ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY REPORT

FOR

PROPOSED BATTERY SERVICING FACILITY IN LAND REFERENCE NUMBER 11895/48, SCARLET BUSINESS PARK, ATHI RIVER, MACHAKOS COUNTY

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JUNE 2020

CERTIFICATION

Rolta East Africa Limited registered by the National Environment Management Authority (NEMA) as a Firm of Experts to offer Environmental Impact Assessment (EIA) and Environmental Audit (EA) services was commissioned by the Proponent: ***Betrilyf Solutions Limited*** to undertake an Environmental and Social Impact Assessment (ESIA) for the proposed battery servicing facility in Plot Land Reference Number (L.R No.) 11895/48, Scarlet Business Park, Athi River, Machakos County.

The ESIA was conducted in accordance with the provisions of the Environmental Management and Coordination Act (EMCA) Cap 387 and the Environmental (Impact Assessment and Audit) Regulations, 2003. To my knowledge, all the information contained in this EIA Study Report is accurate and a truthful representation of all findings as relating to the proposed project.

I. PROPONENT Company Stamp

Name: Betrilyf Solutions Limited
Contact Person: Name: David Osero
Designation: Chief Operating Officer

Signature: ……..

Date: ……..

II. ENVIRONMENTAL CONSULTANT Official Stamp

Name: Rolta East Africa Limited
Designation: EIA/EA Firm of Experts
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Contact Persons:

1)	Elijah Muthusi	EIA/EA Expert Reg. No. 0754	
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	Name	**Designation**	**Signature & Date**

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ABBREVIATIONS

BSI	British Standards Institution
EA	Environmental Audit
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
KPLC	Kenya Power and Lighting Company
MSDS	Material Safety Data Sheets
NEMA	National Environment Management Authority
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Act
PPE	Personal Protective Equipment
TOR	Terms of Reference
WRA	Water Resources Authority

NON TECHNICAL SUMMARY

Introduction

This EIA Study Report has been prepared as part of the statutory requirements under the laws of Kenya, specifically Section 58(2) of EMCA Cap 387 and Regulation 11 of the Environmental Impact Assessment and Audit Regulations, 2003. The Proponent had earlier conducted an EIA Project Report and submitted to NEMA in the year 2019. After review of the submitted EIA Project Report, the Proponent vide letter reference NEMA/PR/5/2/22427 dated 26th September 2019 was directed to submit an EIA Study Report. It is worthy to note that at the time of submitting the EIA Project Report, the Proponent was trading as **Avcon Contractors Limited** before changing the Company name to **Betrilyf Solutions Limited,** in compliance with the Companies Act, 2015.

The Proponent in accordance with Section 58(5) of EMCA Cap 387 contracted a NEMA licensed Firm of Experts: **Rolta East Africa Limited** to conduct the ESIA study for the proposed battery servicing facility within Scarlet Business Park in Plot L.R No. 11895/48, Athi River, Machakos County. The overall objective of the ESIA study was to identify the environmental, occupational safety and health (OSH) and socio-economic impacts anticipated from the proposed project within its cycle, propose practical enhancement initiatives for the positive impacts and propose the applicable mitigation measures for the negative/adverse impacts so as to ensure sustainable development as envisioned in EMCA Cap 387.

The proposed battery servicing facility will be anchored on the British Standards Institution (BSI) technology that entails adding an additive to used Lead acid batteries to regenerate the cells and make the battery function like a new one at a cost of 40-50% of new batteries. BSI technology uses a state of art technology that makes use of a 100% organic polymer additive which is presented in form of a dry capsule or a liquid supplement formula. The patented technology has been developed and used in Israel and Europe as Best Available Technology and Best Environmental Practice for management of used lead acid batteries. The patented organic polymer is certified by IQNeT and The Standard Institution of Israel. It also fulfils the requirements of ISO 9001:2008 Standard.

The main activities within the proposed battery servicing facility will entails receiving and visual inspection of batteries, cleaning of the batteries and

testing for condition, addition of the additive and recharging of the battery. The whole process is a closed cycle to reduce risk of waste and emissions. The Proponent recognizes the sensitivity around lead acid batteries, and has commissioned this ESIA as part of the statutory requirement for such project, as well as to identify and abate potential negative impacts that may arise from the proposed project.

