schedule of activities, reaction with regard to risk prevention and accident control, objectives, specific tasks and budget through an Environmental Management Plan (EMP) during the EIA study process.

xiv) To provide a monitoring program of relevant environmental issues, specific variables to be included in the environmental follow-ups, detection limits and standards to be used and contents of the follow-up program.

The ESIA study methodology was followed that included the screening of the project, scoping which led to the development of the TORs, baseline data collection, stakeholders consultations amongst other processes.

During the project study, key environmental, social and safety issues were raised. Stakeholders' participation and consultation (CPP) was a major source of information that has been used to develop this study report. The CPP process enlisted the views and opinions from a total 229 people whereby170 of these participants were reached out directly by the ESIA Study Team and another 59 through the local area opinion leaders with whom Briefing Meetings were done at the Chief's office (signatories appended to the respective Schedule for Enlisting Public Views).

The overall pattern of the views and opinions obtained can be summarized into four (4) interdependent thematic categories:

i) Approval of the proposed project;
ii) Mutual integration of the proposed project with the setting's natural ecosystem elements;
iii) Local community expectations from the proposed project; and
iv) Technical capacity requirements for sustainability of the proposed project.

The range of issues about safety once there is a gas leakage, solid waste management, and air pollution raised by stakeholders were founded on their understanding of events traditionally ascribed to the sector, and those are adequately addressed in the very design of the Depot and its intended technological structure. Where some unforeseen challenge may emerge over time, especially with regard to noise generation and possible blocking of roads and railway networks, the relevant stakeholders (here Kenya Railways Corporation and Kenya National Highways Authority) committed their availability to provide solutions when duly and formally informed on these matters. Overall, the CPP process revealed a cross cutting approval for the proposed project. No environmental nor social concerns raised by the stakeholders were so fundamentally threatening that they portend significant implications for changes in decisions about construction and operation of the proposed LPG Mounded Container Depot.

On the basis of the views of the stakeholders and the agencies and regulator's requirements, monitoring of the ambient air was undertaken to establish the current baseline conditions of the air quality in the project site. From the monitoring, none of the monitored parameters from the two points was above the tolerance limits. All the parameters (SO_2, NO_2, CO, CO_2, O_3, TVOCs, $PM_{2.5}$, and PM_{10}) were below the tolerance limits.

On analyzing the soil from the site, the results showed that BTEX is less than 0.01mg/kg from all the samples while TPH range between 1.89mg/kg to 2.90mg/kg. This indeed gives the baseline conditions of the soil as of now (before project implementation).

From the Factual Geotechnical survey: for shallow foundations, examination of the excavated foundation layer it is advised that on construction of the mounded tanks, ensure the foundation is placed on good Rock stratum with all pockets of the completely weathered rock as well as all the loose Rock debris being removed; the Engineer must approve all foundation depths before casting of the concrete and the excavations must be blinded soon after approval to forestall further deterioration of the foundation layer due to ingress of water and; the Design Engineer should therefore consider the in-situ and laboratory data analysis, and

recommendations presented on the report so as to determine the foundation type and depths of placement of the foundation at the project site.

Based on a succinct analysis of the views of the stakeholders and the expert observations, the proposed project will not compromise the well-being of the environmental condition since on a wide scale it is meant to reduce on the use of environmentally unsustainable products like biomass and charcoal at household level by increasing the storage facility of LPG in Kenya and the region,. Even the consideration of the neighbouring facilities like KenGen's Kipevu 1 and 3 and Also Tsavo Power that are using the "dirtier" source of fuel i.e. Heavy Furnace Oil to generate power to use the "cleaner" LPG source of fuel shall go a long way in not only reducing the carbon foot prints of these 3 facilities but also reduce the cost of power generation. This reduced cost shall be passed to Kenyans. On the other hand, this project is meant to contribute to the Big 4 Agenda as envisioned by His Excellency the President. The construction of this depot and subsequent operationalization shall employ over 250 people directly. Indirectly it is meant to employ over 1000 people indirectly. On the other hand, this project is meant to increase synergy with other players/stakeholders. It is worth noting that the project shall complement KPA's storage capacity on the land and this shall in turn increase their turn over on the basis of the new KOT that is being constructed. The Kenya Railways' meter gauge shall be used for the transportation of the LPG to other parts of the country and the region.

From the perspective of the public views and opinions gathered during the ESIA Study, the analysis has revealed that establishment of the LPG storage depot in its intrinsic right does not present fundamental social and environmental threats.

Much of the concerns raised from the consultations centred on the need for the operations and management of the LPG storage depot to be in tandem with local community requirements on the need for jobs and cheaper LPG. Most of these potential negative impacts have been mitigated in the ESMP generated which the management needs to adhere to.

To this end, the following considerations have informed the development and structure of the proposed ESMP for the LPG Storage Depot.

a) Establishing an inclusive Grievances Redress and a proposed plant Feedback Mechanism for purposes of capturing, negotiating and streamlining social and environmental impacts that may arise over time in the life of the LPG storage Depot. Stepping up a more transparent and inclusive CSR strategy.
b) Establish an explicit communication and decision making strategy. And there is a strong proposal that the proponent should consider employing a liaison officer
c) Establishing a NEMA coordinated continuous monitoring and evaluation framework for management of the LPG Storage depot.
d) Air quality dispersion modelling should be done once the plant has started operating

We therefore, recommend that NEMA grant a license to this proposed project as most of the issues are mitigatable and there is no adverse irreversible impact that may be caused by the construction, operation and decommissioning of this proposed 30,000 metric tons LPG Gas Depot in Kipevu, Chaani Location, Changamwe Sub-County, Mombasa County, Kenya by Aevitas Investment Company Limited.

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1.0 INTRODUCTION

Background

AEVITAS Investment Company Limited is duly registered Limited Company in Kenya pursuant to and in accordance with the provisions of the Registration of Business Names Act and rules made there under. The company has its Headquarters in Transnational Plaza, Mama Ngina Street, Nairobi, Kenya.

The investment company is proposing to construct a 30,000 metric tons LPG Mounded Storage Depot on plot No. MN/VI/4794, KIBARANI-MOMBASA, in Chaani Location, Changamwe Sub County, Mombasa County, Kenya that shall be constructed in two phases:

a) ***Phase One*** – will involve the construction of 25,750MT
b) ***Phase Two*** – will involve the construction of 4,250MT

This phased construction project shall see the first phase done in the next two years and the second phase projected to be done once the first phase is fully operational.

This mounded depot shall be constructed in part of the 7.796Ha (i.e. 19.3acres) of land registered as plot No. MN/VI/4794, KIBARANI-MOMBASA leased by the company from Kipevu Inland Container EPZ Limited (attached lease agreement and title). This project is located in an energy generating zone whereby the immediate neighbours are Kipevu 3 and Kipevu 1 (which are owned by KenGen) and Tsavo Power which is operated by Wartsila Eastern Africa Limited. These three plants are generating electricity using heavy furnace oil. This indeed makes the project site suitable for the proposed project. The GPS coordinates for the site are A (Latitude -4.03705, Longitude 39.63238), B (Latitude -4.03748, Longitude 39.63426) and C (Latitude -4.03530, Longitude 39.63349).

The project site borders from the left a railway line (Main siding of the Old Metre Gauge Railway Line) that is from the Kenya Ports Authority, KPA. This railway shall be one of the key transport infrastructures for the proponent to use in moving their products to the market. On the right is a wayleave owned by KETRACO but operated by the KPLC. Then towards the right from the wayleave is the Indian Ocean. Right behind the project proposed site are the two KenGen electricity generating companies' i.e. Kipevu 1 and Kipevu 3. Then there is another power generating company between Kipevu 1 and Kipevu 3 called Tsavo Power. These power

generating companies are currently using Heavy Furnace Oil (HFO) to run their turbines for power generation. The proposed LPG depot has high potential to supply to these companies LPG if they are willing to change their source of fuel to LPG since LPG is a clean source of energy. On the front there is an open field that is part of the proponent's land. This open field borders the main Mombasa-Nairobi road. This generally makes accessibility to the project site easy. The terrain of the proposed project site is generally flat with a constructed storm drain that is directed to the Indian Ocean. The site has no human settlement neighbourhood.

Similar Projects in Kenya and in Africa

In Kenya, LPG storage facilities exist and AGOL has such a bulk storage facility while in Africa such facilities exist. In Mauritius, in a two acre piece of land, a 20,000 metric ton single mounded LPG storage depot exists and has been operational. This clearly indicates that having 30,000 metric tons in a 19.3 acres piece of land in three mounds is possible.

Fig 1: Mapping giving the location and neighbourhood of the 20,000 metric tons LPG storage depot in Mauritius

Project Justification

Liquefied Petroleum Gas (LPG) is readily available globally and is lauded as a clean, energy efficient and portable fuel with an affordable price tag. It's currently sourced mainly from natural gas and oil production activities. However, in the wake of new technologies and techniques, LPG can also be produced from renewable sources.

As a mixture of propane and butane its density is higher than that of air, which means that in the event of leakage vapours will accumulate in the lower portion of the surrounding space. That means that it requires a different approach to leak detection and ventilation than Liquefied Natural Gas (LNG). LPG also has a lower flammability range, with a lower explosion limit of 2%. The World LPG Association (WLPGA) is clear on LPG's growing applicability. On the upside, LPG is less challenging with regard to temperatures since it has a higher boiling point and, unlike LNG, is not stored at cryogenic temperatures.

Based on studies to inform policy development on use of LPG, in Kenyan households, firewood, charcoal and kerosene are widely used as the home heat source mainly for cooking. This has made the Kenyan government to recommend LPG use as a restraint on deforestation and the countermeasure against pollution (smoke/air pollution). The government of Kenya is also developing policies like exemption of the value added tax and cylinder purchase subsidy to entice the populace to embrace the use of LPG. With such an enticement, the use of LPG is growing in Kenya and in 2017 there was a 59% increase in the use of LPG from the year 2003. There is a projected increase of 14% of LPG use. With the projected increase in the use of LPG, AEVITAS Investment Company Limited with the technical and financial ability plans to construct a 30,000 metric tons LPG mounded depot that shall be sold in bulk to the local and regional LPG dealers. For such a project, it is a mandatory requirement that it undergoes an environmental and social impact assessment study in order for it to be given an EIA License from the National Environment Management Authority (NEMA). It is with this reason that the proponent commissioned WEEN Consult Ltd to develop terms of reference (ToR) and subsequent environmental and social impact assessment (ESIA) study as guided by the Environmental Management and Co-Ordination Act amendments of 2015. It is important to note that the terms of reference were submitted (NEMA/TOR/5/2/143) and accepted by NEMA on 7th August 2020.

This project is meant to contribute to the Big 4 Agenda as envisioned by His Excellency the President. The construction of this depot and subsequent operationalization shall employ over 250 people directly. Indirectly it is meant to employ over 1000 people.

Project Cost

The implementation of this project is estimated to cost USD 40 Million (Ksh 4 Billion)

Project Objective

The main objective of this project is to develop an LPG storage depot near a common user terminal (CUM) in order to increase LPG storage for ease of distribution and onward use in Kenya and the region.

1.1 Objectives of the Environmental and Social Impact Assessment (ESIA)

The main objectives of the ESIA study process is to assist the Proponent ensure environmental concerns are integrated and accounted for in all stages of the project development and implementation activities.

The specific objectives are:

- To comply and fulfil the legal requirements as outlined in section 58 of the Environmental Management and Coordination Act,(EMCA), 2015 and Section 3&4 of Environmental (Impact Assessment / Audit) Regulation, 2003 as well as other relevant regulations.
- To examine the location of the proposed 30,000MT LPG mounded depot and establish the key environmental concerns associated with the project to be addressed at the ESIA stage
- To identify whether or not the project is likely to have significant impacts, and if yes, identify potential significant environmental impacts, analyze significance of the adverse impacts, determine whether adverse impacts can be mitigated and recommend mitigation measures

- To establish the stakeholders to be involved in the community/public participation process, methods of reporting the project to the public, procedures to be used for community participation and aspects to be considered in the community participation plan during the development and review of the study.
- To develop an Environmental and Social Management Plan for the project outlining anticipated impacts and their mitigation measures.
- To generate baseline data for monitoring and evaluation of how well the proposed mitigation measures shall be implemented during the project cycle.
- To provide a description of the proposed project activities with a potential focus on potential adverse impacts in the design, construction and operation phases caused by the inputs, waste generated and disposal and social economic aspects.
- To establish the legal and regulatory aspects, administrative frame of reference, to identify Legal and Industry Standards as well as Best Practices standards, legislation and guidelines, and to determine permits and authorizations which will be required for the different sectors agencies and institutions involved in this project

- To describe the area of influence, and select methods of measuring the environmental aspects of concern including physical (water, air, soil and noise), biotic environment (vegetation, flora and fauna), chemical, socioeconomic (socio and economic structure, demographic, and socioeconomic background), cultural (aspects of cultural, archaeological, or anthropological interest) and landscape

- To establish scales to be used for required maps and characteristics of baseline and other data required and the reliability or deficiency level stipulated for such data.

- To establish the methods to be used in identifying and quantifying environmental impacts, methodologies for predicting those impacts and how those impacts will be described in terms of; character (negative or positive), condition (reversible or irreversible), period (short, medium, or long-term), scope (cumulative, synergistic, direct, indirect) and establishing what standards will be used for the EIA.

- To establish at what stages of the project the mitigating, corrective, compensatory and other measures will be used to eliminate, minimizing or mitigating adverse/significant impacts and how these measures will be selected.

- To define a schedule of activities, reaction with regard to risk prevention and accident control, objectives, specific tasks and budget through an Environmental Management Plan (EMP) during the EIA study process.

- To provide a monitoring program of relevant environmental issues, specific variables to be included in the environmental follow-ups, detection limits and standards to be used and contents of the follow-up program.

2.0 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) STUDY METHODOLOGY

2.1 Proposed Project Screening and Scoping

Aevitas Investment Company Limited which is investing in the development of the LPG Storage Depot sought for information on which firm of experts can undertake for them a full study ESIA for their project. From the NEMA website, they were able to identify WEEN Consult Limited as one of the firms that has undertaken ESIA projects on energy.

WEEN Consult Limited mobilized their experts for a site visit and scoping before a contract was signed. The main aim of the scoping was to enable the team understand the site in terms of its physical location, the flora and fauna, the neighbouring facilities, the landscape and also the suitability of the site with the project.

Scoping also assisted in determining (screening) whether we were to undertake a summary project report (SPR) or project EIA or full study ESIA or a strategy environmental Assessment (SEA). On the basis of the scoping, the Proponent was advised to undertake a full study ESIA and the consultant to follow all the processes in developing a full study ESIA report.

2.2 Development of Terms of Reference for the EIA study

The development of the Terms of Reference (ToRs) for the proposed project was the second activity in accordance with the requirements of EMCA, [2015 Amendments]. First, the ESIA Team and the proponent visited NEMA headquarters for a briefing session with the NEMA Officers. In this meeting, the best approach to the ESIA full study was discussed and it was agreed that WEEN Consult Limited go ahead and develop the ToRs and submit to NEMA for approval. WEEN Consult Limited then developed and submitted the ToRs which NEMA approved on 7th August 2020

2.3 The EIA study process

After approval of the ToR for the proposed project, the WEEN Consult Limited experts embarked on the full study for the proposed 30,000MT LPG Storage Depot. The following study activities were undertaken.

2.3.1 Literature Review

This stage involved the collection and examination of existing secondary information about the proposed project technology; its previous successes worldwide, including relevant previous studies; project location baseline conditions (soil, land use, natural resources, environmental and infrastructural information); and policy and legal framework governing the proposed project that the proponent will be required to comply with. This also involved designing and testing of data gathering protocols and tools for the public and stakeholder participation.

2.3.2 Collection of Baseline Information

The WEEN Consult Limited experts visited the project site and collected baseline information required from within and around the project area via observations, photography and measurements. Appropriate tools and scientific methods of data collection were employed in the study. Detailed baseline conditions have been discussed in chapter five of this report

2.3.3 Consultation and Public Participation

WEEN Consult developed appropriate programs for consultations with focused groups, key stakeholders, members of the public, government lead agencies and other interested parties as required by the law.

The CPP process enlisted the views and opinions from a total 229 people, 170 reached directly by the ESIA Study Team and another 59 through the local area opinion leaders with whom Briefing Meetings were done at the Chief's office (signatories appended to the respective Schedule for Enlisting Public Views). The sum frequency distribution of participants in the by public and/or stakeholder participant category is presented in the table below.

Table 1: Distribution of participants in the CPP process

Participant category	**Number**	**Percent**
Public Members I: (Public Baraza Meeting)	70	30.6
Public Members II: (Submissions to the Schedule for Views)	97	42.3
Local Community Opinion Leaders (Chaani Location)	33	14.4
Stakeholders I: County Government Departments	3	1.3
Stakeholders II: National Government Agencies/Departments	16	7.0
Stakeholders III: Regional (Coast) Development Partners/Institutions	2	0.9
Stakeholders IV: Private Business Investors	8	3.5
Total	**229**	**100.0**

The overall pattern of the views and opinions obtained can be summarized into four (4) interdependent thematic categories:

(i) Approval of the proposed project;

(ii) Mutual integration of the proposed project with the setting's natural ecosystem elements;

(iii) Local community expectations from the proposed project; and

(iv) Technical capacity requirements for sustainability of the proposed project.

Environmental impacts	Minimal toxic discharge to the Ocean.
Economic impacts	a) Affordable LPG for the local community b) Direct and indirect employment opportunities c) Increased revenue for Mombasa County. d) Contribution to Kenya's GDP and the Big 4 Agenda. e) Expanded resource base for AEVITAS Company Limited to support CSR practices.
Social impacts	a) Additional income from jobs created can be channeled into social services such as investments in education and health. b) Improved security in Kipevu, Chaani Location.

Environmental impacts	a) High likelihood of alterations in traffic/transport flows during construction. b) Possible congestion of the road connecting the proposed site to the main Road during constructions and functioning of the proposed plant.
Social & Economic impacts	a) Possible non-equitable distribution of the resultant job opportunities for the surrounding community members.

Detailed consultation and public participation results have been discussed in chapter eight of this report.

3.0 PROJECT DESCRIPTION, PHYSICAL ENVIRONMENT AND LAYOUT PLAN

3.1 Project Description and Layout Plan

Aevitas Investment Company Limited is proposing to construct a 30,000 metric tons LPG Mounded Storage Depot on Plot no. MN/VI/4794, KIBARANI-MOMBASA, in Chaani Location, Changamwe Sub County, Mombasa County, Kenya that shall be constructed in two phases:

a) ***Phase One*** – will involve the construction of 25,750MT
b) ***Phase Two*** – will involve the construction of 4,250MT

This mounded depot shall be constructed in part of the 7.796Ha (i.e. 19.3acres) of land registered as plot No. MN/VI/4794, KIBARANI-MOMBASA leased by the company from Kipevu Inland Container EPZ Limited (attached lease agreement and title) in two phases.Phase one that is projected to be completed in the next two years shall have a capacity of 25,750 metric tons while phase two that shall have a capacity of 4,250 metric tons shall commence once the storage depot is operational. This project is located in an energy generating zone whereby the immediate neighbours are Kipevu 3 and Kipevu 1 (which are owned by KenGen) and Tsavo Power which is operated by Wartsila Eastern Africa Limited. These three plants are generating electricity using heavy furnace oil. The GPS coordinates for the site are A (Latitude -4.03705, Longitude 39.63238), B (Latitude -4.03748, Longitude 39.63426) and C (Latitude -4.03530, Longitude 39.63349).

Fig 2: The map of the proposed project site

The Kipevu and Changamwe area is the hub and therefore the Cluster of the Oil and Gas Sector in Kenya whereby several oil importing companies, Kenya's only Petroleum Refinery (now disused), Electricity Generating Companies, Oil and Gas Distribution Companies are to be found side by side in a competitive yet complementary and interrelated manner.

The project site borders from the left a railway line (Main siding of the Old Metre Gauge Railway Line) that is from the Kenya Ports Authority, KPA. This railway shall be one of the key transport infrastructures for the proponent to use in moving their products to the market. On the right is a wayleave owned by KETRACO but operated by the KPLC. Then towards the right from the wayleave is the Indian Ocean. Right behind the project proposed site are the two KenGen electricity generating companies' i.e. Kipevu 1 and Kipevu 3. Then there is another power generating company between Kipevu 1 and Kipevu 3 called Tsavo Power. These power generating companies are currently using Heavy Furnace Oil (HFO) to run their turbines for power generation. The proposed LPG depot has high potential to supply to these companies LPG if they are willing to change their source of fuel to LPG since LPG is a clean source of energy. On the front there is an open field that is part of the Proponent's land. This open field borders the main Mombasa-Nairobi road. This generally makes accessibility to the project site easy. The terrain of the proposed project site is generally flat with a constructed storm drain that is directed to the Indian Ocean. The site has no human settlement neighbourhood.

With such suitable conditions for the Energy industry, it logically follows that labour migrates where employment is. The necessary skilled labour for the Energy industry is readily found within this cluster as well as the business acumen that is required to create employment opportunities through investments in the pillars of the Energy industry: Petrol stations, Gas terminals, Heavy Furnace loading stations, Power Generating Plants, Provision of related products such as petroleum based bitumen and transportation services (mainly petroleum and Gas tankers).

The client is proposing to build a common user Bulk LPG receiving, storage and distribution terminal at its existing land in Mombassa Kenya. It is proposed to have a total storage of 4 x 4000 m^3 LPG Mounded Storage Bullets and 11 x 3480m^3 Propane Mounded Storage Bullets, totalling to 25,000 tons (54,280 m^3) of LPG/Propane storage. It is proposed to have 3 mounds as follows: Mound 1 consisting of 4 x 4000m^3 LPG Mounded Bullets, Mound 2 consisting of 5 x 3480m3 Propane Mounded Storage Bullets and Mound 3 consisting of 6 x 3480m^3 Propane Mounded Storage Bullets. The storage bullets will be installed along with with all related infrastructure like LPG import Pipeline from Jetty to storage bullets, Instrumentation system, Electrical system, Fire fighting system, Tanker loading system, Piping and metering system with all related accessories. The plant will function primarily as LPG receipt, storage & bulk distribution facility wherein LPG shall be imported by ship and distributed in bulk through mobile tankers.

During construction, the plant shall consist of additional facilities like LPG Tanker bay with loading system, Weigh bridge, Interconnecting Pipeline for bullets, Safety system like Gas leak detection system, Safety interlocks, High level alarm system, Low level alarm system, Overfill protection system, Dry run protection system, Fire fighting and water sprinkle system, Emergency shut down system. The bullets are provided with instrumentation system consisting of Radar gauges, Pressure transmitter, Temperature transmitter, Tank gauging system, PLC based control panel with SCADA system shall be provided for safe and easy operation of the plant.

3.2 Project Process Design

The project proponent has contracted an Indian based company (BNH Gas Tanks LLP, India) known for its technical ability world wide to construct mounded LPG depots. As a minimum,

the facility's design has adhered to the following international codes while and construction shall undertaken in adherence with the following international codes, as applicable:

Table 2: Design & Installation Codes

Pressure Vessels	ASME VIII Div. 2
Process Piping	ASME B31.3
Relief Devices	API 520, 521, 526 and 2000 as applicable
Fire Detection and Protection	NFPA 15 and NFPA 58
Design and Installation Codes	NFPA 58

Other Reference Standards

Table 3: Electrical, Control and Instrumentation Systems codes and standards:

Instrument Air Quality	ANSI / ISA – S7.0.01
Electrical	API RP 540, API RP 14FZ and International Electro-technical Commission (IEC) suite of codes applicable to propane facilities and explosive atmospheres.
Process Measurement Instrumentation	API RP 551 and 554

Table 4: ISO – International Organization for Standardization

ISO-10790	Measurement of fluid flow in closed conduits – Guidance to the selection, installation and use of Coriolis flowmeters (mass flow, density and volume flow measurements)

Table 5: API – American Petroleum Institute

API 2510	Design and Construction of LPG Installations
API STD 520 P1 & API RP 520 P2	Sizing, Selection and Installation of Pressure-relieving Devices in Refineries
API STD 521	Pressure-relieving and De-pressuring systems
API STD 526	Flanged Steel Pressure Relief Valves
API STD 527	Seat Tightness of Pressure Relief Valves

API RP 551	Process Measurement Instrumentation
API RP 554 - All parts	Process Instrumentation and Control
API STD 670	Machinery Protection System
API STD 607	Fire Test for Quarter - Turn Valves and valves equipped with non-metallic seats
API STD 618	Reciprocating Compressors for Petroleum, Chemical, and Gas Industry Services
API MPMS	Manual of Petroleum Measurement Standards
API Spec 6D	Specification for Pipeline Valves (Gate, Ball and Check Valves)

Table 6: IEC – International Electro-technical Commission

IEC 60079	Electrical apparatus for explosive gas atmospheres (all parts)
IEC 60331	Test for Electric Cables under fire conditions-circuit integrity
IEC 60332	Test on Electric and Optical fiber cables under Fire Condition
IEC 60529	Degrees of protection provided by enclosures (IP Code)
IEC 60654 - All parts	Operating conditions for industrial process measurement and control equipment
IEC 60584 Parts 1 & 2	Thermocouples
IEC 60751	Industrial Platinum Resistance Thermometer Sensors
IEC 60751	Electromagnetic Compatibility
IEC 60801	Electromagnetic Compatibility for Industrial process Measurement and Control Equipment.
IEEE-C62.36-2000	Standard Test Methods for Surge Protectors Used in Low - Voltage Data, Communications, and Signalling Circuits

Table 7: BS – British Standards

BS EN 50288-7	Multi element metallic cables used in analogue & digital communication and control – part 7: Sectional specification for Instrumentation control cables
BS EN 50262	Cable glands for Electrical Installations
BS 6121-1	Mechanical Cable Glands – Specification for Metallic Glands

BS 6739	Code of Practice For Instrumentation In Process Control Systems - Installation Design & Practice
BS EN 837 - 1, 2 & 3	Pressure gauges
DIN 43760	Temperature Vs Resistance curves for RTDs

Table 8: ASME Standards

ASME B1.20.1	Pipe Threads General Purpose
ASME B16.5	Pipe flanges and flanged fittings.
ASME B16.9	Wrought Butt welding Fittings
ASME B16.11	Forged Fittings, Socket-Welding and Threaded
ASME B36.10	Welded and Seamless Wrought Steel Pipe
ASME PTC 19.3	Temperature Measurements
ASME MFC-18M	Measurement of fluid flow using Variable Area Meters

Table 9: NFPA Standards

NFPA 10 (2018)	Standard for Portable Fire Extinguishers
NFPA 15 (2017)	Standard for Water Spray Fixed Systems for Fire Protection
NFPA 24 (2019)	Standard for the Installation of Private Fire Service Mains and their Appurtenances
NFPA 58 (2017)	Liquefied Petroleum Gas Code
NFPA 70 (2017)	National Electrical Code
NFPA 72 (2016)	National Fire Alarm and Signalling Code
NFPA 110 (2016)	Standard for Emergency and Standby Power Systems

Table 10: KS Standard

KS 1938	Part 3 - Liquefied petroleum gas installations involving storage vessels of individual water capacity exceeding 9000 L

3.2.1 Project Proposed Facilities

Aevitas Investment Company Limited, Kenya desires to install a 25,750 M.T. (in phase one) and later 4,250 MT (phase 2) LPG Import, Receiving, Storage & Distribution Facility. The Facility is initially (phase one) planned to be designed for the following:

i) Storage Information

a) *Type of Storage Tanks / Installation*: Horizontal Cylindrical Mounded Bullets
b) *Nominal Storage Capacity*: 11 X 3480 cu.m & 4 X 4000 cu.m– Total 54,280 cubic metres
c) *Product to be stored*: LPG (Butane 90%, Propane 10%), Specific Gravity 0.56
d) *Product Storage Capacity*: 11 x 1650 M.T. & 4 x 1900M.T. – Total 25,750 M.T.
e) *Number of Storage Bullets*: 11+4 = 15
f) *Max. Design Pressure*: 17.24 barg @ 55 Deg. C
g) *Design Temperature*: -27 to 55 Deg.C

ii) Product Receipt Information:

i) *Product to be received*: LPG Max. Operating Pressure: 7 barg @ 45 Deg. C
ii) *Size of the Ship in MT of LPG parcel that will be imported*: 10,000 to 20000 MT
iii) *Size of maximum parcel that will be offloaded at one time*: 25000 MT based on current inventory levels
iv) *Number of Ships to be offloaded every month*: 2-3 Ships per month
v) *Ship Unloading Pumping rates*: 250 to 300 MT per hour
vi) *Time taken to offload this parcel in Hrs*: 34 hours for 10,000 Tons
vii) *Jetty to Tank Farm Pipeline Sizing*: NPS 12" / DN 300
viii) *Jetty to Tank Farm Pipeline Distance*: To be decided later

iii) Bulk Transfer and Loading Facilities (Tanker-Truck Loading Gantry):

- *No. of Bay*: 6 Bays in one Loading Gantry
- *Capacity of Road Tankers to be loaded*: 20 – 25 M.T. each
- *Pumping Rate*: 7 Pumps of 55 m3/hour capacity (6 Working + 1 Standby)
- *Truck Loading capacity*: Approx 1000 MT in 12-hour (Sunrise to sunset)
- *Discharge Pressure while loading Tankers*: 4 – 6 barg at Ambient Temperature

- *Unloading from Tanker*: No
- *Truck loading methodology*: Weigh Bridge on each gantry (Six)

3.2.2 Receiving LPG by ship

It is proposed that the Facility will receive LPG imported by ship in parcels of 10,000 tons each. 2 to 3 such parcels will be received per month. The ship will be offloaded using the Pumps in the Ship capable of pumping at 250 to 300 MT per hour and the LPG will be conveyed through a NPS 12" (DN 300) pipeline installed from the Jetty to the Storage Terminal (Length of pipeline to be decided later). A parcel of 10,000 MT will require approximately 34 hours to be offloaded. The LPG will be directly received into the Mounded Bullets duly measured and inventoried with the help of independent Coriolis mass flow meters to be installed on the feed inlet pipeline before it is stored in the Bullets.

Vapor pipeline between the import and storage terminal is not envisaged in this project.

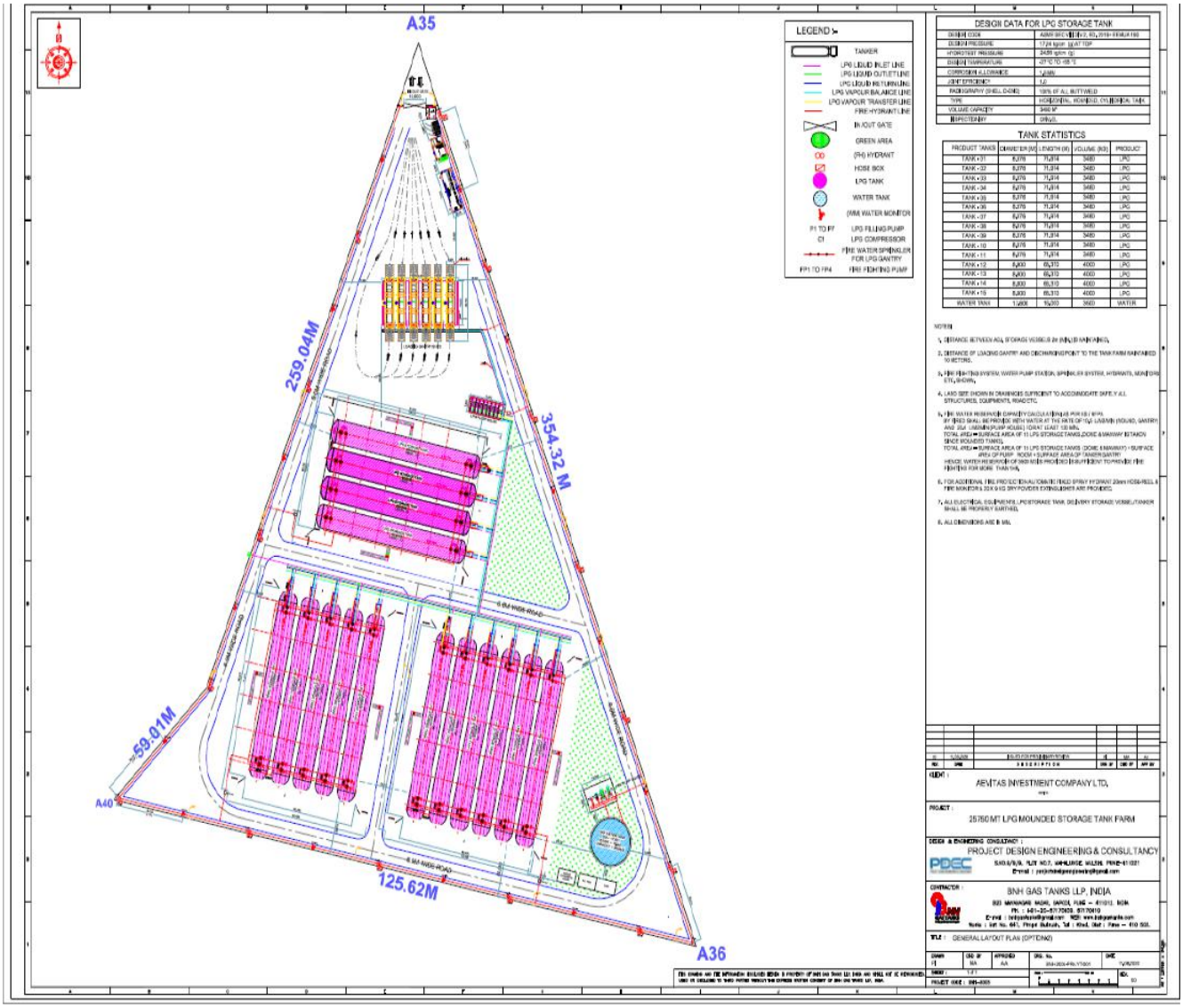


Fig 3: Preliminary Layout for 27000 MT LPG Mounded Storage Tank Farm

3.2.3 Mounded Storage Bullets Technical Specification

CHARACTERISTICS	DESIGN INPUT / REQUIREMENT / COMPLIANCE
Supplier/Seller	BNH Gas Tanks LLP , India
Capacity	3480M³ Gross Nominal capacity
Service	LPG
Type	Mounded, Cylindrical Tank with Hemispherical ends
Diameter Inner	8000 mm x Straight shell length 63,914 mm TL to TL
Corrosion allow	1.5 mm for shell, ends and internals
Code of Construction	ASME Section VIII Div. 2, Class 2, Edition 2019 (No code stamp)

	The bullet design shall also take into consideration guidelines of EEMUA 190 guidelines for inputs related to external loadings.
Shell / Head / Pad Material	ASTM SA-537 Cl. 1 Carbon steel
Pipe Material	ASTM SA-333 Gr. 6
Flange Material	ASTM SA-350 LF2 (Class 300)
Design pressure	Internal: 17.24 Kg/Cm2(g) @ 55 °C including static head External: 2.61 Kg/Cm2(g) (Due to sand and vacuum)
Hydro Test pressure	24.66 Kg/Cm2(g) / As per code requirement
Design Temp	+55°C
MDMT	-27°C
Seismic & Wind load	To be provided by Client
Supports type	Rested on Sand bed of mound
NDE	100% Radiography of all butt-welded seams (Joint efficiency 1)
Nozzles	As per requirement to be finalized after detailed Process Design
Thickness	38 mm shell and 22 mm hemispherical ends
Welding Process	Full penetration welding will be carried out using SMAW or SMAW+SAW processes by welders qualified as per ASME IX
Inspection	Inspection and tests will be controlled and certified by internationally approved third party (DNV GL business Assurance India Pvt Ltd, India).