Study Methodology

The EIA study was undertaken as per the requirements of EMCA Cap 387 and the Environmental Impact Assessment and Audit Regulations, 2003. The main methodology employed included desktop studies, site visits/surveys and public consultation. During the public participation exercise, neighbours to Scarlet Business Park and the tenants within the business park were approached, informed and sensitized about the proposed project in the month of June 2020. The public participation was done through administration of a structured questionnaire and holding a public meeting.

Summary of Key Baseline Conditions

The proposed project will be situated in an existing warehouse within Scarlet Business Park which houses different companies on tenancy terms. The immediate land uses in the study area are largely heavy industrial and commercial land uses. The immediate facilities neighbouring Scarlet Business Park include Petro City Service Station, Mombasa Cement Limited and several other warehouses.

Summary of the Anticipated Impacts

Table 1: Summary of the anticipated Positive Impacts

Impact	Description
Management of Used Battery; reduction of risk of lead pollution.	– *Used battery disposal can be an environmental hazard if not properly handled.* – *The facility solves this problem by refurbishing batteries and extending their shelve life thus reducing demand for new batteries, as well as reducing battery waste.*
	– *The facility further reduces risk of informal recycling of batteries that has contributed to cases of lead poisoning in Kenya.*
Employment Creation.	– *During construction: availability of skilled and unskilled jobs, and support services thus generating job opportunities. During operation, employment for opportunities for workers*

Table 2: Summary of the anticipated Negative Impacts and Mitigation Measures

Impact	Mitigation measure
Installation phase	
Noise ***Pollution and Vibration***	– *Noise survey will be undertaken to determine actual levels and where necessary noise control and hearing conservation implemented.* – *Appropriate personal protective equipment (PPE) to be provided for all persons exposed to high noise levels.*
Occupational Safety and Health Risks	– *Strictly adherence to the provisions of OSHA, 2007 and related subsidiary legislation.* – *Risk assessment to be undertaken prior to commencing the works and safe work method statement developed.* – *Engage a competent safety officer to oversee safety management at the workplace.* – *Develop and implement Permit to Work System.* – *Providing appropriate PPE to workers as task may demand and ensuring they are compulsorily used.* – *Undertake statutory safety training to workers.* – *Undertake workplace assessment and auditing by approved persons.*
Waste Generation:	– *The liquid waste arising to be managed through the existing elaborate liquid waste management system serving Scarlet Business Park.* – *Solid waste anticipated will be, collected and segregated.* – *The solid waste will be re-used at the project to the extent feasible, re-sold where applicable and the waste which remains as waste will be disposed through a NEMA licensed entity at minimum.*
OPERATIONAL PHASE	
Air pollution	– *Undertake air quality survey yearly by an approved person to ensure the levels are within the permissible levels.* – *Provision of adequate ventilation system.* – *Adhere to the provisions of the Environmental Management and Coordination (Air Quality) Regulations, 2014.*
Water pollution	– *Damaged batteries will not be accepted for Servicing at the point of receiving.* – *All the acid from the batteries will be collected and recycled.* – *All staff to undergo sensitization and training on safe practices within the plant.* – *The activities within the plant are automated in a closed system to reduce the risk of spillages.* – *The organic compound used for refurbishment is environmentally*