3.2.4 Mounded Bullet Installation

The Mound shall be designed such that maximum six Bullets are accommodated in one single mound and the separation distance between 2 adjacent bullets shall be 2 m (not be less than 1m based on Table 2 of KS 1938_3_2012.)

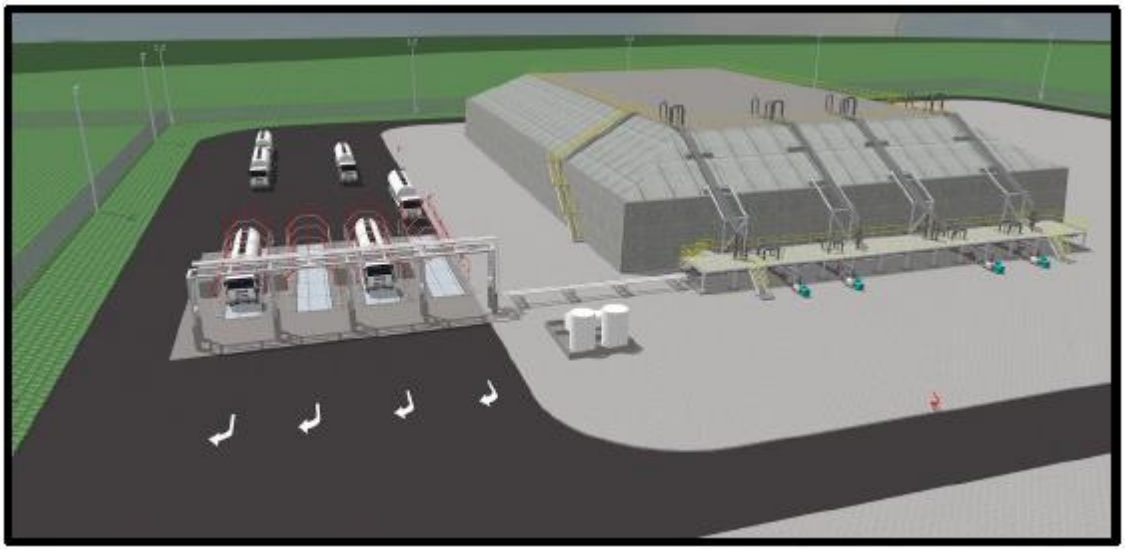
Table 2 — Safety distances

Water capacity of storage vessel L	Minimum (safety) distances(m)					
	From above-ground vessel to points of gas release[a)]	From above-ground storage vessel to buildings and property boundaries	From buried and mounded storage vessel to buildings, property boundaries and points of gas release	From sealed surface equipment to building and property boundaries	From open flame equipment to building and property boundaries	Between above LPG storage vessels
9 000 <V≤ 67 5 00	5.0	9.5	7.0	3.0	5.0	¼ of the diameters of adjacent storage vessels
67 500 <V≤ 135 000	9.5	15.0	15.0			
135 000<V≤ 265 000	15.0	22.5	15.0			
V> 265 000	15.0	30.0	15.0			

[a)] For points of transfer see Clause 12 and Figure 2.

6.4.3.2 Buried or mounded storage vessels should be located outside of any buildings. Buildings should not be constructed over any buried or mounded storage vessels. Sides of adjacent storage vessels should be separated by not less than 1 m.

Fig 4: 3D View of the proposed project Mound as designed by the BNH Gas Tank LLP



3.2.5 Safety Fittings

Mechanical Safety fittings like Excess flow check valves, Temperature Gauge, Pressure gauge, Pressure Safety relief valves, Thermal Relief Valves in addition to Level Transmitters, Pressure Transmitters, Temperature Transmitters, High Level Alarm Switch and Remote Operated Valves shall be installed.

3.2.6 Pumps and Compressors

LPG Loading pumps (6 working + 1 standby) are proposed for gantry loading of LPG semitrailers.Provision for transferring product from one storage tank to another is proposed by means of one separate LPG compressor using the vapor transfer line. The Compressor can also be used to load liquid into the Semitrailers by pushing vapor from the semitrailers to storage tank. Pipeline headers shall be provided with respective manual valves for liquid & vapor transfer operations. The Compressor shall also be installed in the pump shed.

3.2.7 Loading Gantry (LPG Semitrailer Loading System)

Six (06) loading bays shall be provided at gantry for loading of LPG Semitrailers (each of capacity approx. 20 to 25 Tons) by means of Loading hoses. Gantry will handle LPG. It is envisaged to load the semitrailers at the rate of 20 to 25 tons per hour. Hence it is proposed to have six truck tanker loading gantry. Truck off-loading gantry is not envisaged in this project.

The tanker weighment will be done through six dedicated weigh bridges, one under each Gantry. LPG will be transferred by means of (6W + 1S) pumps with bypass valve arrangement to allow required flow rate to gantry.

- Design Cases for the facility is considered as follows:

  Case-1: Liquid loading from storage tank to LPG Semitrailer using pump.

  Case-2: Liquid loading from storage tank to LPG Semitrailer using compressor.

- Gantry Loading Pumps of 50 to 55 cu.m/hr. capacity (6 Working + 1 Stand by) for loading of LPG Semitrailer equipped with flameproof motors.
- LPG vapor balancing will be done before initializing loading operation by means of LPG vapor balance header connected from each LPG storage tank to gantry vapor in/out header.
- LPG compressor for vapor transfer from one storage tank to another or LPG Semitrailer.
- Loading Hoses 3" (liquid) and 2" (vapor) – 6 sets

Table 11: Design Parameters of Loading Gantryle

PARAMETER	DESCRIPTION / VALUE
Tank Truck Capacity	Max. 25 M.T. (57 m3)
Loading Time for Each Road Tanker	60 to 90 minutes
Number of Bays	6
Working hours per day	12 hours (Sunrise to Sunset)
Type of Loading Pumps	Positive Displacement Pump (Corken)
Type of LPG Compressor	Reciprocating Non-Lubricated Compressor (Corken)

3.2.8 Parking Facility

The layout has allocated space to park sufficient number of LPG Semitrailers outside the compound wall. Semitrailers meeting the required specifications shall only be allowed to park in this area due to its proximity to the LPG terminal.

3.2.9 Over-Pressure Protection

All the mounded bullets/pressure vessels, pumps, compressors and isolatable piping sections will be provided against overpressure with Pressure Safety Valves (PSVs) sized as per KS

1938_3_2012 or NFPA 58 and Thermal Relief Valves (TRV) as required in consideration of all relief scenarios.

3.2.10 Cathodic Protection

Impressed Current Cathodic protection {ICCP Mix Metal Oxide (MMO) wire Anode} is considered for prevention of soil side corrosion of the mounded storage vessels with a minimum design life of 50 years.

The mounded bullets will be electrically isolated at all inter-connecting Inlet, Outlet, Vapour balance and Liquid return pipe connections using double flanged Monolithic Isolating joints as per standard requirements.

3.2.11 Piping and other Facilities at Terminal

The general facilities at terminal shall include:

- All Process Piping and Piping Components will be designed, constructed and tested in accordance with the requirements of ASME B31.3.
- All firewater piping and piping components will be designed, constructed and tested in accordance with the requirements of NFPA 13 and NFPA 15.
- All valves will be tested in accordance with EN 12266-1.
- Air compressor: One (01) no. of air compressor (as per air consumption) with air receiver and pre-post filter is considered to cater to the requirements of instrument air by ROV's.

3.2.12 Utilities

Following utilities will be required additionally in the project:

- Power – Will be given by Client up to BNH Gas Tank LLP control panel for Construction and Operation.
- Water – Will be provided by Client for hydrotesting and firefighting.
- Nitrogen – Will be provided by Client for inerting of tanks and pipeline during pre-commissioning.
- LPG Vapors – Will be provided by Client for commissioning.

3.2.13 Electrical

Compartment type Control panel located in Control room be used for catering to various loads of compressors, pumps etc. 230VAC UPS will be installed in the Control Room Building for providing power backup to Instrumentation loads and PLC panel. One 230VAC Lighting DB will be provided for outdoor lighting. Adequate earthing facilities will be provided for the entire facility.

3.2.14 Fire Fighting System

The firefighting installation will meet the requirements of KS 1938_3_2012 or NFPA 58 and will be designed, installed and commissioned in accordance with NFPA 13 and NFPA 15.

The facility shall consist of Firefighting pumps (Diesel engine driven Pump & Jockey pump) Deluge system with auto actuation, Medium velocity water sprinkler system and fire detection system for External exposed surface of LPG Mounded bullet, LPG Pump house, Tanker loading gantry. etc.

A Fire water storage tank of adequate facility to fight fire for 2 hours will be constructed in accordance with code requirement.

3.2.15 Instrumentation & Control

Tank gauging and safety instruments will consist of Two (02) Radar Level Transmitters, One (01) Pressure Transmitter, One (01) Temperature Transmitter, One (01) High Level Alarm Switch, One (01) Pressure gauge and One (01) Temperature gauge per Storage Bullet.

Remote Operated Valves will be provided for isolation of LPG inlet, outlet and gantry operations.

Mass flow meters will be provided for product inlet into storage bullets.

Additionally, Instrumentation system is considered for fire detection, gas leak detection, firefighting deluge actuation and software controlled standalone weigh bridges.

The following list of works shall be carried out in the proposed facility:

i) Mainframe PLC (SCADA) system shall be provided in the Control Room, which will be interfaced with the Emergency shut down system (ESD), Fire and Gas Leak detection systems (F&G system)

ii) One server with Database and Two (02) workstations shall be provided for monitoring and operation of the facility at the Control Room (1 Master + 1 Slave). The workstations shall also be used for inventory management monitoring purposes (TFMS). In case of failure of the master workstation the slave will become master.

iii) Dedicated Tank Farm Management System (TFMS) system to calculate accurate level of all bullets with respect to factors of temperature and pressure compensation. TFMS will consist of Radar Level Transmitters, Pressure Transmitter, Temperature transmitter, Remote Indicator and dedicated TFMS software along with Personal Computer (PC). The TFMS software will generate dynamic graphic pages showing all details of Tanks with dynamic level indication, all other operational data concerning tanks and Fluids. Operator will be able to access the graphics part as more user friendly.

iv) F&G and ESD system shall be provided using Ethernet interfaces and/or serially interfaces to the other systems.

v) Field instruments like Remote Operated Valves, Level Transmitters, Pressure Transmitters, Temperature Transmitters, High Level Alarm Switch and Coriolis mass flow meter etc. shall be provided and connected to the SCADA-PLC system.

vi) 6. PLC system shall also be used to control the batch loading transactions during road tanker loading to indicate the mass flow from Coriolis mass flow meters through each of the loading bays.

vii) Dedicated TFMS system shall be installed for storage tank inventory management in Control Room. TFMS shall be serially interfaced with Mainframe PLC (SCADA) system.

viii) ESD system shall be provided with emergency buttons located at strategic locations like Storage, Pump house, Gantry, Fire Pump House Area, Control room, etc. so that in case of any emergency the system can be triggered and operated to shut down the plant operation and activate the safety system.

ix) Other safety interlocks include pump trip based on low storage level, inlet ROV close based on high storage level etc.

x) Gas detectors for monitoring gas leaks at critical operational areas.

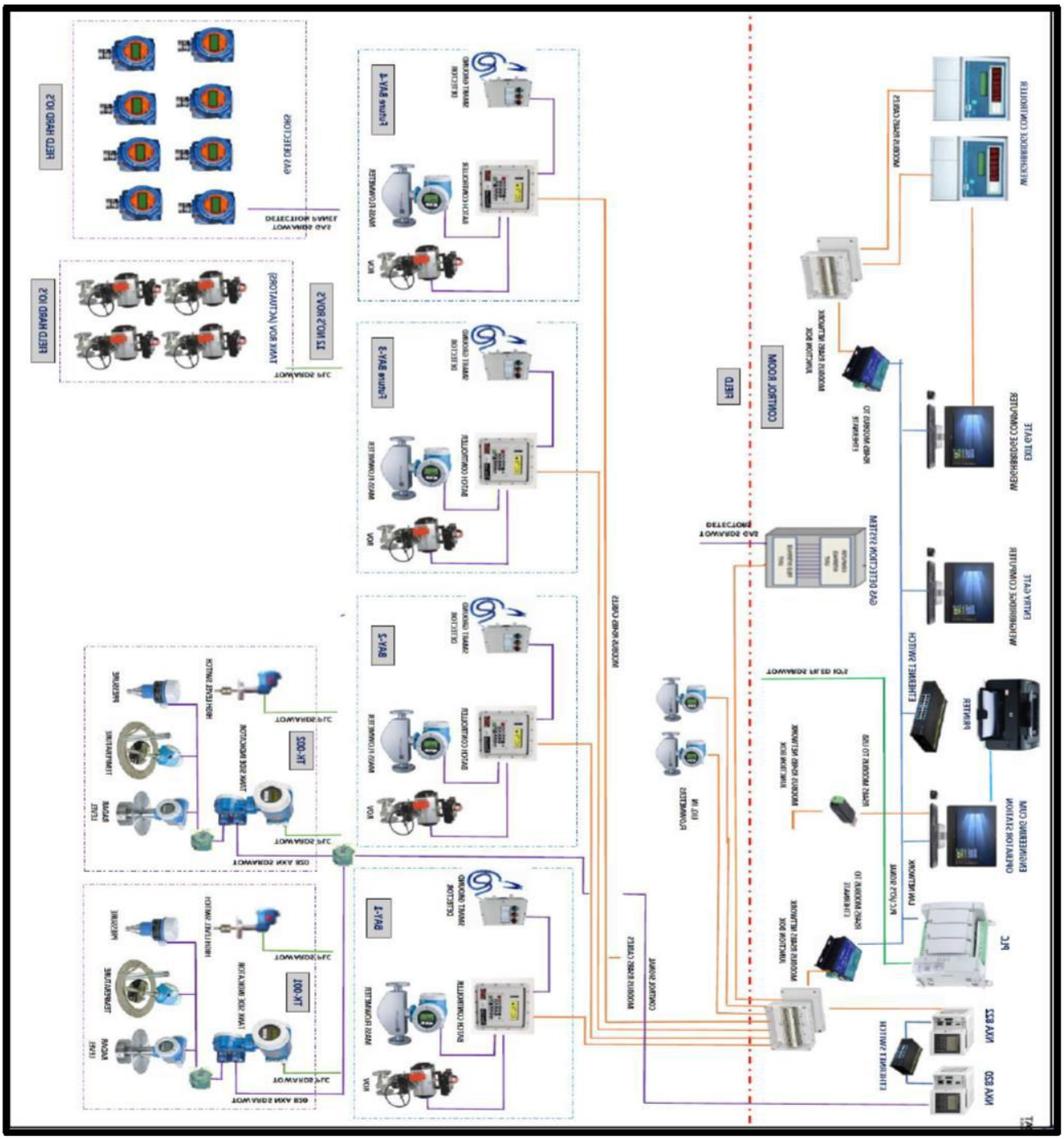


Fig 5: Typical Scada Scheme For Interface With Field Instruments

3.3 Safety and Hazard Management Systems

This section shall focus on the potential hazards areas and the proposed safety systems that the proponent shall put in place to manage these hazards. It is important to note that the highest risk to this project is fire break out given that the product that the proponent shall be storing is a source of fuel. Thus fire safety management is a critical component in protecting the business, environment and health of the workers and neighbouring businesses.

3.3.1 Hazards of LPG

When LPG is released from a storage vessel or a pipeline, a fraction of LPG vaporizes immediately and the other portion forms a pool if the released liquid quantity is more. LPG from the pool vaporizes rapidly entrapping some liquid as droplets as well as considerable amount-of air, forming a gas cloud. The gas cloud is relatively heavier than air and forms a thin layer on the ground. The cloud flows into trenches and depressions and in this way travels a considerable distance.

As the cloud formed in the area of spill moves-downwind under influence of wind, it gets diluted. A small spark within the flammability limit can cause flash fire, explosion and if the liquid pool still exists and remains in touch of cloud under fire it can ignite the whole mass of liquid. However, in case of non-existence of any source of fire there will be no occurrence of hazardous event and the cloud may get diluted to such a level that the mixture is no longer explosive.

Table 12: Important Properties of Liquefied Petroleum Gas (LPG)

Sr. No.	Property	Remark	
1	Appearance and Odour	Colourless and odourless gas when pure. Normally marketed with mercaptan odouring agent	
2	Composition	Mixture of commercial propane, butane and unsaturated hydrocarbons	
3	Liquid Density	500 to 580 kg/m³at 15 deg. C depending on composition	
4	Vapour Density	1.5 to 2.0 times heavier than air	
5	Boiling Point	-50 to -0.5 deg. C.	
6	Flammability Limits in Air	LFL -	1.9% V/V.
		UFL -	9.5% V/V.
7	Permissible Exposure Limit- OSHA Standard	1000 ppm (1800 mg/m³)	

Table 13: Some of the potential hazardous areas/equipment are:

EQUIPMENT/AREA	DIMENSIONS (Internal Diameter)	ORIENTATION	RISK EXPOSED SURFACE
LPG Storage Bullets	8 m (ID) X 71.974 m (L)	Horizontal	Exposed area (domes, & Manholes)
LPG Pumps and Compressor Area	16 m (L) X 6 m (W) X 4 m (H)	Skid/Foundation	Projected Ground Area
Gantry Area	15m (L) X 2.8 m (W) X 3.9 m (H)	Maximum Operation Area	Maximum area of operation

The following are amongst the safety management systems that the project shall incorporate. The technical drawing with all the details are attached in the appendix

3.3.1 Gas Leak Detection System

Gas leak sensors shall be provided at strategic hazardous areas like Storage Bullet areas, Loading Pump Area, Gantry Area, etc. and these sensors are connected to a control monitor in the control room. The sensors are set at 20% and 40% of LEL so that in case of any gas leak, the sensors raise an alarm at 20% of LEL and second alarm at 40% of LEL.

3.3.2 Fire Detection and Protection Facilities

Fire Fighting and Fire Detection System will be provided as per standard. Facilities like MCPs, Fire Extinguishers and Hooters shall be provided.

LPG Installations shall have well defined in-built fire prevention and protection system to mitigate any exigency. The requirements of fire prevention and protection system shall be as under Design Criteria:

i) The single largest fire risk shall be considered as per standard. The fire water system shall be provided based on single largest fire contingency for all locations.
ii) Exposed parts like Manhole and Dome of mounded LPG storage Vessels, Loading Pump / Compressor Houses, Tank Truck Gantry, shall be fully covered by medium velocity water spray system.
iii) Fire Protection Facilities shall have firefighting access, means of escape in case of fire and also segregation of facilities using adequate cooling system so that the adjacent facilities are not endangered during the fire.
iv) Quartzoid bulb for detection of fire for automatic actuation of medium velocity water sprinkler system shall be provided. The QB detectors shall be placed directly in the detection line provided on top of the exposed portion of the LPG Mounded Tank, LPG Pump house, LPG Gantry Area.

v) Deluge valve shall be provided for LPG mounded Tank, LPG Pump house, LPG Gantry Area, which shall be automatically activated through the detection line provided in these areas.

3.3.3 Flow Rate Design

As per NFPA / KS standard the Fire Water pumping requirement for Medium Velocity (MV) spray system shall be calculated based on minimum spray density as 10.5 LPM/Sq.m (as per KS std.). of the exposed surface area in LPG storage tank area and LPG tanker loading gantry area and in case of Loading Pump/ compressor it shall be 20.4 LPM/Sq.m. (as per NFPA std.).

Table 14 The proposed water discharge densities for the hazardous areas/equipment are:

EQUIPMENT/AREA	DENSITY[(2)] ($l/min/m^2$)	PURPOSE OF THE WATER	TARGETED SURFACE
LPG Storage Bullets	10.5	Exposure Protection	Exposed area (domes, & Manholes)
LPG Pumps and Compressor Area	20.4	Control Burning	Projected Ground Area
Gantry Area	10.5	Control Burning	Maximum area of operation

3.3.4 Fire Water System Design

i) The Fire Water pressure system shall be designed for a minimum residual pressure of 7.0 kg/ cm^2 g.

ii) Aboveground fire water ring main shall be provided all around perimeter of the LPG Plant with hydrants/ monitors spaced at specified intervals. Fire hydrants and monitors shall not be installed within 15 Meters from the facilities/ equipment to be protected.

iii) Fire hydrant network shall be in closed loops to ensure multidirectional flow in the system. Isolation valves shall be provided to enable isolation. The isolation valves shall be located normally near the loop junction.

iv) Fire Hydrant Network.

v) Fire hydrant ring main shall be laid aboveground.

vi) Hydrants/ monitors shall be located considering various fire scenario at different sections of the premises to be protected and to give most effective service. At least one hydrant post shall be provided at every 30 meters of external wall measurement or perimeter of battery limit in case of high hazard areas. For non-hazardous area, they shall be spaced at 45 meters intervals.

vii) Hydrants shall be located at a minimum distance of 15 meters from the periphery of storage tank or equipment under protection. In case of buildings this distance shall not be less than 2 meters and not more than 15 meters from the face of building. Provision of hydrants within the building shall be provided in accordance with relevant standard. Hydrant/Monitors shall be located along road side for easy accessibility.

viii) Double headed hydrants with two separate landing valves on stand post shall be used. All hydrant outlets shall be 1.2 meters above ground level.

ix) Monitors shall be located to direct water on the object as well as to provide water shield to firemen approaching a fire.

- The requirement of monitors shall be established based on hazards involved and layout considerations.
- The location of the monitors shall not exceed 45 meters from the hazard to be protected.

x) Tank Truck gantry area should be provided with medium velocity sprinkler system with deluge valve.

xi) Fire water monitors shall be provided with independent isolation valves.

xii) Hose box with 2 nos. hoses and a nozzle shall be provided at each hydrant points.

3.3.5 Medium Velocity Sprinkler System

The medium velocity spray system shall be provided in all critical areas like Storage bullets domes and manholes, Pump/Compressor House, Tank truck loading area, etc.

Spray nozzles shall be directed radially to the vessel at a distance not exceeding 0.6 m from the equipment surface. Only one type and size of spray nozzle shall be used in a particular facility. The horizontal extremities of water flow from spray nozzles shall at least meet.

Where projections (manhole flanges, pipe flanges, staircase, and supports brackets) obstruct the water spray coverage, including rundown or slippages on vertical surface, additional nozzles shall be installed around the projections to maintain the wetting pattern.

Horizontal dry piping downstream of the isolation valve and after deluge valve shall have adequate drain facilities at selected locations.

3.3.6 Automatic Fire Protection System

Automatic fire protection (Fixed) system based on heat detection through quartzoid bulbs detectors shall be employed. Sensors shall be installed at all critical places wherever medium velocity spray system has been installed as described below:

i) In LPG storage area, detectors shall be provided at the top of the mound as per design.
ii) Detectors shall be placed at critical locations in Tank Truck Gantries, Pump/compressor house, etc. Upon actuation there shall be alarm in control panel, pumps and compressors would trip, ROVs (wherever provided) on supply and return lines would trip and the deluge valves on fire water sprinkler system will get actuated.
iii) In case, Quartzoid Bulbs are used for detection, the same shall be designed to blow at 68 deg. centigrade (max.) and Quartzoid Bulb network shall be maintained with water at a pressure not more than 3.5 kg/cm^2 (g) and shall be such that the discharge of water through one Quartzoid Bulb will depressurize the system to actuate the deluge valves.
iv) Water spray nozzles and heat detection system shall be duly certified for the performance.
v) Additionally, suitable systems like push buttons etc. for initiating all the above actions shall be provided on remote operating panel. Further similar system like push buttons, air release valves etc. shall also be provided in the field at safe location for enabling manual actuation by an operator. In case, the zoning concept is used for MV sprinkler system, the operations of sprinkler system in various zones shall be clearly earmarked on the push buttons. In the field, manual bypass valves of fire water deluge valves shall also be provided.

3.4 Fire Water Demand Basis

Active fire protection will be mainly provided by automatically and/or manually operated fixed-installation systems in conjunction with portable fire-fighting equipment.

a) This can be achieved by the following firefighting systems:
- Fire water system (Hydrants/ Water Monitors)
- Water spray system
- Portable and Wheeled fire extinguishers

b) Functional parameters to be met by fire water system include:
- Speed of response and time to full flow condition;
- Application rate;
- Coverage;
- Nozzle location and characteristics;

- Application duration;
- Effectiveness.

c) Performance criteria for fire water system are:

- Application rate will be specified in liters/min/m2 of "wetted surface" to achieve the desired level of cooling or extinguishment;
- The system coverage of the area will be achieved at the required application rate under the operating conditions taking into account wind speeds and directions;
- Discharge nozzle water droplet size and density will reach the area required;
- The time full flow will be such that escalation of the incident to unacceptable levels does not occur and the distribution system will not fail before water starts to flow;
- The system run time will be depending upon the incident duration including any extended cooling time required;
- Manual actuation devices will be in accessible and safe locations;
- Reliability of water supply will be considered in the overall system design.

3.4.1 Basis of Fire Water Demand and Storage Capacity

- The effective capacity of fire water source above the level of suction point shall be considered as minimum 2 hours aggregate working capacity of fire water pumps, as per clause no. 7.6.3.1.1 of KS 1938:2012 (Part 3) & 6.4.5.9 of NFPA 58.
- The minimum velocity shall be three (03) m/s as per clause no. 10.2.1 of NFPA 15.

3.4.2 Fire Water Ring Main and Network

The fire water ring main will be fully gridded network made up of "Galvanized Electric Resistance Welded (ERW) – Class C" material. The ring main will be laid underground and wherever aboveground it will be located such that it is away from the effects of hydrocarbon fire and explosion.

Fire water ring main network around the LPG mounded storage depot will be connecting to the fire water pumps i.e. 2 diesel pumps (1W + 1S) + 1 jockey pump + 1 electric driven pump located in the south east side of mounded storage bullet area.

Fire water mains shall not be installed passing under the buildings and heavy structures. No new structures shall be made over the fire water ring mains.

The fire water mains shall be provided with full bore valve flushing connections at the remote ends, so that all sections and dead ends can be properly flushed out.

At least one fire hydrant post has been provided every 30 meters in accessible areas where high fire hazard has been identified such as storage mounded bullet area, pump and compressor area, truck gantry area and fire pump area. For non-hazardous areas such as LER building, the fire hydrant post shall be spaced at 45 meters interval.

3.4.3 Accessibility Around the Mounded Tanks

There is a proposed road network around the mounded tanks that gives accessibility around the mounds unhindered. The 6 metres wide round enables accessibility to attend any emergency to any of the 3 mounds unhindered. This basically implies that the KenGen wall that is bordering the project site and the way leave managed by KETRACO shall be 21 meters away from the mounded tanks given that the mandatory 15 meters shall be factored and an additional 6 meters included.

3.4.4 Establishment of Trained Safety Team

All employees and visitors shall undergo a safety induction before entering the facility and this induction shall be conducted by safety trained personnel.

The company shall have a safety team comprising of personnel from management and other levels of the workforce

3.5 Resource Efficient and Cleaner Production (RECP) Technologies

This project at the design stage, construction phase and operational phase has incorporated strategies that are preventive, integrated and continuous within their processes, product and services that shall reduce risk to humans and environment. By employing these strategies, the company wants to ensure efficient resource utilization in terms of water and wastewater management, raw materials management, energy management and promoting environmental compliance and sustainability.

The RECP techniques and technologies that have been incorporated include:

ix) ***Good House Keeping Practices*** – Aevitas Investment Company Limited has undertaken managerial and procedural measures to ensure resource efficiency and reduced pollution at source. The good housekeeping practices already incorporated in this project include:

- Installation of gas leakage detection system
- SCADA program to ensure a balance of the procured LPG in and sold LPG. In case of any wastage through loss, it can be detected
- Installation of 6 weighbridges at the 6 loading bays (gantry). This shall reduce the turnaround time of the trucks. The product shall be weighed at the gantry once the truck is loaded and it leaves to the market amongst others
- Installation of push taps and tap sensors to ensure efficient utilization of water
- Training and retraining of staff amongst others

ii) ***Better Process Control*** – The company has put measures to ensure that they loss less resource in terms of LPG gas (raw material), water, energy, human etc. Some of the better process control measures to be employed include:

- The use of bullet mounded tanks as opposed to the spherical above the ground tanks shall ensure that incase of any maintenance on one or two or three tanks, storage and distribution to the market does not stop unlike if the company were to install high capacity spherical above ground tanks
- The automatic shutdown of the entire depot in case of any LPG leakage ensures no LPG gas loss and enhances safety
- The automation of the water sprinklers
- The installation of weighbridges in all the gantry bays

iii) ***Technology Change*** – The Company has entirely put up a new technology that shall ensure safety and proper management. The automation levels shall ensure less human interaction thus enhancing safety of both the humans and environment

iv) ***Energy Efficiency*** – The plan to install motion sensors, solar powered security lights variable speed drive motors, high energy rating cooling systems and ACs, etc. shall go a long way in ensuring efficiency and reducing the cost of operation

v) ***Equipment Modification*** – During the operational phase, the company can evaluate the functionality of their facility and where there could be wastages as a result of the equipment, they can modify some of them to increase the overall efficiency and reduce wastage

The company has committed to put up an RECP team right from the start of operations and also incorporate RECP during the construction phase. The team shall comprise of personnel both from the shop floor and management.

4.0 PROPOSED PROJECT ALTERNATIVES

This section examines alternatives to the proposed project in terms of the site, Raw material availability, project design technology and social aspects. Also, impacts of each alternative are identified, discussed and compared with those of this development proposal. With such information, reviewers and the proponent have basis for decision making.

4.1 Project Location

4.1.1 The Proposed Project Location Alternative

The development area for the proposed LPG depot will see some changes to its environmental attributes (physical and biological). Ecologically there will be loss of habitat and species diversity in the area. While not discounting the value of the ecology that persists in the area, the loss to be incurred will be significant but not major as the flora and fauna diversity in the area is not very high due to energy sector and port related activities in the area.

Existing drainage patterns, groundwater, surface water and soil quality may also be affected. From a Socio-Economic perspective the proposed development would contribute significantly to a national and local income generation. In addition numerous jobs would be created by the development either directly or indirectly as well as community growth and development for the surrounding communities

4.1.2 Alternatives to Project Location

The proposed project site is the most ideal as the proponent is setting up this LPG depot in an area which has energy mix activities and there are no human settlement neighborhoods. The proximity to the Kipevu Oil Terminal One (KOT 1), Kipevu Oil Terminal 2 (KOT 2) and Shimanzi Oil Terminal (SOT) makes the site ideal. Proposing an alternative site outside the proposed site will see the proponent spend another long period of time on land identification, change in source of raw material for the LPG depot and general equipment's design change. The project design is underway based on the size of land identified and proximity to both KOT1, KOT2 and SOT available thus change in location for this project would call for cost already incurred in the proposed development i.e. whatever has been done and paid to consultants to date would be counted as a loss to the proponent.