	safe thus no risk to health and environment. – *Process water will be collected independently and treated to acceptable limits by a NEMA licensed entity for hazardous waste before disposal as appropriate.* – *Provision of proper storage of batteries to prevent breakages.*
Soil Pollution & Land pollution	– *All batteries will be inspected for physical damage prior to being accepted for refurbishment at the point of collection.* – *All floors shall be resin impermeable flooring so as to prevent liquids penetrating into the soil.* – *The facility shall implement a waste management plan.* – *Provision of colour coded waste bins to ensure waste segregation at source.* – *Process liquid waste by design shall be isolated from the black and greywater streams and treated in the proposed waste treatment plant to acceptable limits and disposal as may be appropriate.* – *Waste treatment plant to be licensed by NEMA for suitability in treating the process wastewater to acceptable standards.* – *The blackwater and greywater from the facility will be disposed through the elaborate wastewater management system serving Scarlet Business Park within which the facility shall be located.* – *Solid waste management at the facility shall be strictly guided by the provisions of the Environmental Management and Coordination (Waste Management) Regulations, 2006.* – *Liquid waste management at the facility shall be strictly guided by the provisions of the Environmental Management and Coordination (Water Quality) Regulations, 2006.*
Occupational Safety and Health	– *The Proponent shall ensure compliance with OSHA 2007 and related subsidiary legislation.* – *Undertake risk assessment upon commencement of the operations based on which safe operating procedures shall be developed.* – *Train the workers on the hazards associated risks and applicable precautions.* – *Provide appropriate PPE to workers which should be used at all times.* – *Maintain and make available to users an updated inventory of material safety data sheets (MSDS) for all chemicals used at the workplace for reference.* – *The facility shall undergo regular statutory assessments and audits by approved persons in tandem with OSHA 2007.* – *Hazard communication through signage.*

Fire risks	– *Adequate ventilation to prevent buildup of explosive gases from charging.* – *Provision of fire detection and alarm system.* – *Provision of well-maintained and adequate firefighting appliances.* – *Training of workers on fire safety and emergency preparedness.* – *Ensure Compliance with the Fire Risk Reduction Rules, 2007.*

Issues of Key Concern

The proposed project recognizes the emotional topic of lead poisoning and the risks associated with it. The proposed project further recognizes that informal recycling of lead has contributed to cases of pollution in the country. However, the proposed project does not intend to open up batteries to recover and recycle lead, but uses a technology where by an additive is added to regenerate the battery cells to an almost new status, offering similar warranties to new batteries. The process is fully automated, and batteries are only handled manually during inspection and cleaning. Possible spillages at this stage will be captured for recycling purposes. The remaining processes are fully automated and operate in a closed cycle with zero waste expected. However, an elaborate emergency management plan will be put in place to handle any contingencies that may occur.

Conclusion

A review of the BSI technology in areas where it has been implemented shows compliance to best environmental practices and standards. The BSI technology offer an opportunity to remove battery waste from the main waste stream, considering the large numbers of batteries from motor vehicles, solar units, and electronic lifts that are continuously being generated in the country. With the proposed Environmental Management Plan (EMP) in place, the facility has a low risk profile, if all the guidelines given are properly followed.

1. INTRODUCTION

1.1 Background Information

In recent years, population growth, urbanization and industrial development in Kenya and equally in many developing countries in general, poses formidable environmental challenges. The major environmental problems from rapid population growth are pollution due to the concentrated discharge of residuals (gaseous, liquid and solid wastes) into the environment, and destruction of ecosystems for urban and rural development in environmentally sensitive areas.

In the past, environmental management has been based on reactive policies of the waste generation which led to belated measures that did not necessarily save ecosystems from damage. Waste management, for instance, concentrated on end-of-pipe waste treatment. In above context, it is the government policy to ask every developer of the project to carry out EIA to gauge the degree of potential environmental degradation. The EIA will develop an EMP with clear mitigation measures on the identified adverse impacts to guide all along the project cycle.

This EIA Study Report has been prepared on behalf of Betrilyf Solutions Limited (The Proponent), for the proposed Battery Servicing Facility that will be located within in Scarlet Business Park (Plot L.R No. 11895/48) in Mavoko Sub County, Machakos County.

This EIA Study Report had been prepared in compliance with EMCA Cap 387 Section 58(2) and the Environmental Impact Assessment and Audit Regulations (2003) Regulation 11. The Proponent had earlier conducted an EIA Project Report and submitted to NEMA in the year 2019 and advised to conduct an EIA Study Report vide letter reference NEMA/PR/5/2/22427 dated 26th September 2019. At the time of submitting the EIA Project Report, the Proponent was trading as Avcon Contractors Limited before changing the Company name to Betrilyf Solutions Limited an associate Company of Avcon Contractors Limited, in compliance with the Companies Act, 2015 to accommodate the founders' goals and visions. The Proponent therefore contracted the services of Rolta East Africa Limited, a NEMA Registered Firm of Experts (NEMA Reg. No. 6928) to conduct this ESIA study. The main aim of the ESIA study was to identify the environmental, OSH and socio-economic impacts anticipated from the proposed project within its

cycle, propose practical enhancement initiatives for the positive impacts and propose the applicable mitigation measures for the negative impacts so as to ensure sustainable development as envisaged in EMCA Cap 387.