4.2 Alternative Route for Delivery of LPG (Raw Material) to the Site

The proponent has three possible routes to use in delivering the LPG into the storage depot. All these routes are managed by the Kenya Ports Authority and Kenya Pipeline Company (KPC). The site is well covered with the infrastructure that delivers the LPG to the storage facility. First, Kenya Pipeline has existing LPG pipeline that is passing through the site (the wall boundary between the proposed site the

power generating companies' i.e. KenGen and Tsavo. Secondly, KPA has developed the Common User Man fold (CUM)

4.2.1 Shimanzi Oil Terminal (SOT)

This terminal is currently being used though it is limited in terms of the capacity (the storage capacity is low). This terminal is approximately 1510 meters away from the proposed site.

4.2.2 Kipevu Oil Terminal one (KOT1)

This terminal is the one that is commonly used currently. It is approximately 675 meters away from the project site. It is operational and if the proponent puts in place the entire necessary infrastructure for immediate use, this is ideal.

4.2.3 Kipevu Oil Terminal two (KOT2)

This is the common user man fold that the government of Kenya through Kenya Ports Authority and the government of Japan is constructing as an expansion to increase the storage of LPG after of loading from the ships. This terminal is about 870 meters away from the proposed site.

On consideration of all the three routes, the proposed project site seems ideal for the construction of the 30,000 metric tons storage depot by Aevitas Investment Company Limited.

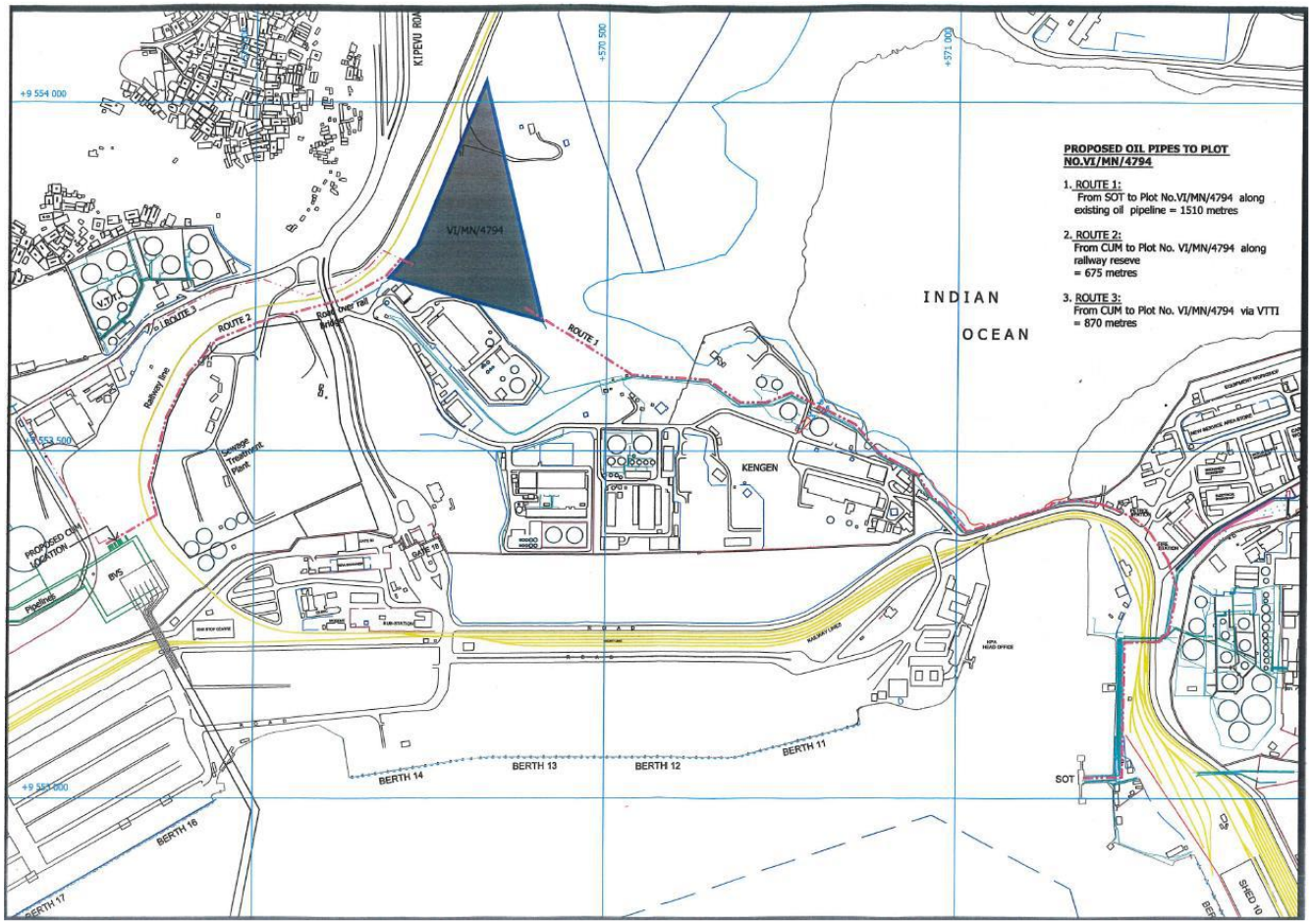


Fig 6: The Routes that the proponent can use in delivering LPG to the proposed site

4.3 Alternative Land Use Activities

This mounded depot shall be constructed in part of the 7.796Ha (i.e. 19.3acres) of land registered as plot No. MN/VI/4794, KIBARANI-MOMBASA leased by the company from Kipevu Inland Container EPZ Limited (attached lease agreement and title). This project is located in an energy generating zone whereby the immediate neighbours are Kipevu 3 and Kipevu 1 (which are owned by KenGen) and Tsavo Power which is operated by Wartsila Eastern Africa Limited. This project is located in an energy generating zone whereby the immediate neighbours are Kipevu 3, Tsavo Power and Kipevu 1 which are owned by KenGen and are generating electricity using furnace oil. This indeed makes the project site suitable for the proposed project. Thus the site is feasible for the proposed project given that the proponent adheres to the NEMA and county government way leave bylaws away from natural water bodies (rivers), wetlands, road and reserves.

4.4 LPG Installation Alternatives

On its own or in combination with butane, propane is readily liquefied under pressure to form LPG (liquefied petroleum gas). At volumes 250 reduced from its natural state, LPG can be efficiently—and economically—transported via truck, rail, barge or ship, making it particularly ideal and in demand for rural and other remote, off-grid locations.

Unlike natural gas (methane), LPG can be relatively quickly deployed to its point of use without the need for pipeline infrastructure, but does require significant storage capacity at points across the supply chain to buffer demand fluctuations and accommodate intermodal transportation management.

Storage options include spherical LPG pressure vessels and both above ground and underground (‘mounded’) cylindrical vessels, also called bullet tanks.

Fig 7: Above ground Spherical LPG pressure storage tanks

Fig 8: Above Ground Open Bullet Tanks

Fig 9: Concreted Mounded LPG Bullet Tank

For decision-making on the best alternative to undertake, understanding the pros and cons of spherical LPG vessels versus underground mounded bullet storage tanks will help ensure the right choice is made. The following critical issues have to be considered to determine the most suitable alternative

a) Land/Space Requirements

LPG Storage Sphere (spherical LPG pressure tanks) - Horton Sphere -The first spherical LPG pressure vessels or 'Horton spheres', as they are also known, were built by the Chicago Bridge & Iron Company (CBI) in 1923. With their unique, entirely rounded profile, Horton spheres allow for efficient, large volume

storage of compressed gases in a liquid stage. With typical capacities ranging from 10,000 to 75,000 barrels (approximately 2,730 metric tons to over 18,200 metric tons) one of the most significant benefits of using spherical storage tanks is the ability to hold very large liquid volumes within a proportionally small amount of space. In other words, the 'footprint' needed for a Horton sphere is considerably smaller than that needed for the number of storage bullets required to accommodate an equivalent volume.

b) Construction and Installation Cost Consideration

One of the drawbacks of the Horton sphere is the amount of time required for fabrication, which can be up to 12 -18 months in some cases. Due to transportation limitations, these large vessels must be fabricated in sections off-site and then completed in the field. The process requires significant time and coordination to ensure proper staging, sequence of assembly and welding—with continual on-site testing throughout the on-site construction process.

The fabrication of LPG storage bullets on the other hand, can be completed entirely off-site, in a controlled environment. Reputable tank manufacturers deliver all tanks pre-tested and certified, National Board code stamped and registered, making in-field implementation a more predictable and faster process. Lead times for bullet tanks are typically in the 8-12 week range.

With capacities of up to 1,092 metric tons per tank and more, multi-tank batteries, or 'tank farms', can readily accommodate large-scale storage needs. For example, a tank farm consisting of ten to twenty-five 1,092 metric tons vessels provides immediate storage for 10,920 metric tons to 27,300 metric tons

For projects with tight delivery schedules—that can accommodate the land space requirements—LPG storage bullets provide faster time-to-market—and faster time-to-money.

c) Operational Cost

Because Horton spheres generally hold more volume per vessel than cylindrical storage bullets, less overall piping will be needed for the interconnection of vessels on site, which can reduce overall project costs. Additionally, mathematically speaking, the spherical shape delivers the smallest possible surface area per unit of volume than any other shape. Because of this, the overall coating/painting cost per unit of volume is also lower for spherical vessels than for cylindrical tanks.

Finally, the spherical shape also offers the most uniform stress resistance, which allows for a thinner wall. Thus materials cost per unit of volume is also lower for spherical vessels.

All of this said, the high in-field fabrication costs of spherical vessels can offset these savings. Long-term cost considerations need to take into account the fact that, from an economic standpoint, it is not tenable to relocate an LPG storage sphere. Just as their initial fabrication must be done in pieces, relocation would call for the disassembly of the sphere into sections, which would then need to be transported and reassembled at a new site. ***The costs involved in ensuring a relocation effort that results in a safe, operational vessel are***

roughly the equivalent of investing in an entirely new storage sphere, making relocation a zero-sum game for the spherical surface LPG tanks.

Typically, used storage bullet tanks on the other hand can be readily relocated, refurbished, and sold at attractive market rates.

d) Safety

One advantage to spherical vessel construction is that the stress concentration for stored LPG is both more uniform and lower than that within a cylindrical shaped bullet. Also, because they have a smaller surface area per unit of volume, the quantity of heat transferred from warmer environments to liquid stored, will be lower than that of bullets.

However, the chance of failure and collapse for a large spherical vessel is greater than that for bullet tanks, as the overall load - for an equivalent volume of liquids stored – is concentrated in a single vessel rather than being distributed over a larger area as when stored within a battery of smaller sized tanks (serving the same total volume.).

The use of multiple storage bullets also reduces the possibility of uneven settlement—another potential cause of vessel failure—again, by dividing the overall load into lesser volumes.

Particularly for geographies prone to natural disasters such as earthquakes, hurricanes or tsunamis, including islands and areas where powerful colliding warm and cold air masses (and resultant tornados) are more common, a battery of multiple storage tanks offers lower risk of failure than large-scale spherical storage vessels.

The following safety measures underscore the critical safety measures of the bullet mounded tanks:

i) LPG Mounded Storage Tanks / Bullets / Vessels are completely covered with Soil and Only Manhole / Dome and other nozzles protrude outside.

ii) The Scenario of BLEVE (Boiling Liquid Expanding Vapour Explosion) is eliminated, since no fire possible below the tanks.

iii) Difficult for external agencies to identify the mound as a storage facility.

iv) Reduced fire case PSV loads as compared to above ground storage tanks and spheres.

v) Fire water requirement for mounded storages is less.

vi) Vessels have slop of 1:200 minimum for drainage purpose.

vii) Mound cover protects the vessels against, heat radiation from nearby fire, pressure wave originating from an explosion, impact by flying objects, sabotage etc.

viii) Site area required less compared to above ground storage due to less stringent inter spacing requirement.

ix) LPG Storage tanks are much safer since it weight is distributed evenly on a larger area thus reducing chances of collapse as compared to sphere, especially in small islands porne to earth quakes, cyclones and Tsunami as can be verified from the recent incident in Japan where a row of LPG sphere went under severe fire condition.

x) Multiple LPG storage tanks have an added advantage that the load is distributed over a larger area thus the problem of uneven settlement / collapse is largely reduced.

xi) In case of installations with Multiple LPG storage tanks if there is any problem / maintenance / repair / breakdown of any one tank the outlet and inlet valves of the same can be closed and the tank can be isolated, also in case of emergency the LPG product in the tank under repair / maintenance can be easily transferred to another tank located in the same plant thus increasing safety of the plant.

e) Maintenance and Shut-Down

One of the strongest arguments in favor of choosing a battery of bullet vessels over one or more spherical vessels when possible is the consideration of ongoing maintenance—including both planned and unexpected shutdowns.

With tank batteries, any maintenance or repair issue that calls for the shutdown of a tank is limited to the tank involved. The particular tank can be shut down and repaired while the remaining tanks continue at full operation.

With the use of larger capacity spherical storage, the shutdown of a single vessel can halt operations entirely, leading to potentially astronomical additional costs associated with halting both incoming and outgoing product.

Further to this, if it becomes necessary to empty the vessel at hand, the contents of a smaller size bullet vessel can be fairly quickly deployed to another vessel on site. The task of addressing upwards of a million(s) of gallons of LPG within a single spherical vessel on the other hand, is a far more onerous task, with an extended period of shut-down to be expected.

f) Aevitas Investment Company Limited Alternative

From the economic, environmental and social standpoint, Aevitas Investment Company limited shall construct the underground (mounded) bullet tanks since such storage as has more benefits that include:

- Automatic Gas Leak Detection System
- Automatic Integrated Tank Firm Management System
- Integrated Fire Safety Management System
- Concrete Bunkered
- No Risk of Explosion
- Minimal Fire Risk, amongst others

Generally, the concrete mounded LPG gas tanks by Aevitas Investment Company Limited shall be developed with lower cost of construction, acquisition and installation and higher levels of safety on installation and operation compared to the above the ground spherical LPG tanks.

4.5 No Project Alternative

This option can be imposed by the National and County Government of Mombasa to the Proponent. This option implies that the existing situation prevail i.e. no development activity to take place. This option is mostly applicable in situations where the proposed project area is in ecologically sensitive areas. The land in which the LPG storage depot is to be developed is in a stable energy sector industrial type environment therefore will not be affected by this development as within the area, there are other production facilities. This project is located in an energy generating zone whereby the immediate neighbours are Kipevu 3 and Kipevu 1 (which are owned by KenGen) and Tsavo Power which is operated by Wartsila Eastern Africa Limited. These three plants are generating electricity using heavy furnace oil. From a socio-economic perspective the "no action" alternative may not be the best alternative as there numerous benefits to be gained from the development locally, nationally and internationally The 'No Project Option' is the least preferred from the socio-economic and partly environmental perspective since if the project is not done;

i) The economic benefits especially during development i.e. provision of jobs for skilled and non-skilled workers will not be realized.
ii) There will be no generation of income by the developer and the Government.
iii) The social-economic status of Kenyans and local people would remain unchanged.
iv) The local skills would remain under utilized
v) No employment opportunities will be created for Kenyans who will work in the project area and after development.
vi) Discouragement for local investment

This alternative is not viable since the proponent has considered this project to solve the problem of LPG storage which is currently a challenge since the demand for LPG has tremendous growth and the Kenya Ports Authority has invested heavily in the construction of the Kipevu Oil Terminal Two (KOT2) with high capacity of LPG but no matching LPG storage facilities available. Thus this project shall complement the efforts of KPA as per their strategic plan.

From the analysis above, it becomes apparent that the 'No Project Alternative' is not the appropriate alternative to the local people, Kenyans, and the Government. This alternative describes a situation where the proposed development fails to be implemented. In case this happens, positive impacts associated with the proposed development will not accrue to the stakeholders including the locals to be the development consultants, contractors and suppliers of materials.

5.0 PROPOSED PROJECT SITE LOCATION BASELINE CONDITIONS

5.1 The Physical Environment

5.1.1 Project Location

This mounded depot shall be constructed in part of the 7.796Ha (i.e. 19.3acres) of land registered as plot No. MN/VI/4794, KIBARANI-MOMBASA leased by the company from Kipevu Inland Container EPZ Limited (attached lease agreement and title). This project is located in an energy generating zone whereby the immediate neighbours are Kipevu 3 and Kipevu 1 (which are owned by KenGen) and Tsavo Power which is operated by Wartsila Eastern Africa Limited. These three plants are generating electricity using heavy furnace oil. The GPS coordinates for the site are A (Latitude -4.03705, Longitude 39.63238), B (Latitude -4.03748, Longitude 39.63426) and C (Latitude -4.03530, Longitude 39.63349).

Fig 10: Map of the proposed project site

5.1.2 Landscape, Topography and Geology

Kipevu is located in northwest coast of Mombasa on Port Reitz. The Mombasa County within which Kipevu is located lies within the Coastal lowland which rises gradually from the sea level in the East to about 132m above sea level in the mainland. The terrain is characterized by three distinct physiographic features of coastal plain, covering parts of the South Coast; the Island; and the hilly areas that rises gently from 45m to 132m above sea level. Other key physical features includes, the fringing coral reefs, cliffs and tidal flats, sandy beaches, the coastal plain and a hilly severely dissected and eroded terrain. In addition, is the broken and severely dissected and eroded belt that consists of Jurassic shale overlain in places by residual sandy plateau, found in Changamwe Sub-County. Finally is the undulating plateau of sandstone that is separated from the Jurassic belt by a scarp fault. The location for the proposed Depot lies on gently sloping site.

Photo 1: Proposed project site with slopes making it ideal for the project

Photo 2: A Picture of a section of the proposed site showing the Indian Ocean

5.1.3 Soil

The soil types are broadly associated with the geological formations along the physiographic zones in the Mombasa County. Along the coastal lowlands four soil types predominate:

i. On the raised reefs along the shore well-drained, shallow (< 10 cm) to moderately deep, loamy to sandy soils predominate.
ii. On unconsolidated deposits in the quaternary sands zone (also referred to as Kilindini sands), is well drained moderately deep to deep, sandy clay loam and sandy clay, underlying 20 to 40 cm loamy medium sand.
iii. On the Kilindini sands there are areas with very deep soils of varying drainage conditions and colour, variable consistency, texture and salinity.
iv. On the Kilindini sands there are also well-drained very deep, dark red to strong brown, firm, sandy clay loam to sandy clay, underlying 30 to 60 cm medium sand to loamy sand soils.

The proposed project site is predominantly loamy soil, and this is favourable for associated construction works.

In the coastal plain, the soils are developed on coral limestone merging to Kilindini sands inland. The coral soils are generally well drained and of sandy clay loam to sandy clay texture. They range from very deep and non-rocky to very shallow and extremely rocky. The soils developed on Kilindini sands vary from excessively drained, very deep, very sandy soils to poorly drained, very

deep, heavy clay soils. Extensive areas of imperfectly drained, clayey soils occur in the southern part of the coastal plain.

The reticulated water supply system is owned and managed by Mombasa Water and Sewerage Company and comes from Mzima Springs in Taita-Taveta County, Marere, and Sabaki/Baricho in Kilifi County and Tiwi Boreholes in Kwale County. The supply only meets 65 percent of the county water demand. Because of its high water table favourable for sinking boreholes and wells to supplement the piped water supply it is approximated that close to 6,245 wells and 6,941 boreholes have been sunk so far. The county has three permanent springs, water pans and a number of boreholes operated by private investors, NGOs and local CBO„s in the rural areas. Natural drainage in the county is mainly formed by semi-perennial rivers and streams like rivers Kombeni and Tsalu that drain into the Indian Ocean. There are three permanent springs in the rural parts of the county. The site for the proposed Depot is connected to the Mombasa Water and Sewerage Company's main water pipeline for piped water supply.

5.1.3.1 Seismicity

The seismic hazard in the vicinity of Mombasa area is low given traces of active faults are seldom at the project site. Active faults are mapped within the floor of the eastern rift valley and within the Chyulu Volcanic centre. The earthquake magnitude range between 3.3 and 3.6, being diffused intensities from proximity earthquake epicentres that are localized dominantly within Lake Magadi area and further south into northern Tanzania.

The analysis of seismic risk hazard along the right of way is based on the seismic record interpretations and associated with Cenozoic rift valley. The seismic activity associated with the Cenozoic rift valley in Kenya generally consists of seismic events of magnitudes $ML < 3$. The seismicity distribution derived from temporary local networks is primarily associated with the Kenya Rift and the east-west-trending Nyanza trough on the western flank of the Kenya dome.

5.1.3.2 Soil Analysis for Total Petroleum Hydrocarbons (TPH) and BTEX (Benzene Toluene Ethylbenzene and the Xylenes)

Total Petroleum Hydrocarbon (TPH) analyses are requested for a range of reasons, from petroleum industry site work through contaminated sites and spills to monitoring of trade wastes, tip leachates and groundwater. This paper will briefly cover how a TPH test is carried out in the laboratory, the variations of the test that exist, including historical methods, and the extra, and sometimes unexpected, information that can be obtained by looking at the TPH chromatogram. Hydrocarbons in the environment may come from two main sources;

- ***Petroleum oil based hydrocarbons***, such as natural gas, LPG, petrol, kerosene, jet fuel, diesel, fuel oils, bunker oils, lubricating oil, transformer oil, greases, asphalt, and bitumen
- ***Natural living sources***, such as terpenes (e.g. rubber, pinene, limonene, camphor), phytoene, pristane, squalene and squalene.

Hydrocarbons can enter the environment either naturally, from spills, by leakage from storage facilities or from deliberate application (oils spread on unsealed roads, diesel as a solvent for herbicide application). Hydrocarbons can affect the environment in a number of ways.

i) They provide an energy source for microbiological activity and so can add to the oxygen demand loading i.e. they contribute to BOD.
ii) They can add to an odour problem e.g. cyclopentadiene
iii) They are flammable (explosive in confined spaces) and so increase the risk of fires
iv) Some are toxic
    - Neurotoxic e.g. hexane
    - Carcinogenic e.g. benzene, benzo[a]pyrene
v) Most are insoluble in water and they are also less dense than water, so they float on water bodies and may coat earth, animals, birds and other surfaces.

BTEX (benzene, toluene, ethylbenzene and xylenes): Used mainly for petrol contamination, but also where solvents such as toluene and the xylenes have been used. It

must be carried out using a purge and trap (P&T) or headspace technique, preferably with gas chromatography-mass spectrometry (GC-MS).

Aevitas Investment Company contracted Pulicon Services (NEMA Accredited Lab) to undertake soil analysis for TPH and BTEX. The testing was done to enable the company have a baseline information on the status of the soils on the proposed project site contamination with TPH and BTEX.

Three samples (marked A, B and C) from different parts (as per to the sampling procedures and method POL/FTS/002) were picked on 1st September 2020 and analysis started on 2nd September 2020.

The results are as presented below:

Polucon
At your service

AEVITAS INVESTMENT COMPANY LIMITED

TEST REPORT NO: 202016020570A	
SAMPLE	SOIL
DATE & PLACE SAMPLED	01st September, 2020 at Aevitas Investment company Ltd, Kibarani.
DATE ANALYSIS STARTED	02nd September, 2020
SAMPLING METHOD	POL/FTS/002
MARKINGS	SAMPLE A

TEST	METHOD	RESULTS	UNITS	CLIENT SPECIFICATIONS
BTEX				
Benzene	PQA/LIM/002	<0.01	mg/Kg	-
Toluene	PQA/LIM/002	<0.01	mg/Kg	-
Ethyl benzene	PQA/LIM/002	<0.01	mg/Kg	-
Xylene	PQA/LIM/002	<0.01	mg/Kg	-
TPH				
Total Petroleum Hydrocarbons	PQA/LIM/003	1.92	mg/Kg	-

**********End of test results**********

Mombasa Lab
04th September, 2020

Analyst

K. Murimi – *Chemist*

POLUCON SERVICES KENYA LTD. P.O. BOX 99344 - 80107, MOMBASA

Technical signatory

Polucon At your service

G. Nduko – Ass. *Lab manager*

Where a statement of conformity is made, the following decision rules are applied not considering uncertainties: 'conform/comply' – Results are within limits while 'non-conform/comply' – Results exceed limits

"Unless otherwise stated the results shown in this test report refer only to sample(s) tested and such sample(s) are retained for 90 days only (if non-perishable)."

GL 0362

Polucon Services (Kenya) Limited
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Member of POLUCON Group

ISO 9001:2015 Certified

Designated Laboratory

ISPM15 CERTIFIED
Heat Treatment provider IPPC KE - 018

Polucon
At your service

AEVITAS INVESTMENT COMPANY LIMITED

TEST REPORT NO: 202016020570B	
SAMPLE	SOIL
DATE & PLACE SAMPLED	01st September, 2020 at Aevitas Investment company Ltd, Kibarani.
DATE ANALYSIS STARTED	02nd September, 2020
SAMPLING METHOD	POL/FTS/002
MARKINGS	SAMPLE B

TEST	METHOD	RESULTS	UNITS	CLIENT SPECIFICATIONS
BTEX				
Benzene	PQA/LIM/002	<0.01	mg/Kg	-
Toluene	PQA/LIM/002	<0.01	mg/Kg	-
Ethyl benzene	PQA/LIM/002	<0.01	mg/Kg	-
Xylene	PQA/LIM/002	<0.01	mg/Kg	-
TPH				
Total Petroleum Hydrocarbons	PQA/LIM/003	2.90	mg/Kg	-

**********End of test results**********

Mombasa Lab
04th September, 2020

Analyst
K. Murimi – *Chemist*

POLUCON SERVICES KENYA LTD. P.O. BOX 99344 - 80107, MOMBASA
Technical signatory
Polucon
At your service
S. Nduko – Ass. *Lab manager*

Where a statement of conformity is made, the following decision rules are applied not considering uncertainties: 'conform/comply' – Results are within limits while 'does not conform/comply' –Results exceed limits

"Unless otherwise stated the results shown in this test report refer only to sample(s) tested and such sample(s) are retained for 90 days only (if non-perishable)."

GL0389

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Member of POLUCON Group

KEBS ISO 9001:2015 Certified
nema Designated Laboratory
ISPM15 CERTIFIED Heat Treatment provider IPPC KE - 016

Polucon
At your service

AEVITAS INVESTMENT COMPANY LIMITED

TEST REPORT NO: 202016020570C	
SAMPLE	SOIL
DATE & PLACE SAMPLED	01st September, 2020 at Aevitas Investment company Ltd, Kibarani.
DATE ANALYSIS STARTED	02nd September, 2020
SAMPLING METHOD	POL/FTS/002
MARKINGS	SAMPLE C

TEST	METHOD	RESULTS	UNITS	CLIENT SPECIFICATIONS
BTEX				
Benzene	PQA/LIM/002	<0.01	mg/Kg	-
Toluene	PQA/LIM/002	<0.01	mg/Kg	-
Ethyl benzene	PQA/LIM/002	<0.01	mg/Kg	-
Xylene	PQA/LIM/002	<0.01	mg/Kg	-
TPH				
Total Petroleum Hydrocarbons	PQA/LIM/003	1.89	mg/Kg	-

**********End of test results**********

Mombasa Lab
04th September, 2020

Analyst

K. Murimi – *Chemist*

POLUCON SERVICES KENYA LTD. P.O. BOX 99344-80107, MOMBASA

Technical signatory

Polucon At your service

G. Nduko – Ass. *Lab manager*

Where a statement of conformity is made, the following decision rules are applied not considering uncertainties: 'conform/comply' – Results are within limits while 'does not conform/comply' – Results exceed limits

"Unless otherwise stated the results shown in this test report refer only to sample(s) tested and such sample(s) are retained for 90 days only (if non-perishable)."

GL 0388

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KEBS ISO 9001:2015 Certified

nema Designated Laboratory

ISPM15 CERTIFIED Heat Treatment provider IPPC KE - 016

From the results, it is evident that BTEX is less than 0.01mg/kg from all the samples while TPH range between 1.89mg/kg to 2.90mg/kg. This indeed gives the baseline conditions of the soil as of now (before project implementation)

5.1.3.3 Factual Geotechnical Investigations

Aevitas Investment Company Ltd in conjunction with PEDC India, commissioned Dhanjal Brothers Ltd (Contractor) to undertake detailed Geotechnical site investigations at Plot. MN/VI/4974, Kibarani in Mombasa County.

The purpose of the site investigations was to gather substratum data to facilitate the design of the proposed substructures and establish engineering parameters of the soil/rock relevant to other auxiliary works during construction of proposed oil & gas terminal.

The envisaged scope of work entailed the following;

1. Drilling of 6 No. boreholes to 30m depths and varying with the type of sub stratum soils encountered.
2. In-situ testing including standard penetration test (SPT) and undisturbed U100 sampling where feasible.
3. Logging of the strata encountered in all boreholes including monitoring of the sub surface water regime where it was encountered.
4. Carrying out all relevant laboratory tests on recovered samples.
5. Preparation of a factual geotechnical report after analysis of in-situ and laboratory tests.

All the fieldwork was carried out according to BS 5930 (code of practice for site investigations), the laboratory testing for soil samples from the site was done in accordance with British Standards (BS 1377) and the American Society for Testing Materials (ASTM) designated D 2938-79.

5.1.3.3.1 FIELD WORK

The investigation work involved drilling of 6 No. boreholes at the site to full depths of 30.00m each below ground level (bgl) while the seventh borehole near BH 5 was abandoned at 3.00m below ground level due to wrong setting out. Apart from the abandoned borehole, termination of drilling was made after proving the potential foundation stratum thickness was continuous for more than 3m and meets the project requirement in terms of depths. The drilling at each borehole was advanced by use of rotary core drilling techniques. Crawler type and track mounted drilling machines using double tube convectional T2 core barrel were used to recover the soil /rock core material. The B-50 track mounted machine drilled BH1, BH2, BH3 and BH4 while the crawler machine drilled BH5 and BH6. Casing tubes were inserted at the weathered and weak levels of the borehole to stem loss of drilling water and to prevent rock debris from falling into the borehole.

In-situ Standard Penetration Tests (SPT) was carried out where feasible at 1.5 m intervals or change in formation character. Where the overburden layer coupled with residual soil was relatively thick, in-situ Standard Penetration Tests (SPTs) was carried out to evaluate the penetration resistance of the soil stratum or that of the completely weathered/or the weakly cemented rocks.

Undisturbed U100 soil samples could not be recovered in the soil profile since the material could not hold on the sampling tube inner walls. Where hard stratum was encountered, rotary drilling progressed to recover the in-situ materials before termination at depths as indicated in table 1. The recovered cores were placed in wooden boxes with correlated depths of each run clearly marked. Geological log description of the strata encountered as well as core recovery and rock quality designation (RQD) percentages were determined before sampling the materials for laboratory testing. Monitoring of the water regime levels was carried out during the drilling period although water rest levels were not feasible.

TABLE 15: Showing Maximum Depth Drilled and Water Level Monitoring

BOREHOLE NO.	MAXIMUM DEPTHS DRILLED (M)	WATER LEVEL MONITORING
1	30	-
2	30	-
3	30	-
4	30	-
5	30	2 hours after drilling 1.70m 24 hours after drilling 1.65m 48 hours after drilling 1.80m
6	30	-
7	3.0	Abandoned

5.1.3.3.2 Laboratory Testing

Soil Samples

Laboratory testing was carried out to complement information obtained from the field to help characterize the ground material and determine the relevant design parameters. The homogeneous soil section samples recovered from the boreholes during the field work were submitted in the laboratory for particle size distribution, Atterberg limit and specific gravity tests to be carried out on disturbed samples following the BS 1377 standards. The purpose of the tests was to give an indication as to the composition of the overburden soil as well as that of the underlying layers. The full results are presented in the annexure.

Rock Samples

The strength of the rock segments from core samples was used to establish the bearing capacities on the more competent strata. For the recovered core samples, selected specimens at different depths and positions were soaked in water for four (4) days to achieve saturation, trimmed to specifications before either Uniaxial Compressive Strength (UCS) or Point Load Test were carried out. The summary of the rock test results is tabulated in Table 3 and data sheets presented in appendix. The bulk density of each rock sample tested for UCS was also determined.

Most of the samples tested were either in a moderate to slightly weathered state or fresh state as those in a completely weathered state could not withstand either the soaking or trimming exercise.

Uni-axial Compressive Strength (UCS)

The standard UCS test was carried out on samples that met the threshold for UCS testing. The corresponding overall UCS values for the different rocks are presented in the rock test results annexed.

Point Load Test

The PLT test results were used as an index test to determine the rock strength for samples that could not be tested under the standard UCS sample requirements. The resulting rock strength values for the different rocks are presented in the rock test results annexed.

Bulk Density

The rock density is controlled by the microstructure arrangement of the rock composition. The results are presented in the rock test results annexed.

5.1.3.3.3 Calculation of Bearing Capacities

An appropriate method to suit the type of stratum encountered at each site is adopted to calculate the bearing capacities as follows;

Bearing capacity from In-situ soil tests

The Allowable bearing pressure for the cohesive soils is determined using Terzhaghi & Peck formulae, which covers all types of foundations irrespective of width.

qa □ 2.7Ckd , but N = ¼Ckd, therefore qa = 10.8 N.....1

Table 16: Computed Allowable Bearing Capacity Using N- Values

BH NO.	SPT No.	N-value	Ncorr	qa
1	1	6	10.5	113
1	2	3	9	97
1	3	4	9.5	103
1	4	4	9.5	103
1	5	3	9	97
1	6	3	9	97
1	7	6	10.5	113
2	1	5	10	108
2	2	4	9.5	103
2	3	13	14	151
2	4	4	9.5	103
2	5	3	9	97
2	6	3	9	97
2	7	3	9	97
3	1	4	9.5	103
3	2	3	9	97
3	3	3	9	97
3	4	3	9	97
3	5	3	9	97

3	6	3	9	97
3	7	3	9	97
3	8	3	9	97
3	9	3	9	97
4	1	7	11	119
4	2	3	9	97
4	3	4	9.5	103
4	4	3	9	97
4	5	3	9	97
4	6	3	9	97
4	7	3	9	97
4	8	3	9	97
4	9	3	9	97
5	1	9	12	130

Pile loads derived using SPT N-Values

If consideration is given to the establishment of pile foundations on the weak strata below the ground, then the Bearing capacities of the piles are evaluated by use of the SPT N-values by adoption of Meyerhof's' method. This method has been selected firstly, because it conforms to practical criteria of pile failure, secondly, it takes into account the critical depth concept and lastly, it is based on full scale field tests of pile.