1.2 The Primary and Secondary Battery

Disposal of solid wastes from human activity is a growing environmental problem for modern society, especially in developing countries. Broken and damaged batteries are one of the very common and most important hazardous solid wastes all over the world. As the number of vehicles on our roads continues to rise as well as telecommunication companies, the problem of used batteries disposal presents serious waste management challenges for society. Used batteries become waste when they become damaged, have outlived their out span and do not function any more. It is thus important to identify proper measures to ensure batteries are refurbished, recycled or well-disposed to reduce environmental hazards.

The Proponent has identified an opportunity of making these products that could be costly in terms of disposal into almost new batteries that can be used again in the same market. The Proponent, Betrilyf Solutions Limited is a registered Company in Kenya which has done extensive research about the market through analysis of the recycling process where this kind of project has worked before. In lieu of this, the Proponent has leased a warehouse within Scarlet Business Park in Mavoko Sub County, Machakos County within which the facility will be located.

Batteries are used whenever electrical energy is needed but there is no direct connection to the main electricity grid. A battery can convert chemical energy directly to electrical energy. Depending on the battery system, this converting process is irreversible or reversible. When the process is irreversible, the battery is called a primary battery. The reversible batteries are called secondary batteries and can be recharged up to 1000 cycles (i.e. lead acid battery). A lead acid battery is rechargeable and is commonly used as a result of its good properties like low maintenance and suitable for many purposes. Furthermore they are easily available and are relatively cheap. Lead-acid batteries either start or power cars, trucks, buses, boats and trains all over the world. However, lead is a very toxic metal and once the battery is not useful anymore, it is of the utmost importance that proper collection and recycling takes place.

The proposed battery servicing facility will be located in a rented existing warehouse in Plot L.R. No. 11895/48 (Scarlet Business Park) along Mombasa Road, Mavoko Sub County, Machakos County. It is recognized that the project as proposed is likely to impart certain effects on the site and the surrounding environment.

Appropriate measures are, therefore, necessary to ensure coexistence of the proposed development with the other social and economic activities in the area. Further, the Proponent is already aware that an EIA is a legal requirement for any project involving the activities listed in the Second Schedule of EMCA Cap 387.

1.3 ESIA Study Objectives

The general objectives of this study were:

- To identify and analyze the impacts of the development on natural environment (biological and physical),
- To evaluate impacts of the proposed project on the socio-cultural environment,
- To assess OSH concerns at the workplace and the neighboring facilities, and
- To develop an EMP outline for the proposed project.

1.4 Scope of the ESIA Study

Arising from the above general objectives, the scope of ESIA study included the following:

a) Analysis of the baseline conditions of the project site,
b) Description of the proposed project,
c) Review of relevant legislative, policy and administrative frameworks,
d) Collection of views/opinions from the public regarding the proposed project,
e) Identification of significant adverse impacts to the environment,
f) Proposing mitigation measures to mitigate against the adverse impacts, and
g) Preparation of an EMP outline for the proposed project.

1.5 Terms of Reference

Prior to carrying out an EIA full study, it is a requirement that the TOR for the study are developed by the Proponent and approved by the Authority (NEMA). For the study project, this requirement was fulfilled as evident in the appendices section of this report. In summary, the TOR normally covers the following:

- The location of the proposed project,
- The objectives of the proposed project,
- A concise description of the national environmental legislative and regulatory framework, baseline information and any other relevant information related to the proposed project,
- The technology, procedures and processes to be used, in the implementation of the proposed project,

- The products, by-products and waste generated by the proposed project,
- A description of the potentially affected environment,
- The environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short term and long term effects anticipated,
- Alternative technologies and processes available and reasons for preferring the chosen technology and processes,
- Analysis of alternatives including project site, design and technologies and the reasons for preferring the proposed site design and technologies,
- An EMP proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment, including the cost, time frame and responsibility to implement the measures,
- Provision of an action plan for the prevention and management of foreseeable accidents and hazardous activities in the course of carrying out project activities,
- The measures to prevent health hazards and to ensure security in the working environment for the employees and for the management of emergencies, and
- Such other matters as the Authority may require.

1.6 Study Methodology

In undertaking the ESIA study, the following methodology was adopted:

1.6.1 Environmental Scoping & Screening

Environmental screening and scoping was done to determine the scope (geographic and thematic) of the proposed project. The possible extent of impact was analyzed. This step was guided by the provisions of EMCA Cap 387 in specific the Second Schedule.

1.6.2 Desktop Study

This involved review of project documents, engineering drawings, similar cases studies of the technology, NEMA EIA/EA guidelines, as well as existing legal and institutional frameworks.

1.6.3 Site Visits and Public Participation

A team of consultants surveyed the site and its surroundings. This field visit ensured the study took into consideration potential receptors of impact, any sensitive environment to the proposed project, surrounding human

activities and land uses, biophysical aspects (topography, visual aspects, noise, soils, potential water sources and aesthetic quality) and biological aspects. The study also sought public opinion/views through a public participation exercise. All the occupants of the surrounding facilities were informed, sensitized on the proposed project, and issued with fact sheets around lead and lead acid batteries. Key informant interviews were also held to gather expert opinion.

1.6.4 Reporting

In the entire exercise, the Proponent and the EIA Experts contacted each other on the progress of the study and signing of various documents. The Proponent through the contracted Firm of Experts was mandated to submit the statutory copies of this EIA Study Report to NEMA for review.

1.7 ESIA output

The ESIA outputs will include:

- A description of the proposed project with a focus on potential impacts to the surrounding environment,
- A systematic environmental assessment following the gazetted regulations,
- An ESIA study report that should contain among other issues identification of key environmental aspects, recommendations on appropriate mitigation measure to minimize or prevent and adverse impacts, and
- An EMP outline.

1.8 Responsibilities

While the environmental assessor provided the technical understanding on the baseline environmental status, projected impacts, management options and legal framework, the Proponent was expected to provide the following:

i. Project/Plant layout plan,
ii. Land ownership documents, and
iii. Project budget summary.

2. DESCRIPTION OF THE PROPOSED PROJECT

2.1 The Proponent

Betrilyf Solutions Limited is a Limited Liability Company that was registered in Kenya in February 2020. The Company is a partnership between a Kenyan Company: *Avcon Contractors Limited* and an Israel-American Company. The Company will operate as a franchise company under BSI International which is the parent Company and the patent owner of the BSI technology that the Proponent will employ for servicing of used batteries. The BSI technology is a solution under energy solutions portfolio aimed to address energy, cost and environmental pollution issues by regenerating dead lead acid batteries.

2.2 Project Justification

Approximately 85% of the total global consumption of lead is for the production of lead-acid batteries (ILA, 2017). The main uses of these batteries are in motorized vehicles, for storage of energy generated by photovoltaic cells and wind turbines, and for back-up power supplies (for both the consumer market and for critical systems such as telecommunications and hospitals). The demand for lead batteries in Kenya is expected to increase as the country experiences growth in telecommunications, renewable energy use, as well as motor vehicle acquisition and use.

Lead battery production and recycling are now the most significant source of lead exposures in many parts of the world. Recycling used lead-acid batteries is of public health concern because this industry is associated with a high level of occupational exposure and environmental emissions (UNEP, 2010). The unregulated, informal recycling of used lead-acid batteries has been a major source of environmental pollution and lead poisoning as it is often carried out by small scale recyclers, often in domestic backyards, and sometimes in secret (UNEP, 2004; Belay et al., 2015; AGENDA, 2016). In Kenya, cases of lead poisoning were reported in Mombasa and Nakuru counties, due to informal recycling of lead from batteries, leading to logical public outcry.