The SPT N-values used have been corrected for;

1. Overburden pressure, using Liao & Whitman (1986) equation, i.e. the correction factor, CN= (95.76/po)1/2 for granular soils and CN = 1 for cohesive soils at all depths.
2. Resistance to excess pore pressure water for SPT values carried out below the water table by, where, N=15+1/2(No-15).
3. Borehole diameter & sampler correction (Cd=Cs=1.0)
4. Drill rod length correction.

The trial Pile adopted is a 450mm Ø driven pile and the computation for its ultimate load is as set out below;

By Meyerhof's method, the ultimate compressive load of a pile, Qu is given by;
Qu = 40Ncor (L/d)Ab + 2NcorAs, Where,

Ncor = corrected N-value

L/d = ratio of pile length to diameter of pile. Ab = base area of pile

As = perimeter area of pile

Applying a load factor of 3, the Allowable load Qa = Qu/3

Table 17: Allowable Pile loads

BH NO.	SPT Depths (m)	N-value	Ncor	AVG Ncor	fs = 2NcorAs	qf = 40Ncor(L/d)	Abqf (KN)	Abqf + Asfs (KN)	Allowable Load (kN)
1	7.5	6	11	11	234.0	7333.3	1166.5	1400	467
1	10.5	3	9	10	297.0	9333.3	1484.6	1782	594
1	15	4	10	10.0	424.0	13333.3	2120.9	2545	848
1	18	4	10	10.0	509.0	16000.0	2545.0	3054	1018
1	21	3	9	9.8	582.0	18293.3	2909.8	3492	1164
1	24	3	9	9.7	656.0	20622.2	3280.2	3936	1312
1	27	6	11	9.9	753.0	23657.1	3763.0	4516	1505
2	4.5	5	10	10	128.0	4000.0	636.3	764	255
2	12	4	10	10	340.0	10666.7	1696.7	2037	679
2	15	13	14	11.3	481.0	15111.1	2403.6	2885	962
2	18	4	10	11.0	560.0	17600.0	2799.5	3360	1120
2	22.5	3	9	10.6	675.0	21200.0	3372.2	4047	1349
2	25.5	3	9	10.3	745.0	23422.2	3725.6	4471	1490

2	28.5	3	9	10.1	817.0	25695.2	4087.2	4904	1635
3	4.5	4	10	10	128.0	4000.0	636.3	764	255
3	7.5	3	9	10	202.0	6333.3	1007.4	1209	403
3	10.5	3	9	9.3	277.0	8711.1	1385.6	1663	554
3	13.5	3	9	9.3	353.0	11100.0	1765.6	2119	706
3	16.5	3	9	9.2	429.0	13493.3	2146.3	2575	858
3	19.5	3	9	9.2	506.0	15888.9	2527.3	3033	1011
3	22.5	3	9	9.1	582.0	18285.7	2908.6	3491	1164
3	25.5	3	9	9.1	658.0	20683.3	3290.0	3948	1316
3	28.5	3	9	9.1	734.0	23081.5	3671.4	4405	1468
4	4.5	3	9	10	212.0	6666.7	1060.4	1272	424
4	7.5	4	10	10.0	297.0	9333.3	1484.6	1782	594
4	10.5	3	9	9.8	372.0	11700.0	1861.0	2233	744
4	13.5	3	9	9.6	448.0	14080.0	2239.6	2688	896
4	16.5	3	9	9.5	524.0	16466.7	2619.2	3143	1048
4	19.5	3	9	9.4	600.0	18857.1	2999.5	3599	1200
4	22.5	3	9	9.4	676.0	21250.0	3380.1	4056	1352
4	25.5	3	9	9.3	752.0	23644.4	3761.0	4513	1504
4	28.5	7	11	11	140.0	4400.0	699.9	840	280
5	6.0	9	12	12	204.0	6400.0	1018.0	1222	407

Bearing capacity from Laboratory Tests on Rock Samples

The computed bearing capacity values from rock samples irrespective of any settlement obtained by use of R. E. Goodman's Formula (Goodman, R.E., 1989) are given at the respective depths as indicated in table 3 below.

$Qf = qu (N\emptyset + 1)$ where,

Qf = Ultimate Bearing Capacity (kN/m2)

Qu = Unconfined compressive strength value of rock core.

= 24 Is (50) (Broch. E and Franklin JA – 1972) Is (50) = Point Load Strength Index

NØ = A constant given by Tan -2 (45+ Ø/2) Ø = Internal Angle of friction of rock core.

Based on the illustrative values of angles of sliding friction, Ø is derived in relation to the failure loads.

Based on experience, a scale factor correction due to the susceptibility of the rock to weathering and fracture intensity trends; and a factor of safety of say 2.5 are applied to the ultimate bearing capacity to determine the allowable bearing capacity for different samples tested.

Table 4 below details information on the computed safe bearing capacities derived from rock cores at the respective depths indicated in column 2:

Table 18: Computed Allowable Bearing Capacities Derived From Laboratory Rock Test Results

BH No.	Depth (m)	Stress (kN/m2)	Allowable Bearing Stress (kN/m2)
5	10.00	947	209
5	10.50	1,136	268
6	16.80	1,894	430
6	25.50	2,840	697
6	27.60	1,894	457
6	29.80	2,462	576

5.1.3.3.4 Discussion of Factual Investigation Results In Relation To Foundation Design

The subsurface formation at the project site shows that the rocks occurring below overburden material vary from poor to moderate to good based on the rock quality designation. The sound rock suites have good bearing strengths as opposed to the highly weathered sections.

Where good rock occurs, the thickness of foundation layers below the overburden formation is sufficient to provide acceptable bearing formation for the respective structures as per the

positions investigated. The bearing strengths at different boreholes with depth for the rock suites are shown in the Geotechnical Logs attached to this report.

- The ground structure shows occurrence of fill material forming the top layer with thickness variation from 1.00m to 14.00m below ground surface. Considering this layer is composed of mixed heterogeneous material, the horizon should not be considered as Foundation layer.
- The top horizon is underlain by a layer of residual clay derived from deep weathered Shales and Lenticular Limestone rock. The stratum is 11.00m thick on BH5 side and thins outwards with thickness reduction to 1.50m in BH6. The formation was not encountered in BH2 to BH4. This formation gives a medium to hard clay with SPT N-values above 9. This horizon forms suitable foundation bearing stratum than the overlying layer where the depths of occurrence is deeper to allow for increased friction resistance. The residual soil layer shows strengths of about 130kN/m2 as determined from the in-situ test results. This horizon offers relatively homogeneous ground, although it may not be suitable foundation layer for high loading structures with shallow foundation depths, unless proper choice of type of foundation is carefully considered. This horizon offers foundation layer to deeper depths that can support relatively moderate loading especially where the weathering is insignificant.
- The top horizon and residual soil layers overlay moderate to slightly weathered stratum of Shales and Lenticular Limestone rock suite down to the final drilled depths in BH6. The UCS values range between 947kN/m2 and 2,840kN/m2 with corresponding safe bearing capacity of between 209kN/m2 and 697kN/m2 from tested samples. This rock offers suitable foundation layer that can support relatively higher loading with high end bearing strengths for pile foundations.
- Where the Shales and Lenticular Limestone thins out, the ground profile encounters Colluvial Sand down to the final drilled depths in respective boreholes. The sand layer shows SPT N-values recorded ranging from 3 to 6 with corresponding strengths of between 97kN/m2 and 113kN/m2 as determined from in-situ test results.

5.1.3.3.5 Recommendations

- The bearing capacities at various depths for each borehole positions investigated are shown in the geotechnical logs. These values should provide guidance to the design engineer when considering the best foundation type and depth for the terminal.

- The ground structure shows occurrence of fill material forming the top layer. Considering this layer is composed of mixed material, the horizon should not be considered as Foundation layer.
- The allowable bearing capacity of the residual clay layer derived from deep weathered Shales and Lenticular Limestone rock is limited to 130kN/m2 as determined from the in-situ test results. This horizon forms a thicker foundation bearing stratum as long as it occurs; which provide for increased friction stress forces to come into play if pile foundations are considered.
- The allowable bearing capacity of the moderate to slightly weathered Shales and Lenticular Limestone rock is relatively higher and should be limited to 430kN/m2 for foundations deeper than 10.0m below ground level. This rock offers suitable foundation layer that can support moderate loading with good end bearing strengths for pile foundations as long as the foundations loading does not traverse into the weaker layer below.
- The allowable bearing capacity of the firm Colluvial Sand stratum is limited to 97kN/m2 as determined from the in-situ test results.

5.1.3.3.6 General Recommendations

- For shallow foundations, examination of the excavated foundation layer is advised to ensure that the foundation is placed on good Rock stratum with all pockets of the completely weathered rock as well as all the loose Rock debris being removed.
- The Engineer must approve all foundation depths before casting of the concrete and the excavations must be blinded soon after approval to forestall further deterioration of the foundation layer due to ingress of water.
- The Design Engineer should therefore consider the in-situ and laboratory data analysis, and recommendations presented herein so as to determine the foundation type and depths of placement of the foundation at the project site.

5.1.4 Climate

Climate is influenced by monsoon winds with the rainfall pattern being characterized into long rains (April – June with an average of 1,040 mm) and short rains (end of October -December with an average of 240mm). The annual average rainfall for the county is 640mm. Annual mean temperature for the Mombasa County is 27.9^0C, with a minimum of 22.7^0C and a

maximum of 33.1^0C. The hottest month is February with a maximum average of 33.1^0C while the lowest temperature is in July with a minimum average of 22.7^0C. The climate regime in the county has led to two major agro-climatic zones which support existing coastal forests, marine and terrestrial ecosystems. Kipevu experiences the same climatic conditions as of the larger Mombasa County.

5.1.4.1 Baseline Ambient Air Quality Assessment

Aevitas Investment Company Ltd acknowledges ambient air as a key environmental component that is likely to be influenced by the proposed activities. In line with this, the proponent contracted Polucon Services (K) limited to conduct a baseline air quality assessment at their proposed construction site at Kibarani, Mombasa County and generate a baseline report on the ambient air quality, as part of the ESIA study for the proposed construction project, and further provide basis for subsequent environmental assessment. Baseline air quality assessment was conducted once on 24th September 2020, at two locations within the proposed construction site and the report is attached as an annex.

The parameters studied in this assessment report were determined based on the requirements of the ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION (AIR QUALITY) REGULATIONS 2014, THE ENVIRONMENTAL (IMPACT ASSESSMENT AND AUDIT) REGULATIONS, 2003 and anticipated parameters of concern for a gas storage plant. The primary parameters of concern are particulate matter ($PM_{2.5}$ & PM_{10}) and gaseous contaminants. The parameters evaluated in this assessment included the following: Nitrogen oxides (NO_x), Sulfur dioxide (SO_2), Carbon monoxide (CO), Total Volatile Organic Compounds and Particulate matter ($PM_{2.5}$ & PM_{10}). Active sampling was used for monitoring of present gaseous and particulate matter parameters.

The location of measurement, parameters measured in each location and the GPS coordinates are presented below:

Monitoring Location	Parameters Tested	G.P.S Coordinates
P 1 (Entrance site)	SO_2, NO_2, CO, CO_2, O_3, TVOCs, $PM_{2.5}$, PM_{10}	S 04º02.123’ E 39º38.003’

P 2 (Property boundary area)	SO_2, NO_2, CO, CO_2, O_3, TVOCs, $PM_{2.5}$, PM_{10}	S 04º02.229' E 39º38.002'

5.1.4.1.1 Proposed site's Wind Speed and Direction

Fig 11: Map showing the direction of wind in relation to the proposed project site at the time of assessment

The average hourly wind speed in Mombasa experiences significant seasonal variation over the course of the year. The windier part of the year lasts for 5.2 months, from April 29 to October 5, with average wind speeds of more than 12.0 miles per hour. The windiest day of the year is July 4, with an average hourly wind speed of 15.7 miles per hour. The calmer time of

year lasts for 6.8 months, from October 5 to April 29. The calmest day of the year is around November 24, with an average hourly wind speed of 8.2 miles per hour.

5.1.4.1.2 Safety of the Neighbouring Power Plants Based on the Wind Direction and Speed

Based on the current natural wind conditions, the wind was observed blowing away from the power plant towards the Mombasa-Nairobi highway (SE) at the time of study. This essentially means that in cases where there is a leakage from the gas storage facility, the dispersion is expected to be away from the power plants (since the gas storage depot is expected to be situated in the opposite direction).

5.1.4.1.3 Ambient Air Quality Results from the Monitoring and Analysis

Active monitoring by use of a real time equipment (Aeroqual) was deployed. The aeroqual gas meter series, a state-of-the-art gas analyzer was used to measure the Particulate Matter (PM) and gaseous parameters levels using the following modern technologies;

- The gas sensitive semiconductor (GSS) sensor uses proprietary sensing material, built in automatic correction (ABC) and interference rejection. This combination results in ppb resolution and a highly linear response.
- The gas sensitive electrochemical (GSE) sensors generate nano-amp currents proportional to the gas concentration. Aeroqual uses low noise electronics to capture these signals resulting in low detection levels.
- The laser particle counter (LPC) for Particulate Matter (PM) measurements uses optimized signal processing using low noise electronics added algorithms to correct for interferences.
- The non-dispersive infrared (NDIR) sensor uses infra-red light, a narrow band-pass filter and photodiode to measure the intensity of light at the gas absorption band. The light intensity is proportional to the gas concentration.

From the monitoring, the results are presented in the table below:

Location	**CO (mg/m^3)**	**NO_x (ppm)**	**SO_2 ($\mu g/m^3$)**	**$PM_{2.5}$ ($\mu g/m^3$)**	**PM_{10} ($\mu g/Nm^3$)**	**TVOCs ($\mu g/m^3$)**
Entrance area (P1) Run 1	0.83	38	20	14	28	38
Run 2	0.81	37	22	13	26	40
Hourly average	**0.82**	**37.5**	**21**	**13.5**	**27**	**39.0**
Precision	0.82±0.01	37.5±0.5	21±1.0	13.5±0.5	27.0±1.0	30.0±1.0
Boundary wall area (P2) Run 1	0.90	46	26	9	22	44
Run 2	0.92	45	28	8	20	46

Hourly average	**0.91**	**45.5**	**27**	**8.5**	**21.0**	**45.0**
Precision	0.91±0.01	45.5±0.5	27±1.0	8.5±0.5	21.0±1.0	45±1.0
ENVIRONMENTAL MANAGEMENT CO-ORDINATION (AIR QUALITY) REGULATIONS, 2014 TOLERANCE LIMITS	***4.0***	***150***	***125***	***75***	***100***	***600***

Results Discussion

- CO was detected and recorded at the time of monitoring. The measured levels of CO at the boundary wall were higher than those at the entrance site. Measured levels were within the stipulated regulatory limits.
- NO_x was detected throughout the monitoring time. Detected levels at the boundary wall area were higher than those at the entrance. Measured levels of NO_x were found to be within the stipulated regulatory limits
- $PM_{2.5}$ was detected during the assessment. The levels at entrance area were higher than at the boundary wall area. From the results it is evident that $PM_{2.5}$ levels were found to be within the stipulated limits.
- PM_{10} concentrations were detected and recorded at the time of monitoring. Entrance area had higher levels than the boundary wall area. The levels were found to be within the stipulated EMC (air quality) regulations tolerance limits.
- SO_2 concentrations were detected and recorded at the time of monitoring. The levels recorded at the boundary wall area were higher than those at the entrance area. Measured levels of SO_2 were found to be within the stipulated regulatory tolerance limits.
- TVOCS were detected at the time of monitoring. Measured levels of TVOCs were found to be within the stipulated regulatory tolerance limits at all measurement locations.

Based on the tabulated findings it can be deduce as follows:

a) All the present gaseous contaminants and the particulate matter parameters measured (at both locations) were within the tolerance limits set in EMC (Air quality) regulation 2014.
b) Gaseous parameters, namely, SO2 NO2, TVOCs and CO were detected and quantified during the assessment. Combustion of fossil fuels in generators and other machines from nearby power plant could have resulted in the recorded gaseous concentrations.
c) Detected levels of dust ($PM_{2.5}$ & PM_{10}) could have been attributed to the ongoing Kibarani-Changamwe road construction works. Truck movement along the site may have resulted in resuspension of particulates in the ambient air at the time of monitoring hence the recorded results.

d) Detected TVOCs levels could have been contributed by vaporization of light hydrocarbons from the nearby storage silos and power plant.
e) The prevailing weather conditions at the time of monitoring were partly windy and sunny. Wind was majorly emanating from the South East direction which is generally expected in the month of September.
f) The windy conditions experienced at the time of assessment could have been instrumental in spatial dispersion of the contaminants, hence the measured levels.

5.1.4.1.4 Conclusion and Recommendations

From the monitoring results, it is clear that the levels of all the parameters measured were observed to comply with the tolerance limits set in EMC (Air quality) regulation 2014 and based on the current natural wind conditions, the wind was observed blowing away from the power plant towards the Mombasa-Nairobi highway (SE) at the time of study. This essentially means that in cases where there is a leakage from the gas storage facility, the dispersion is expected to be away from the power plants (since the gas storage depot is expected to be situated in the opposite direction).

It is recommended that the proponent should consider conducting an air quality modelling (air quality modelling is a mathematical simulation of how air pollutants disperse and react in the atmosphere to affect ambient air quality) for the proposed site once the plant has been set up and operational to determine potential impact of their operations to ambient air and their spillover to the surrounding environment. Air quality modelling will further play a big role in establishing the emission fall off as this location is in close proximity to Kengen Power Plant.

5.1.5 Vegetation cover and wildlife

Mombasa County has a natural forest cover of approximately 300 ha and 138 ha acres of agro-forestry. The county has three main mangrove forests that are protected by the Kenya Forests Service. The vegetation of the project area includes grass and indigenous shrubs that do not hold substantive socio-economic value neither within Kipevu area nor to the larger Mombasa County.

Photo 4: A photo of some Grass vegetation cover at the proposed site

Mombasa County is home to buffaloes, wildebeests, giraffes, hippopotamus, tortoise and a multiplicity of birds and butterflies. However, the proposed site for the LPG Storage Depot does not host any endemic wildlife species except the small insects and birds that are not likely to be fundamentally disturbed by activities of the proposed LPG Storage Depot.

Photo 5: A photo showing the vegetation cover around the proposed Site

5.1.6 Land use and zoning profile

Land in the County Mombasa County has number of land tenure regimes which include public land, private land and community owned land. Land use zoning includes mainly for residential;

industrial and warehousing; physical infrastructure; social amenities; urban; agriculture; mining; and tourism activities. The proposed site is situated within the industrial area in Kipevu area within Ports Area of Mombasa, and is surrounded by industrial activities that are nearly similar to those of the proposed LPG Storage Depot, notably the Kenya Pipeline Kipevu Oil Storage Facility and the FOCUS Container Freight Station, a scenario which reduces the possibility for future conflicts between the proponent and other surrounding enterprises.

Photo 6: A photo of the nearby KenGen Plant next to the proposed site

5.1.7 Infrastructure

5.1.7.1 Roads, Harbour and Rail Network

Mombasa County has a total of 257.17 km of bitumen surface roads, 127 km of gravel surface roads and 91.29 km of earth surface roads in the county. The County has 10 km of railway line and three railway stations. The County has one major airport (Moi International Airport) and other smaller airstrips. It is adequately covered with telecommunication and hosts both private and government-owned communication facilities. The Port of Mombasa is a key resource and the gateway to the East and Central African region and it serves the entire region's export and import needs. Currently, the port has 19 deep-water berths with two additional berths nearing completion and two oil terminals.

The proposed LPG Storage Depot site lies adjacent to the main Mombasa-Nairobi Highway, just about the Changamwe Roundabout, and borders a feeder railway line connected to the Mombasa Port. With this setting granted, the Depot will not require the construction of any elaborate road and/or railway line for easy access to other existing roads and railway networks in Kipevu that otherwise would induce disruptions in settlements and livelihoods.

Photo 7: A Railway Line passing next to the Proposed LPG Plant Site at Kibarani, Kipevu area

5.1.7.2 Access to energy sources

The main source of energy is electricity supplied by the Kenya Power Company. Other sources of energy include solar, gas, and diesel powered generators. The proposed project site enjoys

the advantage of close proximity to the Kenya Power Company's national grid for energy supply. In addition, the proponent will install an automatic generator as an alternative source of energy in the absence of electricity supply.

Photo 8: The KenGen, Kipevu 1 and Tsavo Power Plants next to proposed site

5.1.7.3 Water and Drainage

The main water sources are wells and boreholes. The reticulated water supply system in the county is owned and managed by Mombasa Water and Sewerage Company. The proposed project area is conveniently connected to the piped water supply from Mombasa Water and sewerage Company Limited which is adequate and reliable.

Photo 7: The Storm water drainage on a section of the proposed site

5.1.7.4 Telecommunication Network

Telecommunication services are available in literally every part of Mombasa County. The project area is well served with all the mobile phone network providers and the wireless phone connections including Safaricom, Airtel and Telkom service providers in the country.

5.1.8 Demographic and socio-economic characteristics

5.1.8.1 Population size

According to the 2019 Kenya Population and Housing Census, the total population size of Mombasa County was 1, 208, 333 people (610, 257 males and 598,046 females), and that of the Changamwe Sub-County was 131, 882 people (68,761 males and 63,121 females). Being largely an industrial zone, Kipevu comprises a very small proportion of the Changamwe populace, a pointer to the possibility that the proposed project is not likely to produce significant implications for residential patterns and related life routines in the area.

Photo 8: The Existing Kengen, Kipevu 1 Plant neighboring the proposed site

5.1.8.2 Employment

Major employers include the hotel industry, Kenya Ports Authority, Government of Kenya, Container Freight Terminals and various private institutions such as banks. A significant number is also employed by offering services shipping lines, ship repair, servicing yards, container freight stations, transport, clearing and forwarding firms and grain bulk handling. Majority of the employment is found in the formal sector. The proposed project will help create many job opportunities for the local people.

5.1.8.3 Health

The county has one level five hospital, two level four hospitals, over 35 public Dispensaries and Health Centres, 18 clinics are 18 and 4 special clinics. However, none of these is located near the proposed site for the LPG Storage Depot.

6.0 POLICY, LEGAL AND ADMINISTARTIVE FRAMEWORK

6.1 General Overview

Kenya has a policy, legal and administrative framework for environmental management. Under the framework, the National Environment Management Authority (NEMA) is responsible for ensuring that environmental impact assessments (EIAs) are carried out for new projects and environmental audits on existing facilities as per the Environmental Management and Coordination Act 1999. EIA studies are carried out in order to identify potential positive and negative impacts associated with the proposed project with a view to taking advantage of the positive impacts whilst providing effective mitigation measures for the negative effects. The requirements on EIA are contained in sections 58 to 67 of the Act. According to section 68 of the environmental management and coordination Act (EMCA) 1999 amended in 2015, the Authority shall be responsible for carrying out environmental audits on all activities that are likely to have a significant effect on the environment.

The government has established regulations to facilitate the process on ESIAs and environmental audits. The regulations are contained in the Kenya Gazette Supplement No. 56, legislative supplement No. 31, and legal notice No. 101 of 13th June 2003. In the past, the government has established a number of National policies and legal statutes to enhance environmental conservation and sustainable development.

6.2 National Legal Framework

6.2.1 The Constitution of Kenya, 2010

The Constitution of Kenya Article 42, on the environment provides that every person has the right to a clean and healthy environment which includes the right to have environment protected for the benefit of the present and future generations. Article 69, of the Constitution provides for the establishment of systems of environmental impact assessment, environmental audit and environmental monitoring. The Constitution also states that the State shall eliminate processes and activities that are likely to endanger the environment and the State shall utilize the environment for the benefit of the people of Kenya. The Constitution of Kenya clearly states that every person has a duty to cooperate with State organs and other persons to protect

and conserve the environment and ensure ecologically sustainable development and use of natural resources.

These environmental rights are enforceable in a court of law (Article 70). Land must be used in a sustainable manner, and in accordance with the principles of sound conservation and protection of ecologically sensitive areas. The State may regulate the use of any land or right over any land in the interest of land use planning (Article 66). The Constitution thus gives recognition to public, community and private land. Land use regulation goes beyond exploitation merely for economic purposes, and lays emphasis on conservation. Article 174 of the Constitution sets out the objects of devolution of government, which include: (a) giving powers of self-governance to the people and enhancing their participation in the exercise of the powers of the State and in making decisions affecting them; (b) recognizing the right of communities to manage their own affairs and to further their development; (c) protecting and promoting the interests and rights of minorities and marginalized communities; (d) promoting social and economic development and the provision of proximate, easily accessible services throughout Kenya; (e) ensuring equitable sharing of national and local resources throughout Kenya; and (f) facilitating the decentralization of State organs, their functions and services, from the capital of Kenya.

The Fourth Schedule of the Constitution sets out the functions devolved to the county governments, including agriculture; county health services; control of air and noise pollution; cultural activities; county transport; animal control and welfare; county planning and development; pre-primary education; implementation of specific national government policies on natural resources and environmental conservation; county public works and services and fire-fighting services and disaster management.

The proposed project activities will ensure that the ecological processes and the environment are not severely damaged through proper implementation of the proposed mitigation measures put in place to ensure that the project construction, renovation, installation and operation activities do not adversely affect the surrounding environment.

6.2.2 Vision 2030

Kenya Vision 2030 is the country's new development blue print covering the period 2008 to

2030. The blue print aims at transforming Kenya into a newly industrializing "middle-income country providing a high quality life to all its citizens by the year 2030". The Vision is based on three "pillars"; the economic, the social and the political. The adoption of Vision 2030 came after the successful implementation of the Economic Recovery Strategy for Wealth and

Employment Creation (ERS) which has seen the country's economy back on the path to rapid growth since 2002 when Gross Domestic Product (GDP) grew from a low of 0.6% and rising gradually to 6.1% in 2006, one of the foundations for Vision 2030 is infrastructure. The

Vision aspires for a country firmly interconnected through a network of roads, railways, ports, airports, water and sanitation facilities, and telecommunications. In this Vision to ensure that the main projects under the economic pillar are implemented, investment in the nation's energy sector is given the highest priority. The proposed development project will promote the economic growth of the locality and transport sector during construction and operation phases and help propel Kenya to a middle-income country as envisioned in the Vision 2030 development plan by developing the energy sector, one of the key target sectors in the plan.

6.3 National Policies

6.3.1 The National Environment Policy, 2013

The National Environment Policy aims to provide a holistic framework to guide environmental and natural resource management in Kenya. It also ensures that the link between the environment and poverty reduction is integrated into all government processes and institutions in order to facilitate and realize sustainable development at all levels in the context of a green economy, enhancing social inclusion, improving human welfare, creating employment opportunities and maintaining a healthy functioning of the ecosystem.

This policy presents the framework to deal with the ever-growing environmental issues and management challenges in Kenya like harmonizing of sectoral policy instruments with the

Environmental Management and Coordination Act and the Constitution, implementing the Land Policy, valuing of environmental and natural resources, rehabilitating and restoring environmentally degraded areas, loss of biodiversity, concessions and incentives, urbanization and waste management, pollution, energy, climate change and disaster management, conservation of shared natural resources, invasive and alien species, public participation,

environmental education and awareness, data and information, poverty, weak enforcement, and fragmentation.

6.3.2 National Policy on Water Resources Management and Development (Sessional

Paper No.1 of 1999)

i. The four specific objectives guiding in the management of water resources in Kenya include; Preserve, conserve and protect available water resources and allocate it in a sustainable, rational and economic way;
ii. Supply water of good quality in sufficient quantities to meet the various water needs, including poverty alleviation, while ensuring the safe disposal of wastewater and environmental protection;
iii. Establish an efficient and effective institutional framework to achieve a systematic development and management of the water sector; and
iv. Develop a sound and sustainable financing system for effective water resources management, water supply and sanitation development.

6.3.3 The Draft National Energy and Petroleum Policy 2015

Sessional Paper No. 4 of 2004 was the previous policy guiding the energy sector in Kenya. The new draft policy has been prepared to bring on board emerging issues such as Vision 2030 and more importantly, the functions of county governments in the new Constitutional dispensation. Increased use of LPG will be encouraged to reduce dependence on biomass and eliminate the use of kerosene in homes. Natural gas may be used for power generation, transport and domestic purposes.

6.3.4 Policy on Environment and Development

This is presented as the Sessional paper No. 6 of 1999 on Environment and Development. The overall goal is to integrate environmental concerns into the national planning and management process and provide guidelines for environmentally sustainable development. It portrays portable water and water for sanitation as being central to satisfying basic human needs. Water resources have an extremely high value, and effective mechanisms for managing and conserving water could result into economic benefits as well as sustainable use of this vital

resource. Its key objectives are protecting water catchments; ensuring that all development policies, programmes and projects take environmental considerations into account; and enhancing, reviewing regularly, harmonizing, implementing and enforcing laws for the management, sustainable utilization and conservation of natural resources.

The policy recommends the need for enhanced re-use/recycling of residues including water and wastewater as well as increased public awareness raising and appreciation of clean environment. It also enhances participation of stakeholders in the management of natural resources within their respective localities. The project proponent is encouraged to practice waste water recycling and re-use of some waste materials. The resultant sanitary effluent waste will be disposed into the main Mombasa Water and Sewerage Company Limited main sewerage network serving the area.

6.3.5 The Land Policy (Sessional Paper No. 3 of 2009)

The overall objective of the National Land Policy is to secure land rights and provide for sustainable growth, investment and the reduction of poverty in line with the Government's overall development objectives. Specifically, it seeks to develop a framework of policies and laws designed to ensure the maintenance of a system of land administration and management that will provide all citizens with the opportunity to access and beneficially occupy and use land; economically, socially, equitably, and environmentally sustainable allocation and use of land; effective and economical operation of the land market; efficient use of land and land based resources; and efficient and transparent land dispute resolution mechanisms. The previously existing land laws have been repealed and the law consolidated into three statutes, namely the Land Act 2012, the Land Registration Act 2012 and the National Land

Commission Act 2012.

6.3.6 The Kenya Health Policy (2012 – 2030)

The policy is based on the Constitution of Kenya 2010, Vision 2030 and global health commitments. Its broad aim is to ensure equity, people-centeredness and participation, efficiency, multi-sectoral approach and social accountability in delivery of healthcare services.

6.3.7 The National Environmental Sanitation and Hygiene Policy, (2007)

The Environmental Sanitation and Hygiene (ESH) Policy is intended to improve peoples' health and quality of life. It aims at clarifying the various roles in order to enhance the existing legal and constitutional framework and to encourage the private sector, civil society and community participation in the planning, implementation and ownership of ESH services; protect the environment from pollution and its negative effects on human health; and reduce poverty.

6.4 National Regulatory Frameworks

6.4.1 Environmental Management and Co-ordination Act, 1999 and Environment

Management and Coordination (Amendment) Act, 2015, Cap 387

Environmental legislation in Kenya is provided in over 77 statutes. In order to provide a structured approach to environmental management in Kenya, the EMCA Act was enacted on January 14th 2000 as a framework law and contains provisions for the ESM of the proposed and ongoing Projects respectively in Kenya. With the coming into force of the EMCA, the environmental provisions within the sectoral laws were not superseded; instead the environmental provisions within those laws were reinforced to better manage Kenya's ailing environment. Section 58.(1) Of the Act states "Notwithstanding any approval, permit or license granted under this Act or any other law in force in Kenya, any person, being a proponent of a project, shall, before financing, commencing, proceeding with, carrying out, executing or conducting or causing to be financed, commenced, proceeded with, carried out, executed or conducted by another person any undertaking specified in the Second Schedule to this Act, submit a project report to the Authority, in the prescribed form, giving the prescribed information and which shall be accompanied by the prescribed fee". Environmental Management and Coordination Act 1999 provide a legal and institutional framework for the management of the environmental related matters. This EIA study has been conducted and the final report compiled pursuant to section 58 (1) of the EMCA Act and its respective stipulations.

6.4.2 EMCA Related Regulations

6.4.2.1 Environmental (Impact Assessment and Audit) Regulations, 2003

The Environmental Impact Assessment and Audit Regulations, 2003 are subsidiary regulations of EMCA, 1999 and stipulate the steps to be followed in undertaking an EIA study. The Regulations highlight the stages to be followed, information to be made available, role of every stakeholder and rules to be observed during the EIA process. This EIA study has been conducted as per the provisions and guidelines of the Environmental Impact Assessment and Audit Regulations, 2003; has been planned, designed, compiled and implemented based on the very regulations. It shall also be maintained and guided by the same regulations and an environmental audit study will be done periodically to monitor compliance with the set environmental standards.