In a conventional lead acid recycling plant, the batteries are mechanically or manually broken up to separate out the acid and component parts. The lead components are conveyed to the furnace for smelting. After smelting the slag is removed and the molten unrefined lead may be poured into moulds and cooled or it may immediately be directed to a holding kettle (cast-iron pot) to keep it molten

prior to refining. The aim of the refining process is to produce lead of high purity or to produce alloys (requiring the addition of specific trace elements to the refining kettle) that can be used to make a new lead battery. The molten lead is then cast into moulds and allowed to cool. The process can either be automated, or manually done.

During this process, risk of pollution emanate from:

i. The draining of sulphuric acid batteries from batteries which may contains dissolved lead and if not properly handled may contaminate water and soil.
ii. Manually breaking up the batteries releases lead particles and lead oxide dust, which are a source of lead exposure to the worker. The dust and particles also settle in the surrounding soil and may be blown to more distant areas, contaminating the wider environment and becoming a source of exposure to the community (UNEP, 2003;].
iii. The smelting process generates large amounts of lead fume. The fumes will eventually settle as lead particles on surrounding surfaces and the soil, creating lead dust, which can also be inhaled.

In the absence of recyclers, lead acid batteries still pose a major threat when disposed into landfills. The toxic substances contained in batteries such as Sulphuric acid, Cadmium and Lead permeate into the soil, ground water and surface water and also release toxins when they burnt in municipal waste combustors. Some of these toxins can also be taken up by plant roots and accumulate in fruits, vegetables and grass which cause a variety of health effects when consumed by animals and human beings.

2.3 BSI Technology

BSI technology is used in battery refurbishment, unlike the normal battery recycling process. By regenerating spent batteries, battery refurbishing not only reduces the cost of battery expenses but also protects the environment by reducing the amount of lead-acid batteries disposed into landfills/garbage disposal areas. BSI technology uses a state of art technology that makes use of a 100% organic polymer additive which is presented in form of a dry capsule or a liquid supplement formula. The additive is environmentally friendly and poses no harm to the human body even in case of accidental spillage or direct contact.

The patented organic polymer is certified by IQNeT and The Standard Institution of Israel. It also fulfils the requirements of ISO 9001:2015 standards.

The process is a closed cycle thus no wastes are released into the environment

during the process. Battery refurbishing involves reuse of battery materials which ensures that facilities consume less energy than they would otherwise need to consume to convert raw materials into new batteries.

The process saves on costs by allowing the end user to refurbish old batteries at a price 40%-50% of a new battery, whilst enjoying the performance of new batteries with similar warranty.

2.4 Project Objectives

The goal of the proposed project is to promote environmental conservation through reuse of battery waste which would otherwise lead to environmental pollution. In order to achieve this, the objectives of the proposed project are to:

- Operate the company with environmental health and safety (EHS) management system commensurate with the potential risks associated with similar companies,
- Create employment for the operations by engaging high skilled personnel, and
- Undertake operations in an environmentally friendly manner.

2.5 Description of Proposed Works

2.5.1 Project Design & Construction

The facility will be located in an existing warehouse within Scarlet Business Park (Plot L.R No. 11895/48) located along Mombasa Road in Athi River, Macakos County. The machines and equipment to be used are already pre-designed and sized and will be shipped ready for installment in the warehouse. There will be no significant modifications for the warehouse as the equipment are plug and play.

The facility will include:

- An office space with ancillary structure,
- A receiving area where batteries are received and inspected.
- A cleaning area for cleaning of received batteries,
- Temporary battery storage area (open) just before dispatch,
- Changing room,
- Kitchenette,
- Store for supplies and equipment,
- Training room – first floor above office,
- Reinforced floor – acid resistant and seepage proof,
- A testing center for the batteries, and
- Battery servicing facility plant complete with its features:

- Charging and discharging machines,
- Standard pallets, and
- Electric hoist.

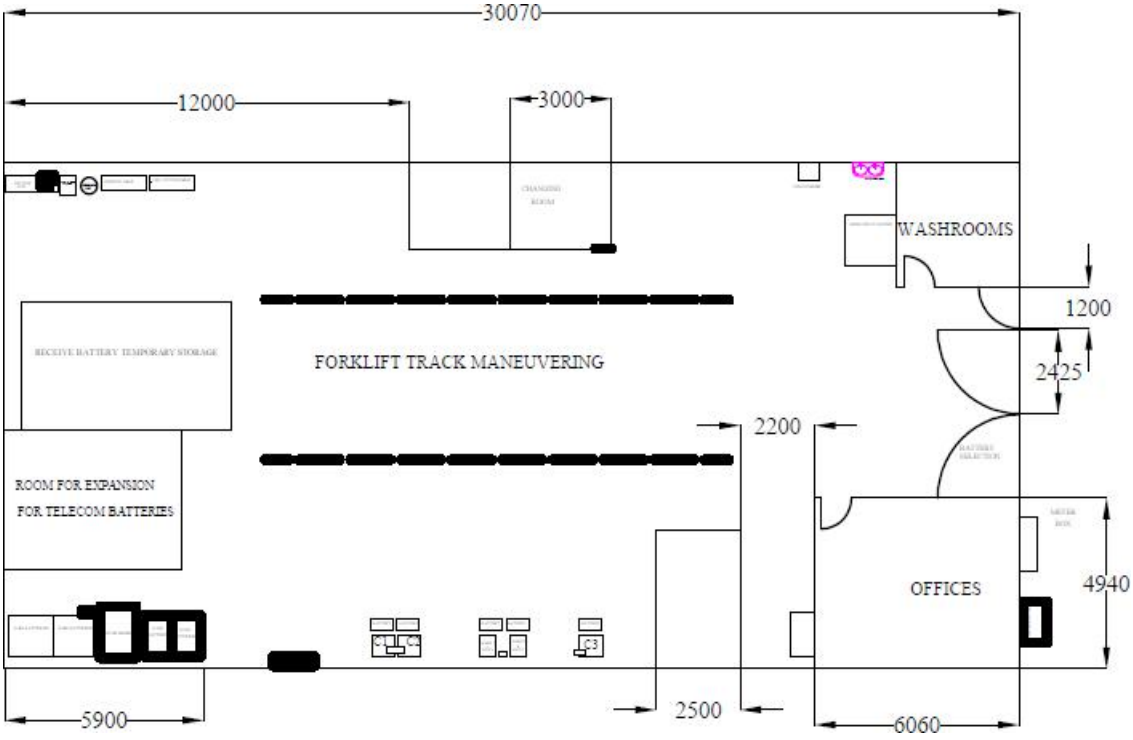


Figure 1: Proposed layout of the facility

The plant is designed to refurbish 300 batteries per batch (each batch is refurbished for 5days) but with provision for scale up.

2.5.2 Operations Phase

The proposed battery servicing process will involves:

- Visual inspection of batteries for physical damage and fatigue: damaged batteries will not be refurbished,
- Cleaning and testing of the battery,
- Adding the "BSI Additive" in liquid or capsulate form,
- Installing any renewed components into the battery, and
- Charging and discharging the battery with BSI-SRS.

2.5.3 Battery Refurbishing Process (Non Industrial Batteries)

The process flow for non-industrial batteries is as follows:

- **INDUCTION:** The batteries are delivered at the warehouse (Scarlet Business Park) by the clients or picked on request by the client.

- **LOAD TEST**: The battery voltage is tested using a load tester that has a voltmeter. This is to check the battery state in terms of voltage.
- **VISUAL INSPECTION**: The battery caps are removed and the plates inspected to check for physical damage.
- **SPECIFIC GRAVITY**: Using a hydrometer, the battery acid is tested to check the amount of acid in the liquid. (the specific gravity test/ acid density test)
- **DISCHARGE**: The battery having passed the above mentioned steps is connected to a discharger.
- Implementing "BSI-SRS" proprietary charging process: The organic additive is added as per battery capacity and then connected to a charger for a preset amount of time. During charging, the batteries are placed on pallets or racks.
- The battery is then tested in terms of voltage and acid density.
- The service date is then plastered and the battery is ready for dispatch.