6.4.2.2 EMCA (Water Quality) Regulations, 2006

The above regulation was promulgated on September 4th 2006 and became effective on July 1st 2007. This regulation provides for the sustainable management of water used for various purposes in Kenya. Its provisions are; 4(1) *Every* person shall refrain from any act which directly or indirectly causes, or may cause immediate or subsequent water pollution, and it shall be immaterial whether or not the water resource was polluted before the enactment of the Act. (2) No person shall throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such substance in or near it, as to cause pollution. Part IV Section 24 states that "No person shall discharge or apply any poison, toxic, noxious or obstructing matter, radioactive wastes, or other pollutants or permit any person to dump any such matter into water meant for fisheries, wildlife, recreational purposes or any other uses". According to these regulations, "Every person shall refrain from any action which directly or indirectly causes, or may cause immediate or subsequent water pollution, and it shall be immaterial whether or not the water resource was polluted before the enactment of the Act".

The proponent shall follow the necessary precautionary measures not to pollute underground water or surface water. The proponent will be required to immediately notify the authority any occurrence of pollution incidence at the site. Use of oils on site will be carefully done to control spills on the surface. Servicing of machines/trucks will be carried out at designated service bay. The waste water from the construction site and construction works will be disposed into the storm water drain and into the main Mombasa Water and Sewerage Company Limited sewer line for safe disposal.

6.4.2.3 EMCA (Waste management) Regulations, 2006

The Waste Management Regulations were promulgated on September 4th 2006 and became effective on July 1st 2007. This regulation is comprehensive and covers the management of various kinds of waste in Kenya. Various clauses relevant to the project are:

Section 4 (18): No owner or operator of a trade or industrial undertaking shall discharge or dispose of any waste in any state into the environment, unless the waste has been treated in a treatment facility and in a manner prescribed by the Authority in consultation with the relevant lead agency. Minimal waste is expected from the undertaking.

Section 4(2) and 6 explain that the waste generator must collect, segregate (hazardous waste from non-hazardous) and dispose waste in such a facility that shall be provided by the relevant local authority. Section 5 provides for methods of cleaner production (so as to minimise waste generation) which includes the improvement of production processes through conserving raw materials and energy.

In section 14 (1) every trade or industrial undertaking is obliged to install anti- pollution equipment for the treatment of waste emanating from such trade or industrial undertaking.

The proponent shall ensure that the garbage collector contracted has a valid license from the National Environment Management Authority (NEMA). So as to comply with this, the contractor shall take precaution not to dump wastes in areas not registered and designated as dumpsites, and all waste disposed of as per the Waste management regulations. Wastes from sanitary facilities will be disposed to the main Mombasa Water and Sewerage Company Limited sewer line while the storm water will be channeled to the existing local county council drainage tunnels within the town.

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

In May 2009, the Minister for Environment and Mineral Resources promulgated the above regulations for management of noise and excessive vibration. The general prohibition states that no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. The regulations further provide factors that will be considered in determining whether or not noise and vibration is loud, unreasonable, unnecessary or unusual.

For fixed installations, excessive vibration under these regulations is defined as any vibration emanating from the source and exceeds 0.5cm/s. Rules 5 and 6 of the regulations define noise levels for various types of activities that generate noise. The first schedule to the regulations defines permissible noise levels measured 30m from the boundary fence of a project. A noise license will be required during the construction phase of the project and a noise survey conducted once operation is recommended for presentation to the authority. The proponent shall implement these measures, ensure that all noise equipment, tools, vehicles, are in good working condition to reduce noise. The project contractor will be required to avoid carrying out noise emitting activities and work within the stipulated time periods plus carry out regular noise monitoring/acquire noise permit in extreme cases.

6.4.2.5 EMCA (Air Quality) Regulations, 2013

The objective of these Regulations is to provide for prevention, control and abatement of air pollution to ensure clean and healthy ambient air. The general prohibitions state that no person shall cause the emission of air pollutants listed under First Schedule (Priority air pollutants) to exceed the ambient air quality levels as required stipulated under the provisions of the Seventh Schedule (Emission limits for controlled and non-controlled facilities) and Second Schedule (Ambient air quality tolerance limits).The proponent shall implement the mitigation measures provided in the EMP to prevent air pollution from cement dust, excavated soil and exhaust fumes which are the leading source of particulate matter emission in the air from such projects. The proponent will also conduct regular air quality monitoring to ensure for safe air circulation.

6.4.3 Other Environment, health and safety, physical planning related laws

6.4.3.1 Water Act, 2002

Water in Kenya is owned by the Government, subject to any right of the user, legally acquired. However; this Act regulates conservation and management of all water resources within the republic, and related purposes.

In section 3 of part II, it states that every water resource is vested in the State, subject to any rights of user granted by or under this Act or any other written law. The Act also provides for establishment of a Water Resource Management Authority, whose aim is to manage and coordinate conservation and utilization of water resources at national scale. The Act will thus

play a central role in guiding the exploitation and conservation of the limiting and scarce water resource throughout the project life.

6.4.3.2 The Penal Code CAP 63

Chapter XVII on "Nuisances and offences against health and convenience" contained in the penal code strictly prohibits the release of foul air into the environment which affects the health of the persons. It states "Any person who voluntarily vitiates the atmosphere in any place so as to make it noxious to the health of persons in general dwelling or carrying on business in the neighbourhood or passing along a public way is guilty of a misdemeanour". Waste disposal and other project related activities shall be carried out in such a manner as to conform to the provisions of the code.

6.4.3.3 Occupational Health and Safety Act No.15 of 2007 and the 2007 Subsidiary legislation (Cap 514)

This Act of Parliament was enacted to provide for the health, safety and welfare of persons employed in workplaces and for matters incidental thereto and connected therewith. Its relevant clauses and stipulations relevant to the proposed project are;

i) Part II of the Act provides the General Duties that Occupiers must comply with in respect to health and safety in the workplace. Such duties include undertaking S&H risk assessments, S&H audits, notification of accidents, injuries and dangerous occurrences, etc.

ii) Part III of the Act provides the Administrative framework for supervision of the Act.

iii) Part IV deals with the enforcement provisions that the DOSHS has been provided with under the Act. It discusses the instances when Improvement and Prohibition Notices can be issued as well as the powers of OSH officers.

iv) Part V of the Act requires all workplaces to be registered with the DOSHS. The Occupier has to apply for registration of their project with the DOSHS on completion of installation of the crusher and before the operational phase of the project

v) Part XI of the Act contains Special Provisions on the management of health, safety and welfare. These include work permit systems, PPE requirements and medical

surveillance. All sections of this part of the Act will be applicable to this project during the operational phase. Part XIII of the Act stipulates the fines and penalties associated with non-compliance of the Act. It includes those fines and penalties that are not included in other sections of the Act and will be important for an Occupier to read and understand the penalties for non-compliance with S&H provisions.

vi) Part XIV of the Act is the last section of the Act and contains miscellaneous provisions which are not covered elsewhere. Most of the sub-sections under this part of the Act will be applicable to mining projects and it is in the interest of an Occupier to read, understand and ensure compliance with it.

Some of the important subsidiary legislations which operationalized the Act and are applicable to the proposed project are described below.

i) **(Safety and Health Committee) Rules 2004**

These rules came into effect on April 28th, 2004 and require that an Occupier formalize a Safety and Health (S&H) Committee if there are a minimum of 20 persons employed in the work place. The size of the S&H Committee depends on the number of workers employed at the place of work. For a Proponent and Contractor, the Occupational Safety and Health Act and the S&H Committee Rules 2004 are important as they require compliance with the following measures:

i) Posting of an Abstract of the Factories and Other Places of Work Act in key sections of each area of the workplace.

ii) Provision of first aid boxes in accordance with Legal Notice No. 160: First Aid Rules of 1977.

iii) Ensuring that there are an appropriate number of certified first aiders trained by a DOSHS approved institution and that the certification of these first aiders is current.

iv) Provision of a General Register for recording amongst other things all incidents, accidents and occupational injuries.

v) Appointment of a safety and health committee made up of an equal number of members from management and workers based on the total number of employees in the company.

vi) Training of the safety and health committee in accordance with these rules.

vii) Appointment of a safety and health management representative by the proponent.

The Safety & Health Committee must meet at least quarterly, take minutes, circulate key action items on bulletin boards and may be required to send a copy of the minutes to the DOSHS local office. Proper record keeping including maintenance of all current certificates related to inspection of critical equipment such as the tractor, transport vehicles and the generator, etc. Such inspections need to be undertaken by a competent person certified by the Director of the DOSHS.

ii) **(Noise Prevention and Control) Rules**

These rules have set minimum and maximum exposure limits beyond which workers and members of the public should not be exposed to noise without adequate means of protection. The rules also have limits for exposure out of workplaces. The rules have several recommendations on a comprehensive noise control program for workplaces that includes a requirement for medical examination of workers who are exposed to noise. The rules have also set the minimum noise levels that should emanate from a facility to public/neighbouring areas by day or by night. The proponent will provide functional earmuffs for those operating the noise emitting machines and those working in noisy environments; and keep on renewing their noise and vibration permit from NEMA. All in all, the project proponent will be required to adhere to all the stipulations of the OSHA Act, 2007 requirements and regulations.

iii) **Medical Examination Rules, 2005**

These rules provide for Occupiers to mandatorily undertake pre-employment, periodic and termination medical evaluations of workers whose occupations are stipulated in the Second Schedule of the Act and the First Schedule of the Regulation. The workers are to undergo medical evaluations by a Designated Health Practitioner (DHP) duly registered by the DOSHS. Exposure to airborne crystalline silica present negative impacts to human health, the workers exposed to the dust will be required to undergo medical examinations in accordance with the above Rules. The project proponent is required to ensure that on site workers are examined medically and appropriate gears availed to them while at site, like earmuffs, helmets, overalls and respiratory gears.

iv) **Fire Risk Reduction Rules, 2007**

These rules were promulgated by the Minister for Labour on April 16th 2007 and apply to all workplaces. The rules apply to this sector project in several ways as enumerated below;

Rule 16 requires a Proponent to ensure that electrical equipment is installed in accordance with the respective hazardous area classification system. It is also a requirement that all electrical equipment is inspected after six months by a competent person and the Proponent is required to keep records of such inspections. Rules 29 – 31 refer to the installation and maintenance of firefighting systems in workplaces. Fire extinguishers are to be mounted at least 60cm above ground while a fire hose reel must be located within a radius of 30m. Fires can arise from electrical fault at the site. Workers safety will be given priority during both construction and operation phases of the project. The proponent shall adhere to the provisions of OSHA, 2007 and the subsidiary rules and regulations under it.

6.4.3.4 The Work Injury Benefits Act (WIBA), 2007

The WIBA Act provides for compensation to employees for work related injuries and diseases contracted in the course of their employment and for connected purposes; Section 7(a) of the Act, on the obligations of the employer, requires an employer to obtain and maintain an insurance policy with an insurer approved by the State in respect of any liability that the employer may incur under this Act to any of his employees. Section 10(1) States that an employee who is involved in an accident resulting in the employee's disablement or death is subject to the provisions of this Act, and entitled to the benefits provided for under this Act. It also states expressly that an employer is liable to pay compensation in accordance with the provisions of this Act to an employee injured while at work.

On First Aid covered in section 45(1), an employer is supposed to provide and maintain such appliances and services for the rendering of first aid to his employees in case of any accident as may be prescribed in any other written law in respect of the trade or business in which the employer is engaged. The proponent shall acquire insurance cover for all the workers for the time they will be working at the project site which will enable them get compensation in case of accident occurrence.

6.4.3.5 The Public Health Act Cap 242

Part IX, section 115 of the Act states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires local authorities to take all lawful, necessary, reasonable and practicable measures to maintain areas under their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable for injurious or dangerous to human health. During the project works, construction activities,

installation and operation, the management will comply with the provisions of this Act in terms of constructing storm drains and sanitary facilities to the required standards and ensuring that the site is safe from nuisance or pollution of any nature.

6.4.3.6 The Land and Environment Court

The Land and Environment Court is established under the Environment and Land Court Act, 2011 (No. 19 of 2011). It is empowered by law, given the status of the High Court and has the jurisdiction to hear and determine disputes, actions and proceedings concerning acquisition of land as well as matters pertaining to the environment.

6.4.3.7 The County Council Act Cap 265

Section 163 allows councils to control or prohibit all businesses, factories and workshops which, by reason of smoke, fumes, chemicals, gases, dust, smell, noise, vibration or other cause, may be or become a source of danger, discomfort or annoyance to the neighbourhood, and to prescribe the conditions subject to which such businesses, factories and workshops shall be carried on. The same section allows municipal councils to prohibit, control and regulate trade and trading activities within their jurisdiction.

6.4.3.8 The Mombasa County Council By-Laws

Project is under jurisdiction of Mombasa County Council. The council operates by laws to govern all aspects of management and is also at liberty to use the various pieces of legislation to enforce conservation and pollution control measures at the Council. Council by laws relevant to conservation, the general nuisance by laws is quite pertinent. They include:

i) **Deposit of Rubbish**

Any person who shall without authority deposit or cause or permit to be deposited any soil, vegetation, refuse or debris or any land in the council shall be guilty of an offence.

ii) **Noise**

Any person who, in connection with any building operations, demolition or road construction work, causes or allows to be caused noise which is so loud, continuous or repeated as to operations constitute a nuisance to the occupants of any premises in neighbourhood, shall be guilty of an offence.

iii) **Approval of Building Plans**

After the site has been successfully identified, plans must be drawn and submitted for approval by the local authority. Amongst other requirements, the plan must have:

a) Proper drainage system,
b) An approved incinerator or legal waste disposal facility,
c) Proper sanitary facilities, and
d) Adequate natural and artificial light and ventilations.

iv) **Occupational Certificate**

After the plans are approved and construction work completed the premises must be inspected by the Local Authority for the purpose of confirming whether the site complied with the approved plans then an occupation certificate issued as provided by the public Health Act and Building Code. The proposed project is under the jurisdiction of Mombasa City County Council hence all the stipulated rules and regulations will be strictly followed.

6.4.3.9 The Physical Planning Act of 1996 CAP 286

The Act allows for prohibition or control over the use and development of land and building in the interest of proper and orderly development of an area. Section 30 states that any person who carries out development without permission will be required to restore the land to its original condition. It also states that no other licensing authority shall grant license for commercial or industrial use or occupation of any building without a development permission granted by the respective local authority. Section 36 states that if in connection with a development application, a local authority is of the opinion that the proposed development activity will have injurious impact on the environment; the applicant shall be required to submit together with the application an environment impact assessment (EIA) report. EMCA, 1999 echoes the same by requiring that such an EIA is approved by the National Environmental Management Authority (NEMA) and should be followed by annual environmental audits. The proposed project construction, installation and operation activities must be granted license by the relevant local authority as the EIA study process is in order with section 36 of this Act.

6.4.3.10 Traffic Act Cap. 403

In Section 51, only proper fuel should be used in vehicles. Similarly, vehicles should be well maintained to prevent any fumes/exhaust that could pollute the environment. All vehicles

transporting construction materials will be granted permits authorizing them to transport materials to the construction site plus all the equipment, lorries and heavy vehicle drivers will possess up to date driving licenses and certificates identifying them and the type of lorries/vehicles/equipment they are authorized to operate, plus deployment of traffic marshals to help control the traffic flow along Kipevu access road.

6.4.3.11 Building Code 2000

The building code under Septic and conservancy tanks, section 202 allows for installation of septic tanks/ conservancy tanks where a sewer system has not been provided that the proponent abides with the provisions under the set table. The effluent waste water from the project site will be channeled to the main Mombasa Water and Sewerage Company Limited network and, storm water drains for proper storm water disposal.

6.4.3.12 Energy Act

80.(1) A person shall not conduct a business of importation, refining, exportation, wholesale, retail, storage or transportation of petroleum, except under and in accordance with the terms and conditions of a valid license. The proponent shall apply to Energy and Petroleum Regulatory Authority (EPRA) for a license to transport, handle and store bulk liquefied petroleum gas at the terminal plant during the operation phase. The proponent also will acquire license for dealing in bulk Liquefied Petroleum Gas storage and other petroleum products.

6.4.3.13 Weights and Measures Act, Cap 513

The above named Act mandates the Weights and Measures Department to annually certify the mechanical pumps and dispensers in order to ensure that they are properly calibrated to dispense the right amounts of the petroleum products. During the certification exercise, the measuring mechanisms inside the pumps are sealed with a seal-mark of quality assurance. The Weights and Measures Department issues a Certificate of Verification for all the mechanical pumps which is usually valid for one year. The proponent shall apply for the Certificate of Verification from the Weights and Measures Department.

6.4.3.14 Merchant Shipping Act, 2009

This is an Act of Parliament to make provision for the registration and licensing of Kenyan ships, to regulate proprietary interests in ships, the training and the terms of engagement

masters and seafarers and matters ancillary thereto; to provide for the prevention of collisions, the safety of navigation, the safety of cargoes, carriage of bulk and dangerous cargoes, the prevention of pollution, maritime security, the liability of ship-owners and others, inquiries and investigations into marine casualties; to make provision for the control, regulation and orderly development of merchant shipping and related services; generally to consolidate the law relating to shipping and connected purposes of surveys, monitoring and inspections; restriction on trading in Kenyan waters; carriage of bulk cargoes and dangerous cargoes;

6.4.3.15 Climate Change Act, 2016

The Act provides a framework for mitigating and adapting to the effects of climate change on various sectors of the economy; facilitating and enhancing response to climate change; and providing guidance and measures on how to achieve low carbon climate resilient development, among other things. It lines up with international best practices and standards.

It establishes the National Climate Change Council which is tasked with coordinating climate change issues.

6.4.3.16 Kenya Standards

Various Kenya Standards have been published for the safe and environmentally sound management of petroleum related installations. The vast majority of these standards have been adopted from other international oil and gas industry standards such as the American Petroleum Institute (API), British Standards Institute (BS), American Society of Testing Materials (ASTM), and American Society of Mechanical Engineers (ASME) among others. The Kenya Standards are mandatory for compliance and it is expected that all new and existing petroleum related facilities will comply with the requirements of these standards.

The proponent is expected to adhere to all the petroleum standards applicable to the operations and management of the terminal plant. Below are some of the Kenya Standards applicable to the petroleum sub-sector.

Table 19: The Kenya Standards available for the petroleum sub-sector

Standard	Standard Description
KS1967: 2006	The Petroleum Industry – Storage and distribution of Petroleum
KS1968: 2006	The Petroleum Industry – Electrical Installations in the distribution

KS1969: 2006	The Petroleum Industry – The installation of underground storage
KS200: Part 1: 2002	Specification for storage tanks for petroleum industry Part 1: Carbon
KS1938-1: 2006	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 water capacity not exceeding 500L and a combined water capacity not exceeding 3000L per installation
KS1938-2: 2005	Handling, storage and distribution of liquefied petroleum gas in domestic, commercial and industrial installations – Code of Practice – Part 2: Transportation of LPG in bulk by road
KS1938-3:2006	The handling, storage and distribution of liquefied petroleum gas in domestic, commercial and industrial installations – Code of Practice – Part 3: Liquefied petroleum gas installations involving storage vessels of individual water capacity exceeding 500L
KS1938-4: 2005	The handling, storage and distribution of liquefied petroleum gas in domestic, commercial and industrial installations – Code of Practice – Part 4: Storage and filling sites for refillable liquefied petroleum gas (LPG) containers of capacity not exceeding 15kg
KS ISO 4706:	Refillable welded steel gas cylinders
KS ISO 11625: 1998	Gas cylinders – Safe handling
KS06-09: Part 3: 2001	Specification for welded low carbon steel gas cylinders exceeding 5- liters water capacity for low pressure liquefiable gas Part 3: Code of practice for filling, distribution and retailing of liquefied petroleum gas in cylinders (First Revision, 2001)
KS09: Part 4: 2002	KS09: Part 4: 2002 Gas cylinders – Refillable welded steel cylinders for liquefied petroleum gas (LPG) Part 4: Requalification and inspection
KS 9-2: 2006	KS 9-2: 2006 Liquefied petroleum gas cylinders Part 2: Safe use of liquefied petroleum gas (LPG) in domestic dwellings – Code of Practice
KS 2024: 2006	KS 2024: 2006 Gas cylinders – refillable welded steel cylinders for liquefied petroleum gas (LPG) – Procedure for checking before, during and after filling

6.4.4 Lands Act, 2012 No. 6 of 2012

Part II Section 8 provides guidelines on management of public land by National Land Commission on behalf of both National and County Governments. This law in Section 8(b) stipulates that the Commission shall evaluate all parcels of public land based on land capability classification, land resources mapping consideration, overall potential for use, and resource evaluation data for land use planning. Section 8(d) stipulates that The Commission may require the land to be used for specified purposes subject to such conditions, covenants, encumbrances or reservations as are specified in the relevant order or other instrument. In managing public land the Commission is further required in Section 10(1) to prescribe guidelines for the management of public land by all public agencies, statutory bodies and state corporations in actual occupation or use. In these guidelines management priorities and operational principles for the management of public land resources for identified uses shall be stated. This in essence means that the Commission shall take appropriate action to maintain public land that has endangered or endemic species of flora and fauna, critical habitats or protected areas. As well the Commission shall identify ecologically sensitive areas that are within public lands and demarcate or take any other justified action on those areas and act to prevent environmental degradation and climate change. Part VIII of the Act provides procedures for compulsory acquisition of interest in land. Section III (1) states that if land is acquired compulsorily under this Act just compensation shall be paid in full to all persons whose interest in the land have been determined. The Act also provides for settlement programmes. Any dispute arising out of any matter provided for under this Act may be referred to the Land and Environment Court for determination. The land on which the project is to be developed fully belongs to the proponent and has a valid land title deed as a proof of ownership.

6.5 International Environmental and Social Impact Provisions and Safeguards

6.5.1 International Environmental Guidelines

Kenya has ratified or acceded to numerous International treaties and conventions, as described below:

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

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

This EIA study is also based on internationally respected procedures recommended by the World Bank, covering environmental guidelines. Reference has been made to the Environmental Assessment Operational Policy (OP) 4.01, and Environmental Assessment Source Book Volume II, which provides the relevant sectoral guidelines as discussed below;

6.5.2 World Bank's safeguard policies

The objective of the World Banks environmental and social safeguard policies is to prevent and mitigate undue harm to people and their environment in the development process. These policies provide guidelines for bank and borrower staffs in the identification, preparation, and implementation of programs and projects. Safeguard policies have often provided a platform for the participation of stakeholders in project design, and have been an important instrument for building ownership among local populations, (World Bank, 1999-2006).

6.5.3 World Bank Safeguard Policy 4.01-Environmental Assessment

The environmental assessment process provides insights to ascertain the applicability of other World Bank safeguard policies to specific projects. This is especially the case for the policies on natural habitats, pest management, and physical cultural resources that are typically considered within the EA process. The policy describes an environmental assessment process for the proposed project. The breadth, depth, and type of analysis of the EA process depend on the nature, scale, and potential environmental impact of the proposed project. The policy favours preventive measures over mitigating or compensatory measures, whenever feasible. The operational principles of the policy require the environmental assessment process to undertake the following:

i) Evaluate adequacy of existing legal and institution framework including applicable international environmental agreements. This policy aims to ensure that projects contravening the agreements are not financed.
ii) Stakeholder consultation before and during project implementation.
iii) Engage service of independent experts to undertake the environmental assessment.

iv) Provide measures to link the environmental process and findings with studies of economics, financial, institutional, social and technical analysis of the proposed project.

v) Develop programmes for strengthening of institutional capacity in environmental management.

The requirements of the policy are similar to those of EMCA which aims to ensure sustainable project implementation. Most of the requirements of this safeguard policy have been responded to in this report by evaluating the impact of the project, its alternatives, existing legislative framework and public consultation.

6.5.4 Petroleum Industry Guidelines

Many environmental management systems have been designed to improve the environmental performance of organizations. Globally recognized and accepted EHS international standards, best practices and guidelines can be successfully used by industries to achieve a successful systems-based approach to EHS management. Guidelines based on information from the International Association of Oil and Gas Producers (OGP), the International Organization for Standardizations (ISO) and the International Electro-Technical Commission (IEC) have become widely accepted as providing a strong basis for preparing regulations, policies and programmes to minimize the impact that these operations have on the environment. The E&P Forum (Oil Industry International Exploration and Production Forum), jointly with UNEP, published a document on the best approaches to achieving high environmental performance and standards worldwide. Within the framework provided, various technical reviews and guidelines already available from other relevant sources can be applied. It developed a general management system to deal with health, safety and environmental (HSE) issues.

6.5.5 Identified Applicable Performance Standards, January 2012

While all Performance Standards (PS) are applicable to this investment project, based on our current information, IFC„s environmental and social due diligence indicates that the construction of the LPG storage depot will have significant impacts which must be managed in a manner consistent with the following Performance Standards; PS 1: Social & Environmental Assessment and Management Systems; PS 2: Labour & Working Conditions; PS 3: Pollution Prevention & Abatement; PS 4: Community Health, Safety and Security; and

PS6: Biodiversity Conservation & Sustainable Natural Resource Management.

6.5.6 The International Code for the Security of Ships and Of Port Facilities

This part of the International Code for the Security of Ships and Port Facilities contains mandatory provisions to which reference is made in chapter XI-2 of the International Convention for the Safety of Life at Sea, 1974 as amended.

The objective of this code is to establish an international framework involving cooperation between Contracting Governments, Government agencies, local administrations and the shipping and port industries to detect security threats and take preventive measures against security incidents affecting ships or port facilities used in international trade; establish the respective roles and responsibilities of the Contracting Governments, Government agencies, local administrations and the shipping and port industries, at the national and international level for ensuring maritime security; ensure for an early and efficient collection and exchange of security-related information; provide a methodology for security assessments so as to have in place plans and procedures to react to changing security levels; and ensure confidence that adequate and proportionate maritime security measures are in place.

6.5.7 The World Bank Group's Environmental, Health and Safety (EHS) Guidelines

The World Bank's 2007 Environment, Health and Safety Guidelines are technical reference documents containing both general and industry specific examples of good international industry practices. The general EHS Guidelines cover environmental, health and safety issues that are applicable by all industry sectors. The Guidelines contain the measures and performance levels that are generally accepted by the International Finance Corporation.

Where host country regulations differ from the measures and the levels contained in the EHS Guidelines, projects will be required to adopt the more stringent ones. Management will thus adopt the World Bank Group's Environmental, Health and Safety Guidelines and other best environmental practices.

6.5.8 Bamako Convention on the Ban of the Import into Africa and the Control of

Transboundary Movement and Management of Hazardous Wastes within Africa, 1991

Waste generation should be to the minimum in terms of quantity and/or hazard potential. Whenever it does generate such wastes, the proponent should transport and dispose of them in a manner consistent with the protection of human health and the environment. Hazardous wastes should as far as is compatible with environmentally sound and efficient management, be disposed of where they were generated, in this case, in Kenya.

6.5.9 World Bank Safeguard Policy BP 17.50- Public Disclosure

This BP encourages Public Disclosure (PD) or Involvement as a means of improving the planning and implementation process of projects. This procedure gives governmental agencies responsibility of monitoring and managing the environmental and social impacts of development projects particularly those impacting on natural resources and local communities. The policy provides information that ensures that effective public disclosure is carried out by project proponents and their representatives. The BP requires that Public Involvement should be integrated with resettlement, compensation and indigenous peoples‟ studies. Monitoring and grievances address mechanism should also be incorporated in the project plan. The proposed project incorporated public participation and stakeholders‟ consultation as part of the Environmental and Social Impact Assessment study in order to collect the views of the local communities and their leaders for incorporation in the project mitigation plan. The consultation was successful and the community members gave a number of views that have been considered in the mitigation plan.

6.6 National Institutional Framework

6.6.1 National Environment and Management Authority

The responsibility of the National Environmental Management Authority (NEMA) is to exercise general supervision and co-ordination over all matters relating to the environment and to be the principle instrument of government in the implementation of all policies relating to the environment. In addition to NEMA, the Act provides for the establishment and enforcement of environmental quality standards to be set by a technical committee of NEMA known as the Standards and Enforcement Review Committee.

7.0 ANALYSIS AND APPRAISAL OF ENVIRONMENTAL IMPACTS

7.1 Identification Analysis and Appraisal of Impacts

In order to accurately identify the proposed development impacts, the following issues will considered pertinent and important for the coverage.

7.2 Physical Environment (Biophysical Impacts)

i) Water quality aspects for both surface water sources like piped water, storm water, and other related aspects
ii) Soil conditions, soil contamination and landscape alterations/degradation (based on aesthetic aspects) associated with the proposed project.
iii) Drainage patterns especially in relation to wastewater effluents, oil spillages, discharges channeled into the drainage ditches.
iv) Air quality aspects especially atmospheric emissions from the plant chimney
v) Noise and vibration (sonic factors) where applicable

7.2.1 Natural Environment

i) Natural flora and fauna from the adjacent ecosystem (i.e. effects to natural plants and animals where applicable).
ii) Adjacent water bodies, tributaries and streams-pollution indicators, impacts on water flow patterns and quality aspects, user interference and contamination.

7.2.2 Social welfare, Economic and Cultural Environment

i) Determination of implications to the human society distribution, demographic details, settlement patterns, changes to the cultural lifestyle and indigenous knowledge of the local society/public where applicable.
ii) Notable changes in land use systems and the general land utilization types where applicable.
iii) Aesthetic, landscape alterations and changes to infrastructural facilities, among others.
iv) Effects associated with the construction and operation activities and related handling and disposal of wastes generated during the operations.

v) Effects associated with income generation opportunities created by the project due to the upcoming operations.
vi) Introduction of nuisances, such as pests and related multiplication breeding sites

7.3 Environmental and Social Impacts identification, methodology and appraisal

7.3.1 Physical Impacts

A. Air Quality

NO_X and SO_X can cause adverse health effects, through both acute and chronic exposure. Chronic exposure may result in increased incidences of respiratory illnesses in the exposed population.

a. Project Site Preparation and Construction Phases

It is expected that during these phases of development, there may be some changes in the air quality. Vegetation clearing for site preparation, storage of raw materials and spoilage, and preparation of access roads are all expected to liberate dust and other forms of particulate matter, which currently is within the set limits for particulate matter (PM). While most of the dust generated is likely to settle a short distance from these sources, smaller particles may be transported across a wider area. The magnitude of dispersion will be influenced by the local meteorological conditions. The dust generated from the site preparation and construction activities is likely to have a major negative long-term local environmental impact. Movement of heavy construction vehicles and the increase in traffic may cause an increase of local greenhouse gas emissions including NO_2 and SO_2. Short and long term exposure to NO_2 and SO_2 may result in the development of both acute and chronic respiratory illness. Chronic exposure may result in increased incidences of respiratory illnesses in the exposed population. The impacts although negative, may be short term, and not significant.

b. Operation Phase

Exhaust from LPG tankers may likely impact air quality. Additionally, incidents such as outflow or leakage from the pipeline may affect air quality. However, online gas detective system shall be installed.

B. Water Quality

a. Site Preparation and Construction Phases

The activities involved in these phases of the project development may cause a major negative long-term impact on the surface (terrestrial) and ground water quality within the development area. This will be as a result of many of the activities which are slated to take place in these phases which includes the possible storage of hazardous substances on the site such as diesel and motor oil for the operation of machinery and stand-by generators, and the storage of raw material for the construction of buildings and roads. The clearing of the vegetation within the development area may also have a synergistic negative long term impact on the water quality in the area as well.

b. Operation Phase

This phase of the development may have the most negative, long term impact on the surface water (aquatic and terrestrial) quality if not properly monitored and managed and is potentially irreversible. This impact on the water quality will be from several sources within impact on the groundwater quality in the area and the lake at large. However, this process is largely dry thus minimal effluent discharge and may have little or no impact on the water quality.

C. Water Quantity

a. Site Preparation and Construction Phases

The water consumption in these phases of the development will be minimal when compared to the rate of consumption in the operation phase. Water will be used for the construction of buildings and roadways, as well as for domestic use among laborers employed to the site. The projects area currently is well served by water and the Indian Ocean thus there will be a strain on the current water supply from. However, for the construction work, the company is encouraged to use treated untreated water.

b. Operation Phase

The Operation of the LPG Depot will need less water for domestic use and the water for the hydrants shall be sourced from other sources e.g. rain water harvested. Besides, the operations at the LPG Depot are largely dry.

D. Soils and Geology

a. Site Preparation and Construction Phases

The activities involved in the site preparation and construction phase of the development may have a major negative and moderate impact on soil and geology of the project site. This is due

to the removal of vegetation from the area which will leave considerable areas of soil exposed to the elements, which may result in soil erosion. Heavy machinery will be traversing the site due to the construction activities this may lead to soil compaction and erosion of the soil. Hazardous substances such as diesel used for the operation of machinery and stand-by generators, may be stored on the property. This may have a significant negative long-term impact on soil quality in the area.

b. Operation Phase

After construction of the depot, the mounded tanks shall be buried. The soils where the tanks shall be installed may not be used for any other purposes.

C. Hydrogeology

a. Site Preparation and Construction Phases

These phases of the development may have a moderate and negative impact on the hydrology of the area. Heavy equipment used in these phases of the development can cause soil compaction and therefore result in increased surface runoff, which changes the natural internal drainage capacity.

b. Operation Phase

The Operation Phase of the development is likely to have a minor negative, long-term impact on the hydrology of the area. This is however not significant as runoff levels predicted are marginal.

D. Noise & Vibration

a. Site Preparation and Construction Phases

The site preparation and construction phases of the development may likely have the most negative impact to the ambient noise and vibration in the development area. A number of measures may be undertaken by the developer/s to reduce the impact of noise on the existing and potential residents as well as the workers involved in the project. This is temporary, however, and the aim at this point is to make the increase in noise as minimal as possible until this phase is complete. The cumulative impact of the construction activities may increase the noise and vibration levels in the area significantly.

b. Operation Phase

The Operation Phase of the project is not expected to cause a major negative impact. Although the depot will be operated as an industrial facility it is likely that the noise limits will not be a problem to the public.

7.3.2 Biological Impacts

A. Terrestrial Environment (Flora)

a. Site Preparation and Construction Phases

The construction phase will result in the removal of some vegetation in the area. The development may have a moderate, short-term, irreversible negative impact on the floral composition of the area. No rare or threatened species has been observed at the project site. This shows that from an ecological stand-point the area is not one of very high ecological importance.

b. Operation Phase

Much of the area will be vegetated after the construction and its auxiliary components have been constructed. The activities involved in the maintenance may have a High negative long-term irreversible impact on the remaining vegetation of the area. These main impacts may be associated with the use of chemicals as raw material and those that will be used in the maintenance of the lawns which may have direct (use of herbicides for turf maintenance) and indirect impacts (alteration of soil chemistry and water quality). The machinery used in maintenance activities may also affect this vegetation.

B. Social Structure (Demography)

a. Site Preparation and Construction Phases

The inflow of workers who choose to reside in the community during these phases of the development may not have any impact on the demography of the area. The numbers of workers anticipated to be employed in these phases is estimated at approximately 100 workers per phase who will be directly employed.

b. Operation Phase

The change in the demography of the area is not likely to increase due to the operation of phase.

C. Infrastructure (Road Network)

a. Site Preparation and Construction Phases

These phases of the development may have a major negative impact on the present road network in the study area. The roads in their current states may not be able to handle the increase in heavy-duty equipment traffic. Thus it is proposed that the proponent improves on the road network at the project site.

b. Operation Phase

The operation phase of the project may have a major negative impact on the road network in the area as the volume of traffic associated with the development i.e. loading of LPG trucks for transportation will be significantly increased, therefore placing a strain on the road network which needs improvements.

D. Utilities (Electricity)

a. Site Preparation and Construction Phases

These phases of the development will not have an impact on the electricity supplying the area. The site is supplied with electricity by KPLC

b. Operation Phase

This phase of the development will not have any impact on the electricity consumption in the area.

E. Utilities (Water Availability)

a. Site Preparation and Construction Phases

These phases of the development will place a strain on the current supply through the construction of buildings and other infrastructural works proposed for the development. The impact on water availability will therefore be negative, compatible and short-term. The proponents will consider alternative sources for water supply e.g. use of bowsers for water transportation.

b. Operation Phase

Based on the evaluation of water availability in the area the available supply will be able to supply the volume of water required for the operation of the plant and the auxiliary activities. The available supply is uncertain thus the proponent is advised to consider other sources of water and reuse of waste water from other process.

F. Utilities (Telecommunications)

a. Site Preparation and Construction Phases

These phases of the development will not have an impact on the telecommunication services in the area. The area is well covered with all mobile providers.

b. Operation Phase

The development may have a major positive impact on the telecommunications services available in the area. The development may see an addition of other services such fast internet to the area.

G. Waste (Solid Waste)

a. Site Preparation and Construction Phases

A significant amount of solid waste will be generated in this phase through the clearing of vegetation for construction. This will therefore have a major negative short-term impact on solid waste collection in the area. The proponent should take the initiative of removal of the solid waste which is expected to be generated during this phase of the development.

b. Operation Phase

The operation phase of the development will not have a major long-term negative impact on the solid collection in the area as this is a GREEN ENERGY PROJECT. However, some solid waste in form of office waste shall be generated.

H. Waste (Sewage and Industrial Effluent)

a. Site Preparation and Construction Phases

Currently this site is not connected to the sewer but the sewer line is not far. Thus the proponent shall connect to the sewer line for the facilities that shall require it. The impact is though short term

b. Operation Phase

Sewage will be generated by employees, customers and its auxiliary activities as well as visitors to the development. If this is not properly maintained, poses a major threat on surface and ground water quality. This may also have a major impact on human health.

I. Social Services (Health Services)

a. Site Preparation and Construction Phases

There may be an influx of workers for these phases of the project. It is however anticipated that most of these workers will be recruited from within the project area and therefore these phases of the project will have a no impact on the Health Services in the area.

b. Operation Phase

The operation phase of the project will have no impact on the health services in the area.

J. Emergency Services (Fire Services)

a. Site Preparation and Construction Phases

The site preparation and construction phases may have a minor negative impact on the fire services in the area. The storage of diesel and other flammable substance for the use in machinery used in this phase of the development poses the possibility of fires. This is increased by the climatic factors such as levels of rainfall and wind speeds and the presence of large vegetated areas within the development. The impact of a fire is reduced greatly due to the fire stations/services in KPA and Kenya Airport Authority which are within the vicinity and further aided by the fire station in Mombasa city.

b. Operation Phase

The operation phase of the project may have a minor negative long-term impact on the Fire Services in the area. LPG is mostly flammable and increases the susceptibility of the area to fires. Mitigation measures must be identified for fire.

K. Emergency Services (Police Services and Security)

a. Site Preparation and Construction Phases

Crime might increase due to influx of youth seeking employment in the proposed project site. Therefore these phase of the development have a minor negative, short term effect on the levels of crime and violence in the area and therefore have an impact on the Police services in the area. To curb on crime due to an influx of youth seeking employment, the proponent must provide security by using security guards and surveillance equipment.

b. Operation Phase

The LPG Depot will be a major income earner and it is therefore expected that large sums of money will be handled at the site daily for payment of suppliers, wages etc. This may attract criminal elements to the site and also increase the level of crime and violence in the surrounding communities. This possible surge in crime and violence may place a strain on the police

services that are responsible for the area. In order to ensure the safety of the workers, it is recommended that the proposed mitigation measures be implemented.

L. Transportation

a. Site Preparation and Construction Phases

Access to public transportation is currently not a problem within the development area. This stage will therefore not have an impact on the transportation network in the area.

b. Operation Phase

The proponent is advised to provide transport for workers to and fro the project site.

5.3.3 Occupational Health and Safety

A. Technological Hazards

Fire and explosions may be described as Technological Hazards, which can cause serious injury or result in loss of life and damage to vegetation.

a. Site Preparation and Construction Phases

Flammable substances including diesel and motor oil may be stored or used on the project site for heavy-duty equipment. These substances are precursors for fires and explosions, which may range from small incipient to larger fires of great intensity, which generates heat causing damage to property, injuries or loss of human life.

b. Operation Phase

In this phase of the development, large volumes of LPG will be stored on the property, which is highly flammable. In addition the operation of a possible kitchen or restaurant for workers on site will mean the storage of LPG on site which is also highly flammable, which may increase the vulnerability of the operation to a fire or an explosion

B. Accidents/General Human Health

Due to the nature of development accidents may be possible. These may occur during the all stages of the development. These accidents often happen unexpectedly and un-intentionally and can result in the loss of life and injuries, as well as damage to property. In addition it is very important that the developer considers the health and safety of its workers and customers.

a. Site Preparation and Construction Phases

The probability of an accident occurring at the project site during these phases of the development is high. This is due to the intense use of machinery and other heavy-duty

equipment used in this phase. The levels of dust in the area are also likely to increase, which may cause respiratory illnesses in humans. It is therefore important that the mitigation measures outlined are implemented to ensure the safety of staff members during these phases of the development.

b. Operation Phase

Accidents will happen whether by human error or failure of machinery. Therefore the probability of an accident happening during this stage of the development is high. Copious amounts of hazardous chemicals will be stored and used in the maintenance. It is imperative that measures be implemented to ensure the safety of workers and guests of the facility.

7.4 Summary of Impact

The following table gives a summary of the anticipated environmental impacts of each phase, impact type

Impact Type		**Assessment**		**Predicted impact**
		Construction Stage	**Operation Stage**	
Pollution control measures				
1	Air pollution	B-	B-	**Construction stage**: Dust created by construction work is likely to impact air quality. **After operation startup**: Exhaust from LPG tankers is likely to impact air quality. Additionally, incidents such as outflow or leakage from the pipeline may affect air quality.
2	Water pollution	B-	C	**Construction stage:** Dredging and earthwork may impact sea water quality. Additionally, wastewater used in pressure tests for the ocean floor pipeline may affect water quality. **Operation stage**: Domestic wastewater may be released by terminal facilities. Additionally, incidents such as outflow or leakage from the pipeline may affect water quality.
3	Waste	B-	B-	**Construction stage**: Solid wastes and construction wastes will be produced. **Operation stage:** Wastes will be generated with LPG tanker and terminal operation.
4	Soil pollution	D	B-	**Construction stage:**·No particular matter of concern **Operation stage**: There is possibility of leakage at LPG transport in and out of facilities, as well as from the pipeline.
5	Noise & Excessive vibration	B-	C	**Construction stage**: Construction work may increase the noise level. **Operation stage**: Operation may increase the noise level.
6	Soil subsistence	D	D	**Construction and operation stages:** No particular concerns.
7	Foul Odour	D	D	**Construction and operation stages:** No particular concerns.
8	Bottom sediment	B-	C	**Construction stage**: Dredging, earthwork and installation of ocean floor pipeline may impact the bottom sediment quality. **Operation stage**: Maintenance dredging may impact the bottom sediment quality.
Environmental (Natural)				

9	Protected areas	D	D	**Construction & operation stages**: Protected areas are not found in the area surrounding the project site.
10	Ecosystem	C	C	**Construction stage:** Construction work will not impact on any marine ecosystem. **Operation stage:** No impact on marine ecosystem though could be affected by wastewater; the extent of such effects will be confirmed going forward.
11	Hydrometeor	B-	C	**Construction stage**: No Dredging but earthwork may impact hydrology in the surrounding area. **Operation stage:** Although the marine ecosystem could be affected by wastewater, the extent of such effects will be confirmed going forward.
12	Topography/ Geology	B-	D	**Construction stage:** The terrain will be altered. **Operation stage:** No particular concerns.
Environment (Social & Cultural Aspects)				
13	Land acquisition & relocation of residents	D	D	**Construction stage**: No human settlement in the area thus no relocation. Residents may have to be relocated with land acquisition. **Operation stage:** No particular matter of concern.
14	The poor/very low income population	B+	B+	**Construction & operation stages**: Job opportunities for local citizens are expected to grow **Operation**: Jobs for skilled labour and none skilled labour.
15	Minority & indigenous ethnic groups	D	D	**Construction & operation stages:** No presence of minorities and/or indigenous ethnic communities.
16	Employment/ livelihoods means	B+/C	B+/C	**Construction stage:** Job opportunities will increase for local residents. At the same time, the project may impact fisheries, etc. **Operation stage**: The project will reduce the use of firewood, resulting in shorter cooking time and reduction of health hazards caused by fumes. At the same time, however, it may impact fisheries, etc.
17	Land use & regional resources	D	D	**Construction stage**: The area is majorly for energy generation. No alterations on land use

				Operation stage: The area is majorly for energy generation. No alterations on land use
18	Water use	D	D	**Construction & operation stages**: Impact on water use is not anticipated in the area surrounding the project site.
19	Existing social infrastructure & services	C	B+	**Construction stage**: There is possibility of traffic congestion by construction work vehicles. **Operation stage**: The project will reduce the use of firewood, resulting in reduction of effort required for cooking with firewood.
20	Social capital & social organization systems/structure	D	D	**Construction and adjoining stage:** No particular effects are anticipated.
21	Damages-benefits imbalances	D	D	**Construction and adjoining stage:** No particular effects are anticipated.
22	Conflict of interests within project locale	D	D	**Construction and adjoining stage:** No particular effects are anticipated.
23	Cultural assets	D	D	**Construction stage:** There is no possibility of cultural heritage property existing in the area surrounding the project site. **Operation stage:** No particular concerns.
24	Scenery	C	C	**Construction stage**: There is possibility of construction work affecting the surrounding landscape. **Operation stage:** There is possibility of impact on the surrounding landscape**.**
25	Gender	C	C	**Construction and operation stages:** Latent effects need to be confirmed going forward.
26	Children rights	C	C	**Construction and operation stages:** Latent effects need to be confirmed going forward.
27	Exposure to HIV/AIDS & other infectious diseases	B-	C	**During construction**: There is a risk of infections such as HIV/AIDS due to influx and movement of construction workers. **After operation startup**: Safety and public health risk in the region in the operation stage must be examined in the future.

28	Safety of the work environment (including OH & S)	B-	B-	**Construction and operation stages:** There is a danger of accidents and other latent risks. Latent risks and dangers need to be confirmed going forward.
29	Accidents	B-	B-	**Construction and operation stages:** There is a danger of accidents and other latent risks. Latent risks and dangers need to be confirmed going forward.
30	Trans-boundary impact & climate change	D	B+	**Construction stage**: No impact of concern is anticipated. **Operation stage**: The project will reduce the use of firewood, resulting in reduction of CO_2 emission.

Key: **+** = Positive impact **-**=Negative Impact, **A**= Significant Impact, **B** = is anticipated to a certain degree, **C** = Impact is unknown, **D**= No impact anticipated

7.5 Monitoring plan

Regular monitoring of important and crucial environmental parameters is of immense importance to assess the status of environment in any industrial process. With the knowledge of baseline conditions, the monitoring programme will serve as an indicator for any deterioration in environmental conditions due to operation of the LPG Storage Depot, to enable taking up suitable mitigation steps in time to safeguard the environment. Monitoring is as important as that of control of pollution since the efficiency of control measures can only be determined by monitoring. The following routine monitoring programme would therefore be implemented in the entire project cycle.

7.5.1 Training Programmes

Trainings and re training will be very important for company workers particularly those who will be operating the machinery. They shall be trained in the following areas:

i) Occupational health and Safety training
ii) Firefighting training
iii) Hazardous and non-hazardous waste management training
iv) Energy efficiency
v) Regular refresher training on relevant process technologies

vi) Environmental management training like internal environmental audit training

7.5.2 Emergency preparedness

Emergency preparedness will be put in place during the entire project cycle. In the event of accidents or any other emergency, it will be possible to manage any situation. Firefighting infrastructure will be installed and continually upgraded. Regular medical extermination will be carried out for workers.

7.5.3 Air and water quality

The proponent will continually monitor the air and water quality at the site by regularly sampling for analysis in licensed laboratories.

7.5.4 Solid and Liquid Waste Management

There will be not much solid raw material and product solid waste during the operational phase. The only sold waste that will require management will be office waste including paper.

Generation of liquid waste from the LPG depot will be at a minimum. It is only envisaged that the main liquid waste will be black and grey water which will be channeled into the sewer line available in the area.

8.0 STAKEHOLDER CONSULTATION AND PUBLIC PARTICIPATION (CPP)

The purpose of stakeholder consultation and public participation (CPP) in the ESIA study was to enlist their views regarding key environmental and social concerns that should be taken into account in the decision making about the proposed the proposed LPG Mounded Container Depot by AEVITAS Investment Company Limited. The aim of the consultations was also to obtain the input of stakeholders to the action plans for addressing any identified significant negative environmental impacts. The key stakeholders and public members included relevant lead state agencies, neighbours and other potentially interested and affected parties. In the wake of prevailing COVID-19 pandemic in Kenya, the CPP was undertaken in line with corresponding containment protocols by the Ministry of Health and guidelines for conduct of EIA studies in Kenya developed by NEMA.

8.1 Background and scope

This chapter presents the views and opinions mapped out from Stakeholder Consultation and Public Participation (CPP) component of the ESIA study for the proposed LPG Depot. The CPP was conducted in accordance with the EMCA, 1999[2015] and its subsidiary EIA/EA Regulations of 2003[2009]. The exercise was anchored on sustainability principles that emphasize application of participatory approaches to development, and also stipulated in Part III, Section 17 of the EIA/EA Regulations. From the view of ESIA as a sustainability driving tool, this legal framework requires that the views and opinions of the local people and relevant stakeholders be duly solicited, synthesized and applied to the decisions about the proposed project.

Against this legal backdrop and people-centered perspective on sustainability, the CPP process sought to map out most of diverse views across public and stakeholder representation scales – starting from resident community members through to government agencies and expert opinion leaders in the field energy and LPG. The views and opinions were obtained for purposes of unravelling pertinent environmental and social impacts that need to be mitigated in the entire life cycle of the proposed project. Thus conceived, the consultations exercise was organized around three thematic perspectives: (i) determining the indicative social and environmental issues for the LPG Container Depot; (ii) analyzing and singling out the core social and

environmental concerns for consideration in the development of the environmental management plan (EMP) for the proposed LPG Container Depot; and (iii) discovering public concerns which are not directly related to the proposed LPG Container Depot yet, in the absence of responsive mitigation measures, they portend significant influences on its construction and ultimate operations.

The rest of this CPP chapter is organized as follows: Section 8.2 describes the CPP methods and procedure in terms of type of data required, their sources, and the steps in data collection, analysis and interpretation for decision making about the proposed project. Section 8.3 is the most elaborate component of this chapter to the degree it presents the details on of CPP deliberations. In this section, a summary of key potential social justice risks and environmental threats associated with the LPG Container Depot arising from the CPP deliberations are presented. Section 8.3 presents also the preferred mitigation measures for the possible negative effects. Finally, section 8.4 outlines the summary of critical social and environmental public concerns about the proposed LPG Container Depot, thereby being part of the basis of recommendations contained in the subsequent EMP for the LPG Container Depot. Supportive CPP delivery tools and filled out instruments are presented in the Appendices.

8.2 Data and methods

8.2.1 Data required and sources

The focus of the CPP was on how the proposed LPG Container Depot, in the context of sustainable development, could induce changes in the existing natural and entire social and economic ecosystem elements. This task entailed unravelling the concerns of the people in relation to how the planned project might conform with or part ways with the quality of their bio-spherical bases and socio-economic and cultural life forms; and enlisting, in their own expressions, the preferred mitigation measures in the entire life cycle of the proposed project. To this end, the CPP process reached to a wide range of participants with equally diverse knowledge, experiences and technical skills about how LPG plants and their technological configurations work and interact with the wider societal elements. This was accomplished through organized meetings with local community members, representatives of specialized state agencies and non-state actor organizations in the field of environmental governance, and face-to-face interviews with local opinion leaders, high level state officers in county/national

administration and environment departments, and top actors in the LPG related business community.

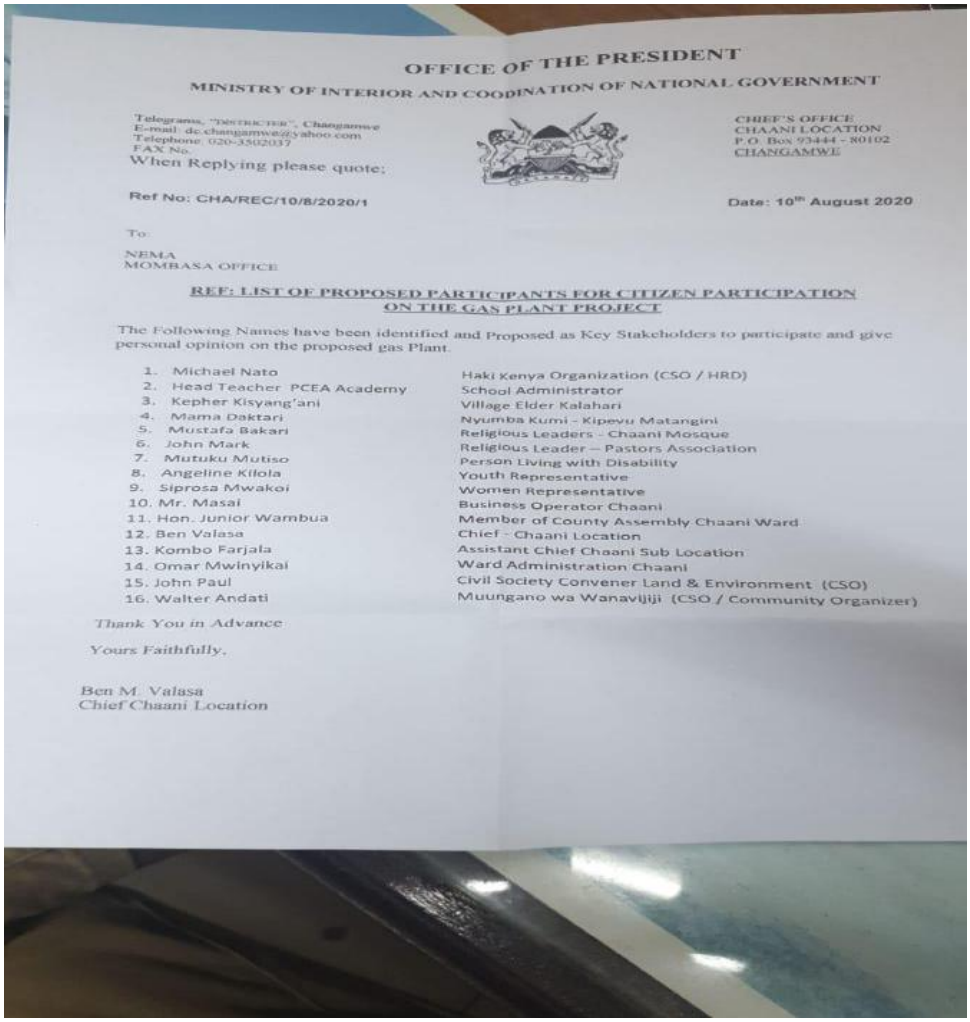
8.2.2 Stakeholders and public mobilization

A mix of strategies were employed in mobilizing different target people for participation in the CPP exercise, taking into cognizance the then climate of corona virus (COVID-19) pandemic in the country and its attendant Ministry of Health Protocols. To begin with, the ESIA study team visited the site for the proposed LPG Container Depot for the screening phase of the study (Photo 9-11). An important aspect of this field scan exercise was to assist the ESIA study team gain familiarity with the site's ecosystem, including pertinent stakeholders and obtaining community organization structures important for planning subsequent public dialogue and discussions with the stakeholders. At this point, it emerged that the area Chief for Chaani Location in Changamwe Sub-County would be an instrumental focal person in assisting with the mobilization of the local community for participation in the ESIA study. Thus, the ESIA study team discussed with him the kind of stakeholders and the members of the public required to provide their views and opinions for the ESIA study, and thereafter left it for him to develop a list of leading local community organisations and institutions and their leadership representatives.

Photo 9-11 ESIA Study Team visit proposed site for Screening

The list the area Chief generated for use was as presented in Figure 12. It included local civil society organisations in the field of environment, representatives of women and youth organisations, heads of various Chaani Location residential villages, People Living with Disabilities (PWDs), religious leaders, association of community SMEs owners, and political

leadership representatives (Chaani Member of County Assembly [MCA], Member of Parliament [MP] for Changamwe Constituency and the Mombasa County Women Representative). The subsequent actions taken to solicit the views and opinions of the local community, as described in section 8.2.3 that follows, was primarily based on reference to this list. Throughout the consultations and discussions with the local community representatives contained in the List, the Chief continued to play an instrumental role of organizing and bringing the participants on board.



OFFICE OF THE PRESIDENT

MINISTRY OF INTERIOR AND COODINATION OF NATIONAL GOVERNMENT

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CHIEF'S OFFICE
CHAANI LOCATION
P.O. Box 93444 - 80102
CHANGAMWE

Ref No: CHA/REC/10/8/2020/1

Date: 10th August 2020

To:

NEMA
MOMBASA OFFICE

REF: LIST OF PROPOSED PARTICIPANTS FOR CITIZEN PARTICIPATION ON THE GAS PLANT PROJECT

The Following Names have been identified and Proposed as Key Stakeholders to participate and give personal opinion on the proposed gas Plant.

1.	Michael Nato	Haki Kenya Organization (CSO / HRD)
2.	Head Teacher PCEA Academy	School Administrator
3.	Kepher Kisyang'ani	Village Elder Kalahari
4.	Mama Daktari	Nyumba Kumi - Kipevu Matangini
5.	Mustafa Bakari	Religious Leaders - Chaani Mosque
6.	John Mark	Religious Leader – Pastors Association
7.	Mutuku Mutiso	Person Living with Disability
8.	Angeline Kilola	Youth Representative
9.	Siprosa Mwakoi	Women Representative
10.	Mr. Masai	Business Operator Chaani
11.	Hon. Junior Wambua	Member of County Assembly Chaani Ward
12.	Ben Valasa	Chief - Chaani Location
13.	Kombo Farjala	Assistant Chief Chaani Sub Location
14.	Omar Mwinyikai	Ward Administration Chaani
15.	John Paul	Civil Society Convener Land & Environment (CSO)
16.	Walter Andati	Muungano wa Wanavijiji (CSO / Community Organizer)

Thank You in Advance

Yours Faithfully,

Ben M. Valasa
Chief Chaani Location

Figure 12: List of Opinion Leaders Prepared by the area Chief, Chaani Location

The Scoping Visit to the site also made the ESIA study Team gain an understanding of additional state agencies and surrounding enterprises that would be consulted for their views and opinions about environmental and social aspects of the proposed project. The set of institutions, government agencies and businesses consulted in the ESIA study was as presented in Table 20.

Table 20: Agencies, institutions and business entities mapped out for Consultation

	AGENCY, INSTITUTIONS AND BUSINESS ENTITY	**TARGET PARTICIPANT**
1.	County Commission (Changamwe Sub-County)	Deputy County Commissioner
2.		Sub-County Administrator
3.		Chaani Ward Administrator
4.	County Government of Mombasa	County Director of Health
5.		Minister, Environment & Waste Management
6.		Chief Executive, Environment & Waste Management
7.	National Government, Ministry of Interior & Coordination	Chief, Chaani Location
8.		Assistant Chief, Chaani Sub-Location
9.	Regional Administration & Development partners	Regional Commissioner (Coast)
10.		Director, Coast Development Authority (CDA)
	Adjacent businesses and state agencies	
11.	Kenya Power and Lighting Company (KPLC)	Managing Director
12.	Tsavo Power Limited	Managing Director
13.	Kenya Marine Authority	Environment Officer
14.	Kenya Ports Authority (KPA)	Managing Director
15.	Kenya National Highways Authority (KeNHA)	Managing Director
16.	Kenya Railways Cooperation	Managing Director
17.	Kenya Pipeline Limited	Managing Director
18.	KenGen Limited	Managing Director
19.	KETRACO	Managing Director
20.	Energy and Petroleum Regulation Authority (EPRA)	Director General
21.	FOCUS Limited	General Manager
22.	VTTI Kenya	Country Coordinator
23.	Multiple Hauliers Limited	Managing Director

The mobilization of the local community members took three mutually interactive phases. First, the Chief brought together various tier of community opinion leaders into Briefing Meetings with the ESIA study Team. The participants in these Briefing Meetings comprised representatives of local organisations and actor groups contained in the List he had generated.

Here, the purpose was to familiarise them with proposed concept of the LPG Mounded Container Depot with a view to, on one hand, enabling them provide their views and opinions in their own right as community leaders-as responses to the study questionnaire (Appendix 8A), and, on the other hand, preparing them to effectively further reach out to their community members for additional views and opinions-aided by a developed Schedule (Appendix 8B). To this effect, 2 such Briefing Meetings were held at the Chief's Office, one with two representatives of a local area youth-led movement on Land and Environment (Photo 12 and Attendance List in Appendix 8C), and another with the rest of persons in the list he prepared (photo 13 and Attendance List in Appendix 8D). The corresponding minutes of the deliberations are presented in Appendix 8E (a) and Appendix 8E(b).

Plate 12 Briefing Meeting with Opinion Leaders, Chaani Location Chief's Office

Due to the prevailing devastating COVID-19 situation in the country at the time of the ESIA study, it was not possible to hold a series of large-size public *baraza* meeting as has been the tradition for ESIA studies. This circumstance compelled the ESIA study team to evolve a methodological innovation that would serve the purpose of the traditional large-size public *baraza* meetings. To this end, participants in the Briefing Meetings at the Chief's Office were provided with the study questionnaire to use in filling out their views and opinions and, in addition, prevailed upon to reach out to their neighbouring community members for additional views and opinions, aided by the above referred to Schedule (Appendix 8F) as the tool for use in recording the additional views obtained. They were also issued A Technical Project Briefing

Note (Appendix 8G), to also share with persons who would reach out to them to facilitate more understanding about the proposed project.

These additional views would be unveiled on the occasion of the public *baraza* meeting, eventually held at the site for the proposed project in Kipevu, Chaani Location within Changamwe Sub-County on 28th August 2020. In addition, a radio announcement of the planned public *baraza* meeting was made 14 days *priori* (Appendix 8H), and related announcement posters placed at conspicuous points within the location of the venue for the planned *baraza* (sample images in Plate 13-15). The Announcement Posters directed the readers to names and phone contacts of persons they could reach out to in order to with their views and opinions on the proposed project.

Photo 13-15 ESIA Study Team Member, mounting Announcement Posters for the Public Baraza

In the case stakeholders listed in Table 20 above, official letters, accompanied by the Technical Project Briefing Note and the study questionnaire were hand-delivered and/or sent via email addresses to the respective target participants and they were kindly asked to respond in a time

span of 14 days upon receipt. This action was complemented with follow-up phone calls for purposes of providing explanations about the study and the type of details required.

8.2.3 Collection and analysis of views and opinions

During the face-to-face and public *baraza* consultative meetings, participants were first provided with essential background information on the proposed LPG Mounded Container Depot with a view to grounding them on the concept of LPG Mounded Container Depot, and enabling them constructively ventilate their thoughts on its related environmental and social perspectives. This action of shading clarity on the subject matter was buttressed with the aid of print outs of the Technical Project Briefing Note (Appendix 8H), explaining how the concept is designed to work and the diverse measures the proponent intends to incorporate towards ascertaining that the attendant environmental, social and economic concerns are addressed throughout the project cycle; during construction to the operation phases of the LPG Mounded Container Depot.

Thereafter, participants would be granted the opportunity to freely air their opinions and views regarding the proposal in the form of questions that seek clarifications on the proposed project, comments on its intent, and suggestions for input to and/or improvement. To ensure that the views and opinions gathered were objective and divulged in atmosphere of freedom from coercion, participants were told that they choose not to provide their thoughts on the proposed project, but none responded in affirmative to this created window of freedom. The photo gallery in photo 16 to Plate 20 present the pictorial impressions of proceedings of the public *baraza* meeting.

Photo 16Area Chief delivering opening speech

Photo 17 ESIA Team Leader inviting participants to provide their views


Photo 18, 19 and 20 Community members providing their views

Chief Ushering in Local Leaders selected to steer proponent-community engagements in the project

Photo16 - 20 Proceedings of the Public Baraza Meeting at the Proposed Site, 28th August 2020.

In the case of stakeholders and public opinion leaders that were able to read and write, the study questionnaire was handed over to them to self-administer, with the presenting ESIA Study Team member providing clarifications on areas as highlighted by the respondents. Like participants in the Opinion Leaders Briefing Meetings and Public *Baraza* Meeting, they were also granted the liberty to pull out of the exercise if they deemed fit, but throughout the consultations exercise, no person opted to prematurely quit from the engagement.

The resultant statements contained in the field notes were, thereafter, examined for common patterns in the expressed views and opinions on social and environmental risk factors and potential mitigation measures for the LPG Mounded Container Depot. At the end of every consultation session, the ESIA Team informed the participants that a further platform would

be presented to them for more input when NEMA analyses the ESIA Report and finally publishes invitations for public hearings for ultimate decision on the proposed project.

8.3 The CPP Results

8.3.1 Characteristics of participants

The CPP process enlisted the views and opinions from a total 229 people, 170 reached directly by the ESIA Study Team and another 59 through the local area opinion leaders with whom Briefing Meetings were done at the Chief's office (signatories appended to the respective Schedule for Enlisting Public Views). The sum frequency distribution of participants in the by public and/or stakeholder participant category is presented in Table 21.

Later after the public *baraza* meeting, the Commission for Human Rights and Justice also reached out to the project proponent with a letter pointing out areas in which they would have wanted clarifications about the proposed LPG Depot. This letter was responded to and the elaborations formally endorsed by the Commission as satisfactory. These concerns have been incorporated in the analysis of views from the CPP process, and related correspondences were as provided in Appendices 8I. The ESIA study team also reached out to Multiple Hauliers Limited (Appendix 8J) and the Kenya Pipeline Company, considering their close proximities to the site of the proposed LPG Depot, but they did not fill-out the study questionnaire.

Table 21: Distribution of participants in the CPP process

Participant category	**Number**	**Percent**
Public Members I: (Public Baraza Meeting)	70	30.6
Public Members II: (Submissions to the Schedule for Views)	97	42.3
Local Community Opinion Leaders (Chaani Location)	33	14.4
Stakeholders I: County Government Departments	3	1.3
Stakeholders II: National Government Agencies/Departments	16	7.0
Stakeholders III: Regional (Coast) Development Partners/Institutions	2	0.9
Stakeholders IV: Private Business Investors	8	3.5
Total	**229**	**100.0**

Table 21 shows that a vast majority of participants in the CPP process (87.3%) were residents in the neighbourhood of the proposed project (Public Members I, Public Members II and their Community Opinion Leaders combined). Another total 8.3% participants were drawn from National Government Agencies and/or Departments and County Government Departments. Other respondents were representatives of Regional (Coast) Development Partners and managers of private business entities located within the site for the proposed project, 0.9% and 3.5% respectively. This Summary of distribution of the participants by their tier of actor representation group is as presented in Figure 13.

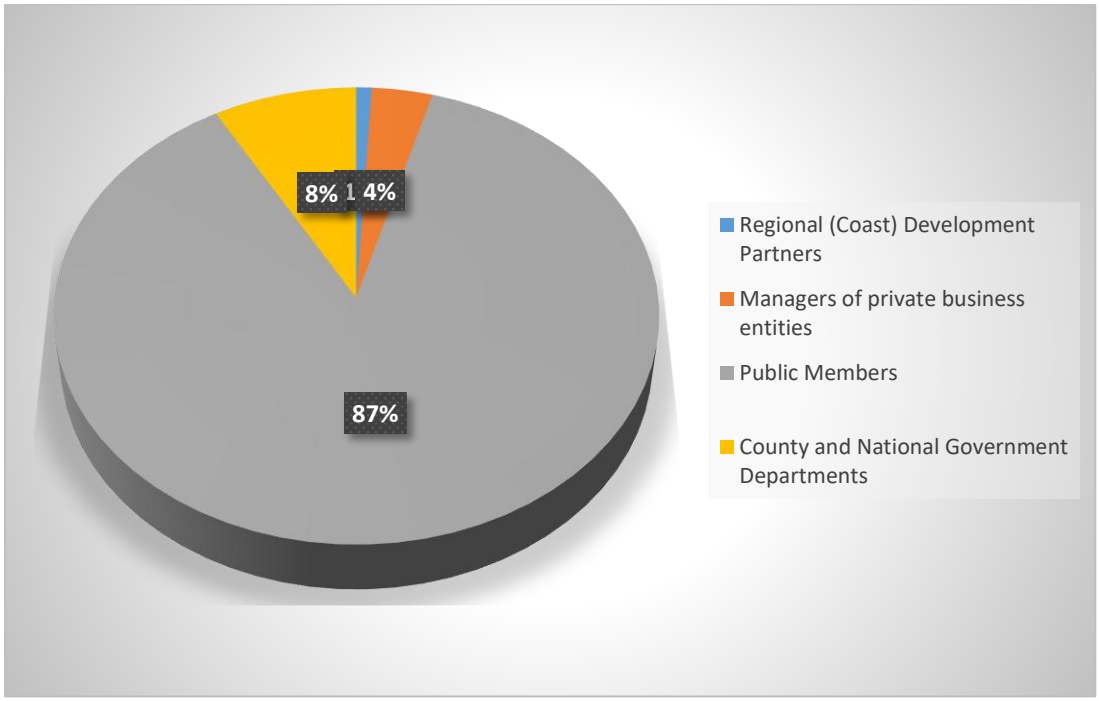

Figure 13: Summary distribution of participants by broad tier of representation actor group

8.3.2 Views and opinions expressed

The CPP exercise was successful in enlisting critical views and opinions of the public and specialized agencies on potential social and environmental impacts that need to be factored in the design and priority actions in the life cycle of the proposed project. These perspectives are presented in this section, with their associated potential high risk social and environmental aspects and corresponding mitigation measures provided for in the chapter on EMP. The unit of analysis adopted for this purpose is the script of notes from the field. A total of 54 scripts containing the views and opinions gathered from engagements with the public and stakeholders were obtained and/or prepared Figure 14.

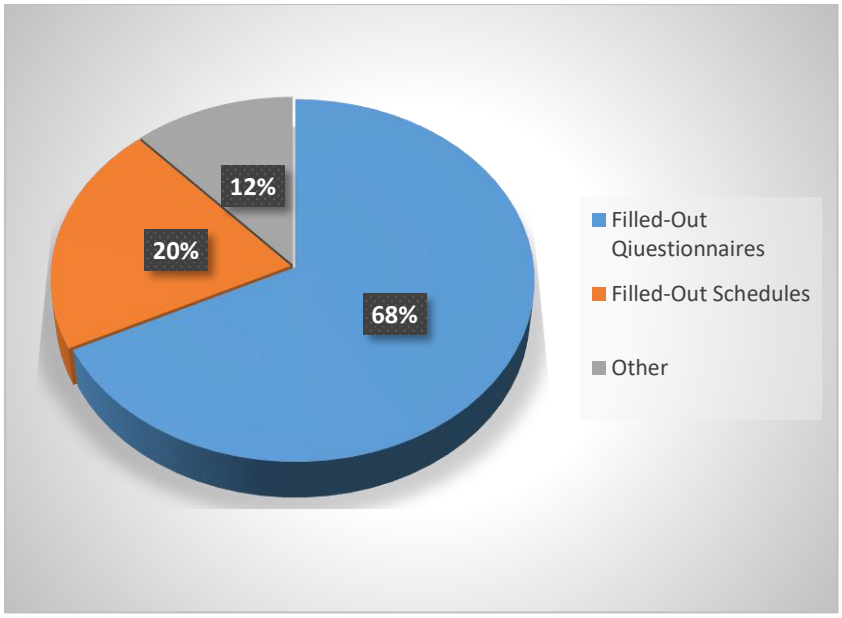

Figure 14: Distribution of the CPP Field Scripts

Most of the scripts used in the analysis (36, 68%) were filled-out study questionnaires, of which responses were provided by community opinion leaders, representatives of County and National Government Departments/institutions, regional (coastal Kenya) development partners/offices, and managers of related industrial business entities within the site of the proposed project. Another 11 (20%) of the scripts were the filled-out Schedules for Collecting Views prepared and provided to the Community Opinion Leaders as facilitative tools for use in reaching out to the wider neighbouring community members. The rest 9 scripts (12%) in the 'other' category in Figure 14 were: Minutes of 3 Briefing Meetings held at the area Chief's office, 2 'Memoranda' (one prepared by a consortium of Chaani Location youth and another by Haki Kenya, a local CBO); 1 submission by Hon. Omar Mwinyi, MP for Changamwe Constituency - delivered and read on the occasion of the public *baraza* meeting; and the Field Notes (1 script) taken on the occasion of the public baraza meeting. In the sub-sections that follow, the views and opinions gathered are presented according to the respective representation actor group tiers, and in relation to the thematic contents of the Scoping Matrix developed for the ESIA study.

8.3.2.1 Views from neighbourhood public and private corporate establishments

This section highlights the social, environmental and suggested improvements on the project by the immediate neighbouring facilities that included: Kenya National Highways Authority (KeNHA), Kenya Marine Authority (KMA), Kenya Railways Corporation (KRC), KETRACO, Kenya Power; KenGen, Tsavo Power, Kenya Pipeline Company and VTTI Kenya.

Analytical theme		**Predicted impact**	**Expressed view(s) and/or opinion(s)**								
				A	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Pollution control measures											
1	Air pollution	**Construction stage**: Dust created by construction work likely to impact air quality.	Possibility of impact raised	√	√	√	√	√	√	√	√
		After operation startup: Exhaust from LPG tankers likely to impact air quality. Additionally, incidents such as outflow or leakage from the pipeline may affect air quality.	Possibility of impact raised	√	√	√	√	√	√	√	√
2	Water pollution	**Construction stage:** Dredging and earthwork may impact Ocean water quality. Additionally, wastewater used in pressure tests for the ocean floor pipeline may affect water quality.	Participants were very concerned about the future of the water in the neighbouring ocean shore.	√	√	√	√	√	√	√	√
3	Solid waste	**Construction stage**: Solid wastes and construction wastes will be produced.	Possibility of this impact raised.	√	√	√	√	√	√	√	√
		Operation stage: Wastes will be generated with LPG tanker and terminal operation.	Possibility of this impact raised	√	√	√	√	√	√	√	√
3	Soil pollution	**Construction stage:**·No	Possibility of this impact raised.	√	√	√	√	√	√	√	

		particular matter of concern.									
4	Noise & Excessive vibration	**Construction stage**: Construction work may increase the noise level.	Many participants raised concern over the likely noise and excessive vibration during construction.	√	√	√	√	√	√	√	√
Environmental (Natural)											
5	Ecosystem	**Construction stage:** Construction work may temporarily impact the marine ecosystem. Also, mangrove clearing is anticipated.	No particular concerns raised.	√	√	√	√	√	√	√	√
		Operation stage: Although the marine ecosystem could be affected by wastewater, the extent of such effects will be confirmed going forward.	Concern raised	√	√	√	√	√	√	√	√
7	Topography/ Geology	**Construction stage:** The terrain will be altered.	Concern over possible landscape changes raised.	√					√		√
Environmental (Social and cultural aspects)											
8	The poor/very low income population	**Construction & operation stages**: Job opportunities for local citizens are expected to grow.	Confirmed: participants expressed the view that additional job opportunities are going to emanate from this project.	√	√	√	√	√	√	√	√
9	Employment/ livelihoods means	**Construction stage:** Job opportunities will increase for local residents. At the same time, the project may impact fisheries, etc.	High stakes raised on employment opportunities	√	√	√	√	√	√	√	√

		Operation stage: The project will reduce the use of firewood, resulting in shorter cooking time and reduction of health hazards caused by fumes.	Confirmed: participants raised the view that the LPG from the plant would be cheaper, thereby enabling them to transit from use of wood fuel and charcoal.	√	√	√	√	√	√	√	√
10	Water use	**Construction & operation stages**: Impact on water use is not anticipated in the area surrounding the project site.	Possible impact on water use in the setting raised by Kenya Marine Authority		√		√			√	√
11	Existing social infrastructure & services	**Construction stage**: There is possibility of traffic congestion by construction work vehicles.	Confirmed: There is possibility of traffic congestion by construction work vehicles.	√	√	√	√	√	√	√	√
		Operation stage: The project will reduce the use of firewood, resulting in reduction of effort required for cooking with firewood.	Confirmed: participants expected the project to reduce use of firewood, resulting in reduction of effort required for cooking with firewood.	√	√	√	√	√	√	√	
12	Conflict of interests within project locale	**Construction and adjoining stage:** No particular effects are anticipated.	All KenGen, KRC and Kenya Power Company Ltd and KeNHA strongly expressed the view that the project does not present any serious challenges to their businesses. Proponent only needs to advise then in case of any temporary disruption during the construction phase.			√	√	√	√		
13	Safety of the work environment (including OH & S)	**Construction and operation stages:** There is a danger of accidents and other latent risks. Latent risks and dangers need to	Confirmed: participants from KenGen raised concern about the danger of accidents and other latent risks occurring. Most outstanding			√			√		

		be confirmed going forward.									
14	Accidents	**Construction and operation stages:** There is a danger of accidents and other latent risks. Latent risks and dangers need to be confirmed going forward.	Confirmed: participants raised concern about the danger of accidents and other latent risks occurring.	√	√	√	√	√			
		Operation stage: The project will reduce the use of firewood, resulting in reduction of CO_2 emission.	Confirmed.	√	√	√	√	√	√	√	

KEY

A: KeNHA; B: Kenya Marine Authority (KMA); C: Kenya Railways Corporation (KRC); D: KETRACO; E: Kenya Power; F: KenGen;

G: VTTI Kenya and H: Tsavo Power

8.3.2.2 Views and opinions from the public baraza meeting

This section presents the issues that were raised during a public baraza meeting.

Assessment perspective		**Predicted impact**	**Expressed view(s) and/or opinion(s)**
Pollution control measures			
1	Air pollution	**Construction stage**: Dust created by construction work likely to impact air quality. **After operation startup**: Exhaust from LPG tankers likely to impact air quality. Additionally, incidents such as outflow or leakage from the pipeline may affect air quality.	Impact raised by a few the participants. One Women Leader typically emphasised that, "the proposed development should not tamper with air. No pollution!" Another public member noted also that, "Dust emissions during the development [construction phase] are likely to cause health hazard to the community around". Impact raised by many participants.
2	Water pollution	**Construction stage:** Dredging and earthwork may impact Ocean water quality. Additionally, wastewater used in pressure tests for the ocean floor pipeline may affect water quality. **Operation stage**: Domestic wastewater may be released by terminal facilities. Additionally, incidents such as outflow or leakage from the pipeline may affect water quality.	Participants were very concerned about the future of the water in the neighbouring ocean shore. Possibility of impact raised by a few the participants.
3	Solid waste	**Construction stage**: Solid wastes and construction wastes will be produced. **Operation stage:** Wastes will be generated with LPG tanker and terminal operation.	Possibility of this impact raised by participants, with one participant requesting that the task of "garbage collection should be given to us [youth]" In the same vain, one participant noted that, "Disposal waste from the plant could also pollute the environment around, [thereby] endangering the health of the community & marine life as well considering that the plant is adjacent to the sea (sic)". In another Filled-out Schedule, a particular participant was found to have summed it that, "protection of soil erosion, landscaping around the area, and proper [solid] waste management [are crucial considerations and] all these [should] be done or contracted to the locals". Possibility of this impact raised by participants.
4	Soil pollution	**Construction stage:**·No particular matter of concern **Operation stage**: There is possibility of leakage at LPG transport in and out of facilities, as well as from the pipeline.	No particular matter of concern raised Possibility of this impact raised by participants.
5	Noise & Excessive vibration	**Construction stage**: Construction work may increase the noise level. **Operation stage**: Operation may increase the noise level.	Many participants raised concern over the likely noise and excessive vibration during construction. No particular matter of concern raised to this effect.
6	Soil subsistence	**Construction and operation stages:** No particular concerns.	No particular concerns raised.
7	Foul Odour	**Construction and operation stages:**	No particular concerns raised.

		No particular concerns.	
8	Bottom sediment	**Construction stage**: Dredging, earthwork and installation of ocean floor pipeline may impact the bottom sediment quality. **Operation stage**: Maintenance dredging may impact the bottom sediment quality.	No particular concerns raised. No particular concerns raised.
Environmental (Natural)			
9	Protected areas	**Construction & operation stages**: Protected areas are not found in the area surrounding the project site.	Confirmed: No particular concerns raised.
10	Ecosystem	**Construction stage:** Construction work may temporarily impact the marine ecosystem. Also, mangrove clearing is anticipated. **Operation stage:** Although the marine ecosystem could be affected by wastewater, the extent of such effects will be confirmed going forward.	Participants raised the matter of the need to plant trees, and the job of doing this to be entrusted with the local community residents. No particular concerns raised.
11	Hydrometeor	**Construction stage**: Dredging and earthwork may impact hydrology in the surrounding area. **Operation stage:** Although the marine ecosystem could be affected by wastewater, the extent of such effects will be confirmed going forward.	No particular concerns raised. No particular concerns raised.
12	Topography/ Geology	**Construction stage:** The terrain will be altered. **Operation stage:** No particular concerns.	No particular concerns raised. No particular concerns raised.
Environmental (Social and cultural aspects)			
13	Land acquisition & relocation of residents	**Construction stage**: Residents may have to be relocated with land acquisition. **Operation stage:** No particular matter of concern.	Since the site is far off the residential areas, no concern was raised regarding the possibility of relocation for settlement. Participants sought to assured of their current residences should the operations of the proposed Depot expand in future.
14	The poor/very low income population	**Construction & operation stages**: Job opportunities for local citizens are expected to grow.	Confirmed: participants expressed very high hopes that the Proponent would sourcing the labour force from within, especially for the less expertise oriented positions.
15	Minority & indigenous ethnic groups	**Construction & operation stages:** The presence of minorities and/or indigenous ethnic communities requires inspection in future.	No related concern expressed, save for the view that there was the risk that future considerations for employment in the plant could granted to "in-migrants" to Chaani from other parts of Mombasa County.
16	Employment/ livelihoods means	**Construction stage:** Job opportunities will increase for local residents. At the same time, the project may impact fisheries, etc.	High stakes raised on employment opportunities, but no concern raised over possibilities of adverse effects on the fishery.

		Operation stage: The project will reduce the use of firewood, resulting in shorter cooking time and reduction of health hazards caused by fumes.	Confirmed: participants raised the view that the LPG from the plant would be cheaper, thereby enabling them to transit from use of wood fuel and charcoal. As one participant summarized it, "People will use the product as clean energy".
17	Land use & regional resources	**Construction stage**: There is possibility of impact on fisheries, etc. **Operation stage**: There is possibility of impact on fisheries, etc.	No concern raised over possibilities of adverse effects on the fishery. No concern raised over possibilities of adverse effects on the fishery.
18	Water use	**Construction & operation stages**: Impact on water use is not anticipated in the area surrounding the project site.	No matter raised on impact on water use in the setting.
19	Existing social infrastructure & services	**Construction stage**: There is possibility of traffic congestion by construction work vehicles. **Operation stage**: The project will reduce the use of firewood, resulting in reduction of effort required for cooking with firewood.	Confirmed: There is possibility of traffic congestion by construction work vehicles. Confirmed: participants expected the project to reduce use of firewood, resulting in reduction of effort required for cooking with firewood.
20	Social capital & social organization systems/structure	**Construction and adjoining stage:** No particular effects are anticipated.	Confirmed: No social capital & social organization systems/structure came out to be under threat.
21	Damages-benefits imbalances	**Construction and adjoining stage:** No particular effects are anticipated.	Some participants projected that the security situation in the area would improve consequent to operation of the planned project. Several others suggested that the proponent should "Give space to plant more trees". Although some opinion leaders and stakeholders expressed their uncertainty about the possibility of displacement for some families as had been witnessed in the case of expansion of KPA, the Memorandum submitted to the ESIA study team assured that, "The project, being (sic) located in the industrial area will not receive hostility from the local whose houses have been demolished during expansion of the Kenya Ports Authority".
22	Conflict of interests within project locale	**Construction and adjoining stage:** No particular effects are anticipated.	Memorandum by Haki Kenya expressed the view that the Proposed project should take cognizance of the recently rehabilitated Kibarani dumpsite and its gazette as a National Park. Other possible areas of conflict highlighted were closeness of the proposed plant to the KPA premises in case of emergencies, "in case it demands much water there is a [high] likelihood that the community will suffer dry taps as it has happened with other developments in the area, power shortages, black-outs and noise during construction".
23	Cultural assets	**Construction stage:** There is possibility of cultural heritage property existing in the area surrounding the project site. **Operation stage:** No particular concerns.	No particular concerns. No particular concerns.
24	Scenery	**Construction stage**: There is possibility of construction work affecting the surrounding landscape.	No particular concerns.

		Operation stage: There is possibility of impact on the surrounding landscape**.**	No particular concerns.
25	Gender	**Construction and operation stages:** Latent effects need to be confirmed going forward.	No specific gender-tailored concern raised.
26	Children rights	**Construction and operation stages:** Latent effects need to be confirmed going forward.	Some residents applauded the news that the Depot would be constructed at the proposed site, noting that this would be an important cure to the problem of disappearance of their children who had been crossing the field through to the ocean shore.
27	Exposure to HIV/AIDS & other infectious diseases	**During construction**: There is a risk of infections such as HIV/AIDS due to influx and movement of construction workers. **After operation startup**: Safety and public health risk in the region in the operation stage must be examined in the future.	No fundamental fear of Exposure to increased HIV/AIDS & other infectious diseases raised. Some participants expressed the view that the proponent need to put in place express cautionary measures to safeguard for the safety and pollution – induced health risks to workers and local residents.
28	Safety of the work environment (including OH & S)	**Construction and operation stages:** There is a danger of accidents and other latent risks. Latent risks and dangers need to be confirmed going forward.	Confirmed: participants raised concern about the danger of accidents and other latent risks occurring. Most outstanding concern over this was raised in the Filled-out Schedule submitted by members of the West Coast Parish of the Presbyterian Church of East Africa. In response to this, they were informed about the safety measures embedded in the design and concept of the proposed LPG Mounded Container Depot.
29	Accidents	**Construction and operation stages:** There is a danger of accidents and other latent risks. Latent risks and dangers need to be confirmed going forward.	Confirmed: participants raised concern about the danger of accidents and other latent risks occurring. In response to this, they were informed about the safety measures embedded in the design and concept of the proposed LPG Mounded Container Depot.
30	Trans-boundary impact & climate change	**Construction stage**: No impact of concern is anticipated. **Operation stage**: The project will reduce the use of firewood, resulting in reduction of CO_2 emission.	No concern over trans-boundary impact & climate change raised by any participant. Confirmed: Many participants urged that the proponent should consider waivers on the cost of the LPG so that the local people may reduce use of wood fuel and charcoal.

8.3.2.3 Views and opinions of Community Opinion (and Youth) Leaders

Assessment perspective		**Predicted impact**	**Expressed view(s) and/or opinion(s)**
Pollution control measures			
1	Air pollution	**Construction stage**: Dust created by construction work likely to impact air quality. **After operation startup**: Exhaust from LPG tankers likely to impact air quality. Additionally, incidents such as outflow or leakage from the pipeline may affect air quality.	Impact raised by some opinion leaders. Impact raised by many participants.
	Water pollution	**Construction stage:** Dredging and earthwork may impact Ocean water quality. Additionally, wastewater used in pressure tests for the ocean floor pipeline may affect water quality. **Operation stage**: Domestic wastewater may be released by terminal facilities. Additionally, incidents such as outflow or leakage from the pipeline may affect water quality.	Participants were very concerned about the future of the water in the neighbouring ocean shore. They we assured that there would be sufficient distance between the Container Depot and the Ocean shore, and that the Ocean Water would not be under any threat owing to the design of the Mounded Container concept. Possibility of impact raised by a few the participants. Participants were very concerned about the future of the water in the neighbouring ocean shore. They were assured that there would be sufficient distance between the Container Depot and the Ocean shore, and that the Ocean Water would not be under any threat owing to the design of the Mounded Container concept.
3	Solid waste	**Construction stage**: Solid wastes and construction wastes will be produced. **Operation stage:** Wastes will be generated with LPG tanker and terminal operation.	Possibility of this impact raised. Possibility of this impact raised.
4	Soil pollution	**Construction stage:**·No particular matter of concern **Operation stage**: There is possibility of leakage at LPG transport in and out of facilities, as well as from the pipeline.	No particular matter of concern raised Possibility of this impact raised. It was explained to them that owing to the overall design and safety precautions embedded in the plant, there was very minimal likelihood of incurring spillages leading to pollution of the surrounding soil.
5	Noise & Excessive vibration	**Construction stage**: Construction work may increase the noise level. **Operation stage**: Operation may increase the noise level.	No particular matter of concern raised to this effect. No particular matter of concern raised to this effect.
6	Soil subsistence	**Construction and operation stages:** No particular concerns.	No particular concern raised.
7	Foul Odour	**Construction and operation stages:** No particular concerns.	No particular concern over foul odour raised.
8	Bottom sediment	**Construction stage**: Dredging, earthwork and installation of ocean	No particular concern about possible effect on the bottom sediment raised.

		floor pipeline may impact the bottom sediment quality. **Operation stage**: Maintenance dredging may impact the bottom sediment quality.	No particular concern about possible effect on the bottom sediment raised. .
Environmental (Natural)			
9	Protected areas	**Construction & operation stages**: Protected areas are not found in the area surrounding the project site.	Confirmed: No particular concerns raised.
10	Ecosystem	**Construction stage:** Construction work may temporarily impact the marine ecosystem. Also, mangrove clearing is anticipated. **Operation stage:** Although the marine ecosystem could be affected by wastewater, the extent of such effects will be confirmed going forward.	Participants raised the matter of the need to plant trees, and the job of doing this to be entrusted with a local community based tree nursery entrepreneurs. No particular concerns raised.
11	Hydrometeor	**Construction stage**: Dredging and earthwork may impact hydrology in the surrounding area. **Operation stage:** Although the marine ecosystem could be affected by wastewater, the extent of such effects will be confirmed going forward.	No concern raised. No concern raised.
12	Topography/ Geology	**Construction stage:** The terrain will be altered. **Operation stage:** No particular concerns.	No particular concern raised. No particular concern raised.
Environmental (Social and cultural aspects)			
13	Land acquisition & relocation of residents	**Construction stage**: Residents may have to be relocated with land acquisition. **Operation stage:** No particular matter of concern.	Since the site is far off the residential areas, no concern was raised regarding the possibility of relocation for settlement. Participants sought to assured of their current residences should the operations of the proposed Depot expand in future.
14	The poor/very low income population	**Construction & operation stages**: Job opportunities for local citizens are expected to grow.	Confirmed: participants expressed very high hopes that the Proponent would consider employing the local people in the Plant. Investing Corporate Social Responsibility came out strongly as a favourable mechanism the proponent is expected to employ towards enabling the poor and low income population categories experience a sense of gratification of eventual presence of the proposed plant in their midst. One opinion leader summed up this view by noting that, "The investor should consider ways of giving back to the community, especially educational institutions, to help equip the young for the future."
15	Minority & indigenous ethnic groups	**Construction & operation stages:** The presence of minorities and/or indigenous ethnic communities requires inspection in future.	No related concern raised.

16	Employment/ livelihoods means	**Construction stage:** Job opportunities will increase for local residents. At the same time, the project may impact fisheries, etc. **Operation stage**: The project will reduce the use of firewood, resulting in shorter cooking time and reduction of health hazards caused by fumes.	High stakes raised on employment opportunities, but no concern raised over possibilities of adverse effects on the fishery. Confirmed: participants expressed their hope that the LPG from the plant would be cheaper than the contemporary market prices, thereby being affordable to them, thus enabling them to switchover to minimal use of wood fuel and charcoal.
17	Land use & regional resources	**Construction stage**: There is possibility of impact on fisheries, etc. **Operation stage**: There is possibility of impact on fisheries, etc.	No concern raised. No concern raised.
18	Water use	**Construction & operation stages**: Impact on water use is not anticipated in the area surrounding the project site.	No concern raised about the effect on water use in the setting.
19	Existing social infrastructure & services	**Construction stage**: There is possibility of traffic congestion by construction work vehicles. **Operation stage**: The project will reduce the use of firewood, resulting in reduction of effort required for cooking with firewood.	Confirmed: There is possibility of traffic congestion by construction work vehicles. One opinion leader asked whether the KeNHA had also been consulted as it was likely to respond more authoritatively on this matter. The ESIA study Team informed him that KeNHA too had been consulted. Confirmed: participants expected the project to reduce use of firewood, resulting in reduction of effort required for cooking with firewood.
20	Social capital & social organization systems/structure	**Construction and adjoining stage:** No particular effects are anticipated.	Confirmed: No social capital & social organization systems/structure was highlighted as at the risk of loss.
21	Damages-benefits imbalances	**Construction and adjoining stage:** No particular effects are anticipated.	No particular effect mentioned.
22	Conflict of interests within project locale	**Construction and adjoining stage:** No particular effects are anticipated.	Representatives of the local Land & Environment Movement sought clarification over the matter of required land ownership legal documents had been obtained, noting that, "issues to do with land ownership in Mombasa have been very complex in the recent years". He was assured that these were already in the custody of the proponent.
23	Cultural assets	**Construction stage:** There is possibility of cultural heritage property existing in the area surrounding the project site. **Operation stage:** No particular concerns.	No concern raised. No concern raised.
24	Scenery	**Construction stage**: There is possibility of construction work affecting the surrounding landscape. **Operation stage:** There is possibility of impact on the surrounding landscape**.**	No concern raised. No concern raised.

25	Gender	**Construction and operation stages:** Latent effects need to be confirmed going forward.	Female youth and women group leaders prevailed upon the proponent to consider engaging women for supply and sale of food to the constructors and thereafter, to employees (as Canteen operators) during operation of the Depot.
26	Children rights	**Construction and operation stages:** Latent effects need to be confirmed going forward.	No concern raised.
27	Exposure to HIV/AIDS & other infectious diseases	**During construction**: There is a risk of infections such as HIV/AIDS due to influx and movement of construction workers. **After operation startup**: Safety and public health risk in the region in the operation stage must be examined in the future.	No fundamental fear of Exposure to increased HIV/AIDS & other infectious diseases raised. Proponent need to put in place precautionary measures to safeguard for the safety and pollution–induced health risks to workers as well as local residents.
28	Safety of the work environment (including OH & S)	**Construction and operation stages:** There is a danger of accidents and other latent risks. Latent risks and dangers need to be confirmed going forward.	Confirmed: participants raised concern about the danger of accidents and other latent risks occurring. In response to this, they were informed about the safety measures embedded in the design and concept of the proposed LPG Mounded Container Depot.
29	Accidents	**Construction and operation stages:** There is a danger of accidents and other latent risks. Latent risks and dangers need to be confirmed going forward.	Confirmed: participants raised concern about the danger of accidents and other latent risks occurring. For example, one opinion leader observed that the proponent needs to "consider the safety of neighbouring power stations and slums". Still, another opinion leader noted that, "the investor should formulate a comprehensive emergency response plan for the employees and general public in case of accidents or emergency incidents". In response to this, they were informed about the safety measures embedded in the design and concept of the proposed LPG Mounded Container Depot.
30	Trans-boundary impact & climate change	**Construction stage**: No impact of concern is anticipated. **Operation stage**: The project will reduce the use of firewood, resulting in reduction of CO_2 emission.	No concern over trans-boundary impact & climate change raised by any participant. Confirmed: Many participants urged that the proponent should consider waivers on the cost of the LPG so that the local people may reduce use of wood fuel and charcoal.

8.3.2.4 Views from regional partners, county and national government agencies/institutions

Assessment perspective		**Predicted impact**	**Expressed view(s) and/or opinion(s)**
Pollution control measures			
1	Air pollution	**Construction stage**: Dust created by construction work likely to impact air quality. **After operation startup**: Exhaust from LPG tankers likely to impact air quality. Additionally, incidents such as outflow or leakage from the pipeline may affect air quality.	Concern over air pollution impact raised by nearly all respondents. Concern over air pollution impact raised by nearly all respondents.
	Water pollution	**Construction stage:** Dredging and earthwork may impact Ocean water quality. Additionally, wastewater used in pressure tests for the ocean floor pipeline may affect water quality. **Operation stage**: Domestic wastewater may be released by terminal facilities. Additionally, incidents such as outflow or leakage from the pipeline may affect water quality.	Confirmed: Dredging and earthwork may impact Ocean water quality. As one respondent emphasised, "I would recommend that all wastewater be treated and recycled if possible. Never shall it be channeled to the ocean." Possibility of impact raised in the responses. One respondent, for example, pointed out "Ground and surface water contamination due to surface run-off and contamination from oil leakages, hydraulic fluids, etc."
3	Solid waste	**Construction stage**: Solid wastes and construction wastes will be produced. **Operation stage:** Wastes will be generated with LPG tanker and terminal operation.	Possibility of this impact raised by participants, with one participant requesting that the task of "garbage collection should be given to us [youth]" Possibility of this impact raised, with one respondent expressing that the proponent should "waste receptors for waste [streams] such as repair parts, packaging materials".
4	Soil pollution	**Construction stage:**·No particular matter of concern **Operation stage**: There is possibility of leakage at LPG transport in and out of facilities, as well as from the pipeline.	Concern about possible loss of soil quality raised. Possibility of this impact raised by participants.
5	Noise & Excessive vibration	**Construction stage**: Construction work may increase the noise level. **Operation stage**: Operation may increase the noise level.	Concern raised, with one respondent suggesting that, "minimise noise pollution during construction especially during late night hours". No particular matter of concern raised to this effect.
6	Soil subsistence	**Construction and operation stages:** No particular concerns.	No particular concern raised.
7	Foul Odour	**Construction and operation stages:** No particular concerns.	No particular concern raised.
8	Bottom sediment	**Construction stage**: Dredging, earthwork and installation of ocean floor pipeline may impact the bottom sediment quality. **Operation stage**: Maintenance dredging may impact the bottom sediment quality.	No particular concern raised. No particular concern raised.

Environmental (Natural)			
9	Protected areas	**Construction & operation stages**: Protected areas are not found in the area surrounding the project site.	Confirmed: No particular concern raised.
10	Ecosystem	**Construction stage:** Construction work may temporarily impact the marine ecosystem. Also, mangrove clearing is anticipated. **Operation stage:** Although the marine ecosystem could be affected by wastewater, the extent of such effects will be confirmed going forward.	Concern over future of the marine habitat in the setting raised. Concern over future of the marine habitat in the setting raised.
11	Hydrometeor	**Construction stage**: Dredging and earthwork may impact hydrology in the surrounding area. **Operation stage:** Although the marine ecosystem could be affected by wastewater, the extent of such effects will be confirmed going forward.	No concern over possibility of this impact highlighted in the responses. No concern over possibility of this impact highlighted in the responses.
12	Topography/ Geology	**Construction stage:** The terrain will be altered. **Operation stage:** No particular concerns.	No particular concern raised. No particular concern raised.
Environmental (Social and cultural aspects)			
13	Land acquisition & relocation of residents	**Construction stage**: Residents may have to be relocated with land acquisition. **Operation stage:** No particular matter of concern.	No particular concern raised. No particular concern raised.
14	The poor/very low income population	**Construction & operation stages**: Job opportunities for local citizens are expected to grow.	Confirmed: participants expressed very high hopes that the Proponent would sourcing the labour force from within, with one person typically expressing the view that the proponent should "ensure that majority of locals benefit from the employment opportunities that will be provided for".
15	Minority & indigenous ethnic groups	**Construction & operation stages:** The presence of minorities and/or indigenous ethnic communities requires inspection in future.	No related concern expressed.
16	Employment/ livelihoods means	**Construction stage:** Job opportunities will increase for local residents. At the same time, the project may impact fisheries, etc. **Operation stage**: The project will reduce the use of firewood, resulting in shorter cooking time and reduction of health hazards caused by fumes.	High stakes raised on employment opportunities. Confirmed: participants raised the view that the LPG from the plant would be cheaper, thereby enabling them to transit from use of wood fuel and charcoal.
17	Land use & regional resources	**Construction stage**: There is possibility of impact on fisheries, etc. **Operation stage**: There is possibility of impact on fisheries, etc.	No concern raised over possibilities of adverse effects on the fishery. No concern raised over possibilities of adverse effects on the fishery.

18	Water use	**Construction & operation stages**: Impact on water use is not anticipated in the area surrounding the project site.	No issue raised on impact on water use.
19	Existing social infrastructure & services	**Construction stage**: There is possibility of traffic congestion by construction work vehicles. **Operation stage**: The project will reduce the use of firewood, resulting in reduction of effort required for cooking with firewood.	Confirmed: There is possibility of traffic congestion by construction work vehicles. Confirmed: participants expected the project to reduce use of firewood, resulting in reduction of effort required for cooking with firewood.
20	Social capital & social organization systems/structure	**Construction and adjoining stage:** No particular effects are anticipated.	Confirmed: No social capital & social organization systems/structure came out to be under threat.
21	Damages-benefits imbalances	**Construction and adjoining stage:** No particular effects are anticipated.	No particular effects were anticipated.
22	Conflict of interests within project locale	**Construction and adjoining stage:** No particular effects are anticipated.	One respondent connoted the popular view that the project will induce "high consumption of water hence competing with households. [as] Water is scarce in Mombasa."
23	Cultural assets	**Construction stage:** There is possibility of cultural heritage property existing in the area surrounding the project site. **Operation stage:** No particular concerns.	No concern raised. No concern raised.
24	Scenery	**Construction stage**: There is possibility of construction work affecting the surrounding landscape. **Operation stage:** There is possibility of impact on the surrounding landscape**.**	No concern raised. No concern raised.
25	Gender	**Construction and operation stages:** Latent effects need to be confirmed going forward.	No specific gender-tailored concern raised.
26	Children rights	**Construction and operation stages:** Latent effects need to be confirmed going forward.	No concern raised.
27	Exposure to HIV/AIDS & other infectious diseases	**During construction**: There is a risk of infections such as HIV/AIDS due to influx and movement of construction workers. **After operation startup**: Safety and public health risk in the region in the operation stage must be examined in the future.	No concern raised. No concern raised.
28	Safety of the work environment (including OH & S)	**Construction and operation stages:** There is a danger of accidents and other latent risks. Latent risks and dangers need to be confirmed going forward.	Confirmed: participants raised concern about the danger of accidents and other latent risks occurring.

29	Accidents	**Construction and operation stages:** There is a danger of accidents and other latent risks. Latent risks and dangers need to be confirmed going forward.	Confirmed: participants raised concern about the danger of accidents and other latent risks occurring.
30	Trans-boundary impact & climate change	**Construction stage**: No impact of concern is anticipated. **Operation stage**: The project will reduce the use of firewood, resulting in reduction of CO_2 emission.	No concern over trans-boundary impact & climate change raised by any respondent. Confirmed: many of these key stakeholders were of the view the planned project will eventually contribute to lowering the rate of use of wood fuel and/or charcoal.

8.4 Summary of public views and opinions

8.4.1 Thematic public preferences for mitigation measures

In sum, the overall pattern of the views and opinions obtained can summarized into four (4) interdependent thematic categories:

a) Approval of the proposed project: Overall, the CPP process revealed a cross cutting approval for the proposed project. No environmental nor social concerns raised were so fundamentally threatening that they portend significant implications for changes in decisions about construction and operation of the proposed LPG Mounded Container Depot. The range of issues about safety gas leakage, solid waste management, and air pollution as raised by participants were founded on their understanding of events traditionally ascribed to the sector, and those are adequately addressed in the very design of the Depot and its intended technological structure. Where some unforeseen challenge may emerge over time, especially with regard to noise generation and possible blocking of roads and railway networks, the relevant stakeholders (here KRC and KeNHA) committed their availability to provide solutions when duly and formally informed on these matters.
b) Mutual integration of the proposed project with the setting's natural ecosystem elements;
c) Local community expectations from the proposed project; and
d) Technical capacity requirements for sustainability of the proposed project.

8.4.1 Potential positive impacts

Environmental impacts	Minimal toxic discharge to the ocean.
Economic impacts	• Affordable LPG for the local community

	• Direct and indirect employment opportunities. • Increased revenue for Mombasa County. • Contribution to Kenya's GDP and the 4 Big Agenda. • Expanded resource base for AEVITAS Company Limited to support CSR practices.
Social impacts	c) Additional income from jobs created can be channeled into social services such as investments in education and health. d) Improved security in Kipevu, Chaani Location.

8.4.3 Potential negative impacts

Environmental impacts	c) High likelihood of alterations in traffic/transport flows during construction. d) Possible congestion of the road connecting the proposed site to the main Road during constructions and functioning of the proposed plant.
Social & Economic impacts	b) Possible non-equitable distribution of the resultant job opportunities for the surrounding community members.

8.5 Recommendations for decisions and action

In view of the perspectives from the public, the following issues command consideration in the decisions and actions on the proposed project:

(i) Establishing an inclusive Grievances Redress and Feedback Mechanism for purposes of capturing, negotiating and streamlining social and environmental impacts that may arise over time during construction and operation phases of the LPG Mounded Container Depot. Inclusive Grievances Redress and Feedback Mechanism to the extent it is a platform that creates open opportunities and reasonably democratic spaces for the local community members, relevant state agencies and interest groups to engage with decisions and actions attendant on the operations and any non-anticipated changes relating the proposed project.

(ii) Develop a rigorous and highly transparent CSR strategy.

(iii) Establish a clear communication and decision making strategy.

(iv) Establishing a neatly interwoven and expert facilitated scheme for continuous monitoring and evaluating the operational activities of the LPG Mounded Container Depot.

8.6 Conclusion

Most of the issues raised from the public on consulting them ranged from job creation to environmental, social and safety management systems that the proponent need to put in place to ensure that the project succeeds. We appreciate all this issues as they are meant to improve on the project activities during the construction, operation and decommissioning phase.

It is important to note that these issues have been adequately addressed in the environmental and social management plan (ESMP)

9.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

This chapter outlines an environmental management plan (EMP) covering impacts and their mitigation in various stages of the LPG storage depot development. It is the responsibility of proponent to ensure incorporation of these measures in the development and operation of the LPG storage depot. It is envisaged that the Project Manager will appropriately define project specific responsibilities, terms of reference and lines of communication in the entire project cycle.

It is imperative that this study report is made available to the relevant project team members prior to mobi1ization, the proponent should include all proposed mitigation and management measures in his schedule of works, and the supervising consultant should ensure that the schedule and the environmental management and monitoring is complied with. This will lend a sense of ownership, in addition to instilling a thorough understanding of the pertinent issues identified in this study.

The responsibility for the supervision and implementation of all the proposed mitigation measures during development, operation and the defects liability period; and the responsibility for maintenance lies with the proponent, including monitoring activities.

Table 22 below provides a detailed ESMP for the impacts identified, responsibilities and approximate budget for their implementation.

Table 22: Environmental and Social Management Plan ESMP)

ANTICIPATED IMPACTS	POSSIBLE MITIGATION MEASURES	RESPONSIBILITY	ASSOCIATED COSTS (KSH)
IMPACT ON PHYSICAL CLIMATE			
SITE PREPARATION AND CONSTRUCTION PHASE	• Remove only vegetation that is absolutely necessary; • Ensure that buffer areas is incorporated in the project design especially the 15meters and additional 6 meters (for the road) is maintained from the KETRACO wayleave; • Most construction materials must be sourced as close as possible to the construction site; • Use locally sourced labour during the construction phase; Ensure that the contractor employs as many locals as it is practically possible • Ensure that all vehicles are properly maintained and serviced; and Machines must not be left idling to save fuel and reduce emissions.	Aevitas Investment Company , Contractors and WEEN Consult Ltd	As Per Bill of Quantities
OPERATION PHASE	• Implement a traffic system that involves appropriate signals and signs. • Re-vegetate open areas with fast growing trees. • Ensure that buffer areas is incorporated in the project design especially the 15meters and additional 6 meters (for the road) is maintained from the KETRACO wayleave;	Aevitas Investment Company Management , and WEEN Consult Limited	150,000

	• Landscaping involving greening the site should be done by locals		
IMPACT ON AIR QUALITY			
SITE PREPARATION AND CONSTRUCTION PHASE	• The clearing of vegetation must be carried out on a phased basis • All material (sand and aggregate) stockpiled on the site should be regularly sprayed using water to reduce dust emissions • All trucks carrying aggregate and sand should be covered during delivery to the site. • Spillage control measures of construction materials should be in place to prevent spread. • Ensure sprinkling of water to reduce dust in periods when wind speed is greatest and the rainfall amounts are lowest. • All staff employed at the construction site must be provided with dust masks and other appropriate personal protective equipment (PPE) and be trained on how to use them. • All waste must be transported off-site to designated area approved by NEMA. • Perform road repair and construction at times that persons are at work.	Aevitas Investment Company Management , Contractor and WEEN Consult Ltd	As Per Bill of Quantities

OPERATION PHASE	• Ensure that the proposed LPG leakage detection system is maintained and is working at all times • The proposed automation system to prompt the depot operations shutdown in case of any LPG leakage should be well maintained to avoid system failure • The proposed LPG material balancing system that shall be installed should also be maintained to avoid failure. The system ensures no LPG gas is unaccounted for within the system • The proposed automated water sprinklers should be well maintained. They ensure any LPG gas escaping is vaporized and contained within the facility • Undertake Air Quality Analysis in accordance with the EMCA Air Quality Regulations and International Standards	Aevitas Investment Company Management	2,000,000
IMPACT ON WATER QUALITY			
SITE PREPERATION AND CONSTRUCTION PHASE	• All diesel and motor oil should be stored in a designated area that is properly contained. • Install siltation traps within the drainage design to collect silt and sediment. • If required, conduct periodical water quality monitoring to ensure that standards are maintained.	Aevitas Investment Company Management Contractor and WEEN Consult Ltd	As Per Bill of Quantities

	• Use untreated water for construction		
OPERATION PHASE	• Maintain a vegetation buffer around natural environments to reduce any pollution loading to the waterways. • Ensure that any chemicals (e.g. petroleum products like diesel and petrol) are properly stored and properly labelled. The area where chemicals will be stored and handled must be constructed with an impermeable surface. • Ensure that there is proper storage and disposal of waste generated • Conduct regular water quality monitoring of any waste water and watercourses to ensure that these are in keeping with the prescribed water quality standards	Aevitas Investment Company Management , and WEEN Consult Ltd	50,000
IMPACT ON SOIL AND GEOLOGY			
SITE PREPERATION AND CONSTRUCTION PHASE	• Install appropriate drainage systems to direct water away from slopes; • Avoid as far as possible the traversing of bare soil by vehicles to reduce soil compaction; • Designate a main access route for heavy machinery;	Aevitas Investment Company Management , contractor and WEEN Consult Ltd	As Per Bill of Quantities

OPERATION PHASE	• The concrete Mound of the LPG gas should be constructed and maintained to protect the bullets. The soil materials to be used for constructing the mounds should be locally sourced. • Apply practices and use products that reduce the potential for contamination of soils including the physical removal of weeds, use of slow-release products and choosing the most 'environmentally friendly products available • Prevent the contamination of soils by the designation of a maintenance area for the maintenance of vehicles and other equipment to be used for the upkeep of the turf. This area should be lined with an impervious material and all run-offs from this area channelled and collected in a catchment area. • Undertake periodic soil analysis for TPH and BTEX to determine any soil contamination by the LPG storage tanks	Aevitas Investment Company Ltd Management and WEEN Consult Ltd	30,000

ANTICIPATED IMPACTS	POSSIBLE MITIGATION MEASURES	RESPONSIBILITY	ASSOCIATED COSTS (KSH)
IMPACT ON HYDROLOGY			
SITE PREPARATION AND CONSTRUCTION PHASE	• Ensure that the drainage plan proposed is implemented as stipulated on the plan. • The current flood management system of culverts that is draining the area should be checked maintained to avoid any blockage • Additional drainage may be put in place to convey the flood discharge and the retention areas used primarily to retain water from the constructed LPG depot storage area when it rains • Provision for rain water harvesting from areas like the office block	Aevitas Investment Company Ltd Management , contractor and WEEN Consult Ltd	As Per Bill of Quantities
OPERATION PHASE	• Ensure that all drains and culverts collecting water within the site are regularly cleaned and maintained. • Harvest rain water from surfaces like the office block • Use raw water for services and areas that do not need treated water	Aevitas Investment Company Ltd Management and KNCPC	20,000
IMPACT ON NOISE AND VIBRATION			

SITE PREPARATION AND CONSTRUCTION PHASE	• Silenced machinery and instruments should be employed to reduce the impact of noise to the neighbouring facilities and workers. • Machinery, vehicles and instruments that emit high levels of noise should be used on a phased basis to reduce the overall impact. • These pieces of equipment such as drills, graders and cement mixers should also be used when the least number of residents can be expected to be affected, for example during periods where most residents are at work or school. • Workers, especially those working with machinery, vehicles and instruments that emit high levels of noise should be supplied with ear plugs and ear muffs to reduce the risk of hearing impairment. Temporary barriers such as earth berms, zinc fencing and sound dampening fencing such as acoustic screens should be employed to reduce the impact of noise to the existing residents; • Ensure that construction activities for the development and the other developments proposed for the area are staggered to decrease the levels of noise and vibration in the area; • Construction hours should be limited to the hours of 8:00 a.m. and 6:00 p.m. daily except Sundays. • The delivery of raw materials must be limited to 8:00 a.m. and 6:00 p.m.	Aevitas Investment Company Ltd Management , contractor and WEEN Consult Ltd	As Per Bill of Quantities

OPERATION PHASE	• Ensure that there is proper traffic signage and signals where necessary or appropriate to effect the free and safe movement of traffic and there reduce the noise caused by traffic build-up. • Ensure that deliveries to the facility are made between 8:00 a.m. and 5:00 p.m. daily. • Ensure that maintenance works occurs between the hours of 8:00 a.m. and 5:00 p.m. daily. • Undertake period Noise Mapping and Assessment as required by Directorate of Occupational Health and Safety Services (DOHSS)	Aevitas Investment Company Ltd Management and KNCPC	1,000,000
IMPACT ON LAND SCAPING AND AESTHETICS			
SITE PREPARATION AND CONSTRUCTION PHASE	• Conduct vegetation clearance on a phased basis. • Re-vegetate cleared areas as soon as possible. • Retain vegetation screens to reduce the visual effect of this stage of the development. • Ensure that local building materials and muted colours are used to reduce the visual impacts of the development and the landscaping to blend with the local environment.	Aevitas Investment Company Ltd Management , contractor and WEEN Consult Ltd	As Per Bill of Quantities

OPERATION PHASE	• Ensure that landscaping incorporated within its designs are regularly maintained.	Aevitas Investment Company Ltd Management and WEEN Consult Ltd	10,000 monthly
IMPACT ON BIOLOGICAL IMPACTS (FLORA AND FAUNA)			
SITE PREPARATION AND CONSTRUCTION PHASE	• Determine access roads which are to be used by machinery used in the construction and site clearance phase of the development to avoid the unnecessary trampling of vegetation that will be maintained within the development • Reduce edge effect and habitat loss by physically delimiting the remaining vegetation by some means of fencing which will reduce the impact of secondary opportunistic clearance in the area as a result of increased accessibility created by the development; • Incorporate as much local plants found within the area	Aevitas Investment Company Ltd Management, contractor and WEEN Consult Ltd	As Per Bill of Quantities
OPERATION PHASE	• Reduce Clearance in the area as a result of increased accessibility created by the development; • Develop and implement a comprehensive Nutrient Management Programme for the maintenance of the lawns.	Aevitas Investment Company Ltd Management and WEEN Consult Ltd	200,000

	• Hire locals to maintain the lawns		
IMPACT ON SOCIO-ECONOMIC MITIGATION MEASURES			
Community Cohesion			
SITE PREPARATION AND CONSTRUCTION PHASES	• Employment of locals and purchase of construction materials from locals where possible should avoid any feelings of resentment and will ensure that the community derives the most benefits from the development. As far as possible purchase supplies to be used in the construction should be sourced from nearby suppliers. • Identify a specific area on the project site for vending type activities ensuring that there are garbage receptacles throughout the project site.	Aevitas Investment Company Ltd Management , contractor and WEEN Consult Ltd	As Per Bill of Quantities
OPERATION PHASE	• As far as possible purchase goods and supplies from suppliers within the area. The Local Planning Authority must play an important role in ensuring that the development slated for the area is monitored and implemented in an orderly and sustainable manner. • The developer should develop a Corporate Social Responsibility Programme which could provide assistance to the community such as free medical camps, sponsor locals to training on oil and gas short courses and support for other education and social programmes.	Aevitas Investment Company Ltd Management ,	1,000,000 annually

	• The proponent should consider employing a community liaison officer		
IMPACT ON INFRASTRUCTURAL AND ROAD NETWORK			
SITE PREPARATION AND CONSTRUCTION PHASES	• The developer must improve the road network which provides access to the project area. This should be accompanied by an upgrade in the drainage along this road network. Ideally the road improvement works should take place prior to the infrastructural works at the development site. • These road improvements must be scheduled between 9:00 a.m. and 4:00 p.m. daily, so as not to disrupt traffic in the area and to abate the increase in ambient noise levels in the community.	Aevitas Investment Company Ltd Management , contractor and WEEN Consult Ltd	As Per Bill of Quantities
OPERATION PHASE	• Ensure that roads are regularly maintained • Consider using the neighbouring Meter Gauge Railway for LPG distribution • Establishing an inclusive Grievances Redress and the proposed plant Feedback Mechanism for purposes of capturing, negotiating and streamlining social and environmental impacts that may arise over time in the life of the LPG Storage depot. Stepping up a more transparent and inclusive CSR strategy. • Establish an explicit communication and decision making strategy.	Aevitas Investment Company Management , contractor	4,000,000

	• Establishing a NEMA coordinated continuous monitoring and evaluation framework for management of the depot. • Establishing a strategy for continuous engagements between Aevitas Investment Company Ltd and a competent technical support agency for RECP improvements.		
IMPACT ON UTILITIES AND ELECTRICITY			
OPERATION PHASE	• Install energy saving utilities like lights, VSDs, motion sensors, etc. • Ensure that a back-up generator is installed for use in periods of power outages. • Ensure that the depot is designed in such a manner that there is reduction in the energy use associated with the operation of air conditioning units; and • Train employees in the benefits of energy conservation.	Aevitas Investment Company Ltd Management	5,000,000
IMPACT ON WATER AVAILABILITY			
SITE PREPARATION AND CONSTRUCTION PHASES	• Ensure that there is adequate water available to supply the increase in demand that the construction activities will pose. • Maximize on the use of untreated water for construction	Aevitas Investment Company Ltd Management , contractor and WEEN Consult Ltd	As Per Bill of Quantities

OPERATION PHASE	• Ensure that there is an upgrade to the water supply in the area prior to the operation of the plant. Water consumption during this phase can be reduced with the installation of water conservation fixtures in buildings and maximizing of recycled water where possible • Ensure the designed water storage facilities especially the one to be used enhance the depot safety and emergency preparedness are installed as per the designs and calculations • All water to be used by the firefighting systems should be readily available as by to the design and locations ALL the TIME • All the safety systems using water should be well maintained to avoid any failure at the hour of need	Management ,	500,000
ANTICIPATED IMPACTS	POSSIBLE MITIGATION MEASURES	RESPONSIBILITY	ASSOCIATED COSTS (KSH)
IMPACT ON SOLID WASTE			
SITE PREPARATION AND CONSTRUCTION PHASES	• Promote recycling of waste as much as possible e.g excavated soil can be used for backfilling some sections than need levelling	Aevitas Investment Company Management , contractor	As Per Bill of Quantities

	• The developer should seek to hire a private licensed solid waste collection company. All the refuse generated should be properly transported and disposed of at the nearest licensed solid waste facility. • Ensure that vending during these phase of the development is localized. • Provide garbage receptacles around the project site.		
OPERATION PHASE	• The developer should install a mechanism to manage solid waste generated. • Waste generated should be handled by NEMA licenced firms • Embrace Resource Efficient and Cleaner Production (RECP) technologies and techniques to minimize waste generation or avoid generating waste in the first place. • Conduct periodic waste audits and set targets on reduction	Aevitas Investment Company Ltd Management	100,000
IMPACT ON SEWAGE EFFLUENT			
SITE PREPARATION AND CONSTRUCTION PHASES	• Ensure that toilets are provided for use by employees during these phases of the development. A reasonable ratio would be one (1) toilet per eight (8) workers.	Aevitas Investment Company Limited Management contractor	As Per Bill of Quantities

OPERATION PHASE	• The developer should ensure that all sewage treatment lines or septic tanks are maintained regularly and that, all effluent released is within or below the standards for effluent as stipulated by the NEMA, Water Quality Regulations, 2006.	Management	200,000
IMPACT ON SOCIAL SERVICES			
SITE PREPARATION AND CONSTRUCTION PHASES	• Provide a First Aid Kit on site for any minor injuries that may occur on site • Inform and make arrangements with the nearest Health Clinic to accommodate any major injuries that may occur in these phases of the project	Aevitas Investment Company Ltd Management	As Per Bill of Quantities

ANTICIPATED IMPACTS	POSSIBLE MITIGATION MEASURES	RESPONSIBILITY	ASSOCIATED COSTS (KSH)
IMPACT ON EMERGENCY SERVICES			
SITE PREPARATION AND CONSTRUCTION PHASES	• Burning should not be employed on the site preparation activities. Bund areas where flammable substances will be stored. These bunds must be designed to hold approximately 1 ½ times the amount of the substances that will be stored • Place warning signs in areas where flammable substances will be stored	Aevitas Investment Company Ltd Management	As Per Bill of Quantities
OPERATIONAL PHASE	• The company should have a safety committee • There shall be trained first aiders • All first Aid kits shall be strategically placed and each member of staff made aware on their locations • Persons accessing the first shall have safety induction first before accessing the facility • Arrangements shall be made with nearby health facilities to ensure emergences are attended to • A fire assembly point shall be availed and all staff made aware of its location	Aevitas Investment Company Ltd Management	1,00,000

	• Training and retraining of staff on safety • The company shall adhere to all National and Safety Requirements of LPG Storage Depot management • Mandatory periodic safety audits shall be done and submitted to DOHSS		
IMPACT ON SECURITY			
SITE PREPARATION AND CONSTRUCTION PHASES	• It is recommended that persons from the nearby communities be employed to work on the construction site. This will avoid any feelings of resentment that may be felt from locals and may reduce the level of crime and violence during these phases of the development.	Aevitas Investment Company Ltd Management and contractor	As Per Bill of Quantities
OPERATION PHASE	• Ensure that buildings are properly secured; and Ensure that there is adequate security on site at all times • The proponent may wish to implement a transportation system for workers, in the event that problems with access to transportation by workers become evident	Aevitas Investment Company Ltd	1,000,000

OCCUPATIONAL HEALTH AND SAFETY MITIGATION MEASURES		RESPONSIBILITY	COSTS IN KSHS
Hazards			
SITE PREPARATION, CONSTRUCTION AND OPERATION PHASES	• Provide all employees with safety and protective gear • Including hard hats, safety goggles, dust masks, gloves and safety shoes. Employees will be required to wear these at all times on the project site. • Designate the roles and responsibilities of employees, which will enable a clear chain of command during a fire or explosion and allows persons to be aware of their responsibilities in the event of such occurrences. • Ensure that all machinery used on the site is properly maintained and inspected before use. • Install several suitable, approved fire extinguishers at accessible, conspicuous and unobstructed points throughout the development area. • Place a fully equipped first aid kit on the project site.	Aevitas Investment Company Ltd Management and contractor	As Per Bill of Quantities

	• Place conspicuous warning signs where hazardous or flammable substances will be stored. • Place information signs around the project site which list the numbers of the person responsible for handling emergencies on the site, i.e. Mombasa Fire Department, Keep an emergency log to document any occurrences of fires and explosions as well as to record any damage to the property and human injuries. This log must also contain emergency contact information for all employees.		

ACCIDENTS AND GENERAL HUMAN HEALTH			
SITE PREPARATION, CONSTRUCTION PHASE	• Provide all employees with safety and protective gear including hard hats, safety goggles, dust masks, gloves and safety shoes. Employees will be required to wear these at all times on the project site. Designate the roles and responsibilities of employees, which will enable a clear chain of command in the event of an accident and allows persons to be aware of their responsibilities in the event of such occurrences. • Place a fully equipped first aid kit on the project site. • Ensure that a crew member is trained in basic first aid practices. • Place information/warning signs around the project site, which indicates where hazardous and flammable material will be stored. • Signs must also be placed around the construction site displaying the numbers of the person responsible for handling emergencies on the site, • Keep an emergency log to document any occurrences of any accidents that may occur on the site.	Aevitas Investment Company Ltd Management and contractor	As Per Bill of Quantities

	• Ensure that all machinery operating at the project is regularly serviced and maintained. • Ensure that persons operating equipment's are trained		
OPERATION PHASE	• Ensure that only the required amounts of chemicals to be used in the short-term will be stored at the maintenance facility; • Ensure that chemicals are stored in a safe and secure environment, and that only authorized persons will be allowed in these storage areas. These areas should be properly signed to indicate that hazardous chemicals are stored in this area; • Develop and implement a Health and Safety Training Manual for the employees.	Aevitas Investment Company Ltd Management	2,000,000

10.0 PROJECT DECOMMISIONING

10.1 Decommissioning Phase

Decommissioning in this project will occur twice. First, after a successful completion of the construction of the proposed 30,000 metric tons LPG storage depot, the temporary structures erected at the project site for the contractor shall be decommissioned and second after the entire project ceases or comes to the end of its life.

During these phases, all equipment and fixtures that were required during the construction and operational phase will be dismantled and removed from the site. It is mandatory that the proponent ensures safe dismantling of all the facilities and equipment's.

10.1.1 Removal of Waste

Waste from the facility during construction and usage will be carted away and disposed of by a licensed NEMA waste handler. Waste generated during this phase may include:

i) Masonry works/building works, (cement bags, broken building blocks, etc.

ii) Roofing (iron sheets, timber/ metal pieces, etc.)

iii) Plumbing (pipe fittings and off cuts, etc.)

iv) Electrical works (residual cables and connectors, damaged electrical fittings, etc.)

v) Wastes generated from dismantling of fixtures and equipment.

vi) Wastes generated from wrappers and packaging material

vii) Domestic garbage

10.1.2 Site Restoration

Once all the waste resulting from demolition and dismantling works is removed from the site, the open earth sites will be restored through replenishment of the topsoil and re-vegetation where appropriate.

10.2 Impacts during Decommissioning Phase

If at the end of the project life span the facilities are to be demolished, then decommissioning stage will have to address issues related to environmental impacts of demolishing old buildings and the manufacturing plant.

10.3 Handling Hazardous and Regulated Materials

In addressing these issues, deconstruction of the old buildings and the mounded LPG gas tanks is usually undertaken. The deconstruction process is the opposite of the construction process; the last thing to go on is the first thing to come off. Deconstruction is the manual dismantling of a building so that materials can be salvaged for reuse. Deconstruction can range from the soft stripping of non-structural elements such as cabinets and plumbing to the full structural disassembly of the buildings. Of necessity, most deconstruction projects employ all three options viz reuse, recycling and disposal. However, reuse is often made the priority. .

Preservation should be the first choice when deciding what to do with old buildings. With increased mechanization, however, recycling and disposal of construction and development debris has become more appealing than dismantling for reuse. Current building methods and materials such as use of composite materials, laminates and adhesives also favor recycling or disposal alternatives.

Table 10.1 provides a summary of the LPG Storage Depot decommissioning plan

Table 23: Summary of the Decommissioning Plan for the Proposed 30,000 Metric tons LPG Gas Depot

Issues	Potential impacts	Significance	Mitigation measures	Implementation period	Responsibility
a) Generation of wastes • Generation of solid, liquid and hazardous wastes	- Pollution of surface / ground water and air - Disposal costs	Significant, negative & short term	• Re-use and re-cycle demolition wastes • Limit pollution from liquid waste by providing pre-treatment systems prior to safe disposal • Contract a NEMA licensed vendor to manage the waste. • Donate to charity office equipment or sale to public • Dispose in approved sites • Contact NEMA licensed waste managers to handle and dispose hazardous wastes • Improve security of the demolition zones	During entire Decommissioning period	Contractor and Aevitas Investment Company Ltd management

			• Plant trees, restoration programmes after demolition • Compensation programs for sacked workers absorb staff in other areas. • Contract specialized experts to demolish the mounded LPG tanks for safe demolition and waste management thereof		
b) Occupational health and safety concerns • Dust • Falling objects, • Noisy machinery, Gaping holes and electrical risks among others. c) Security concerns	Potential health effects and injuries	Significant, negative & short term	• Provide relevant PPEs for works during the entire demolition exercise. • Use specialized experts where applicable • Secure the area while demolishing	During entire Decommissioning period	Contractor and Aevitas Investment Company Ltd management

• Increased insecurity due to the influx of people who would want to salvage some usable materials and parts. d) Loss of aesthetic value of land e) Loss of benefits associated with the LPG Storage Depot	Cases of theft and personal harm	Significant, negative & short term	• Enhance security systems by working closely working with the local administration and the police • Restoration of the area into a recreational park	During entire Decommissioning period	Contractor and Aevitas Investment Company Ltd management
f) Soil erosion	Vegetation and Soil loss	Significant, negative & short term	• Ensure that the site is rehabilitated by vegetation and restored.	After decommissioning	Contractor and Aevitas Investment Company management

g) Social Economic and Cultural Impacts	Loss of jobs and alteration of cultural norms modified by the LPG Storage Depot operations i.e. religion and some cultural believes	Significant, negative & short term	• Re-deploy works to other group companies. • Sustain social systems such as religion etc. within the area.	During the decommissioning process and after	Contractor and management

11.0 CONCLUSION

Based on a succinct analysis of the views of the stakeholders and the expert observations, the proposed project will not compromise the well-being of the environmental condition since on a wide scale it is meant to reduce on the use of environmentally unsustainable products like biomass and charcoal at household level by increasing the storage facility of LPG in Kenya and the region,. Even the consideration of the neighbouring facilities like KenGen's Kipevu 1 and 3 and Also Tsavo Power that are using the "dirtier" source of fuel i.e. Heavy Furnace Oil to generate power to use the "cleaner" LPG source of fuel shall go a long way in not only reducing the carbon foot prints of these 3 facilities but also reduce the cost of power generation. This reduced cost shall be passed to Kenyans. On the other hand, this project is meant to contribute to the Big 4 Agenda as envisioned by His Excellency the President. The construction of this depot and subsequent operationalization shall employ over 250 people directly. Indirectly it is meant to employ over 1000 people indirectly. On the other hand, this project is meant to increase synergy with other players/stakeholders. It is worth noting that the project shall complement KPA's storage capacity on the land and this shall in turn increase their turn over on the basis of the new KOT that is being constructed. The Kenya Railways' meter gauge shall be used for the transportation of the LPG to other parts of the country and the region.

From the perspective of the public views and opinions gathered during the ESIA Study, the analysis has revealed that establishment of the LPG storage depot in its intrinsic right does not present fundamental social and environmental threats.

11.1 RECOMMENDATION

Much of the concerns raised from the consultations centred on the need for the operations and management of the LPG storage depot to be in tandem with local community requirements on the

need for jobs and cheaper LPG. Most of these potential negative impacts have been mitigated in the ESMP generated which the management needs to adhere to.

To this end, the following considerations have informed the development and structure of the proposed ESMP for the LPG Storage Depot.

a) Establishing an inclusive Grievances Redress and a proposed plant Feedback Mechanism for purposes of capturing, negotiating and streamlining social and environmental impacts that may arise over time in the life of the LPG storage Depot. Stepping up a more transparent and inclusive CSR strategy.

b) Establish an explicit communication and decision making strategy. And there is a strong proposal that the proponent should consider employing a liaison officer.

c) Establishing a NEMA coordinated continuous monitoring and evaluation framework for management of the LPG Storage depot.

d) Air quality dispersion modelling should be done once the plant has started operating

We therefore, recommend that NEMA grant a license to this proposed project as most of the issues are mitigatable and there is no adverse irreversible impact that may be caused by the construction, operation and decommissioning of this proposed 30,000 metric tons LPG Gas Depot in Kipevu, Chaani Location, Changamwe Sub-County, Mombasa County, Kenya by Aevitas Investment Company Limited.

12.0 TEAM COMPOSITION

Name	Key Responsibilities	Position
Nyamori Steve Onserio	• Project study coordination • Data collation and report writing coordination • Quality Checking • Safety data collection	Team Leader and Chemical Safety Specialist
Kigen Kipkorir	• Field work coordination • Data Collection Coordination • Report writing	Lead Expert/Social Economic Expert
Peter Ohon	• Focused group discussions coordination • Key informants consultation coordination • Report writing	Sociologist/Stakeholders Engagements Specialist
Amos Ogechi King'oina	• Primary and Secondary data sourcing and collection in regard to the project • Photography, GPS coordinates and other tools preparation and administration • Report writing	Associate Expert/Data Collection Specialist
Eng. Nathan Bogonko	• Data collection, collation and report writing • Assisting team leader during public consultation and participation • Report writing	Lead Expert/Energy Specialist

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