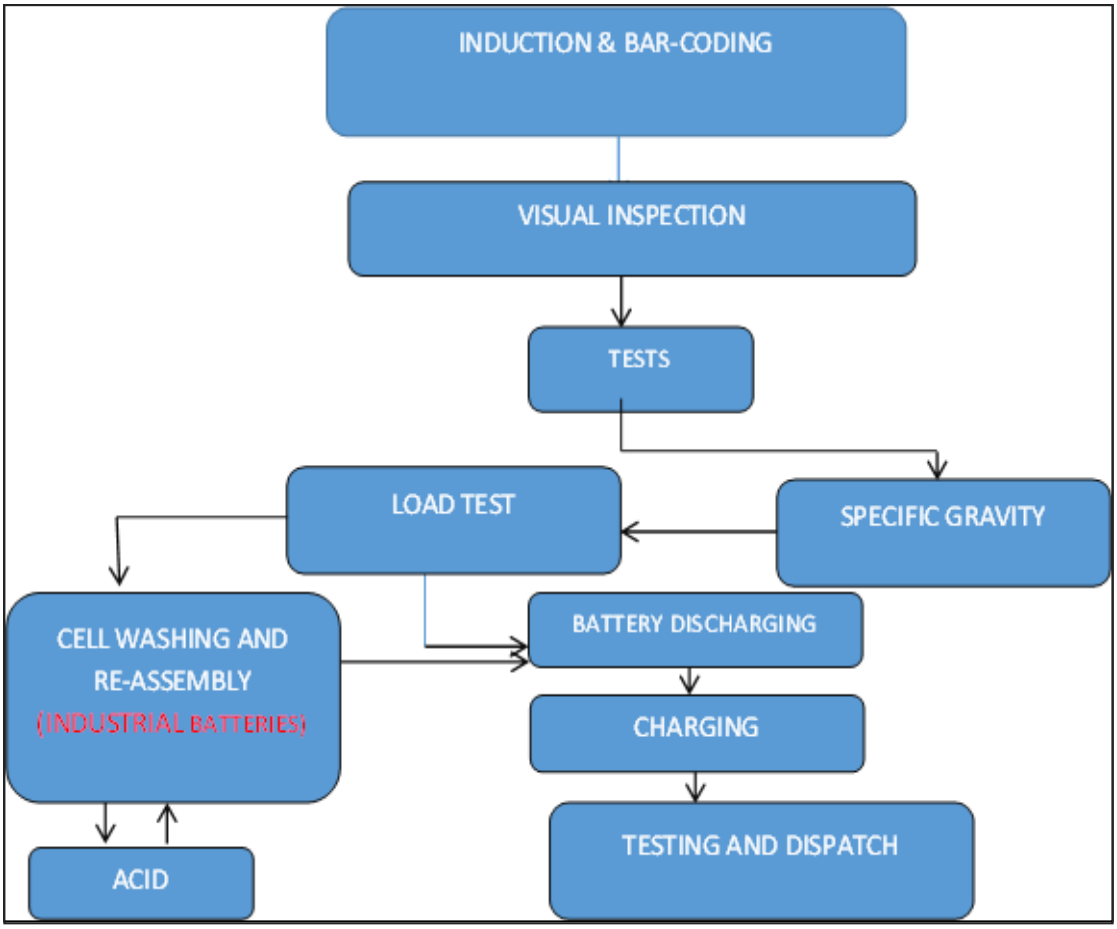


Figure 2: Process Flow

2.5.4 Battery Refurbishing Process (Industrial Batteries)

The process flow for industrial batteries is similar except that they have to be opened up and the plates removed for cleaning. The plates are suspended over a

basin using a hook to allow the plates to be washed without physically damaging them. The resulting effluent is channeled to the acid recovering system.

The removed acid is subjected to a filter system to extract the lead chips while the acid is taken through an acid recycling process. All the battery components are refurbished hence no wastes are released into the environment. The recovered lead is channeled back to the lead market for use in other activities.

Sealing of the batteries involves use of a polymer hand welding gun thereby eliminating the risks of exposure to dangerous welding fumes and sparks. Battery lifting and movement within the plant will be done using forklifts.

2.6 Quality Control

The Proponent has invested in ensuring all employees and management are thoroughly trained before the plant is commissioned and before taking job. The closed environment will ensure zero spillages. The Proponent will provide Standard Operating Procedures that will govern all project operations. A quality assurance manager will be employed who will oversee the quality of work done. The Proponent will have a service level arrangement with all clients to ensure consultations are done prior and after work is done.

2.7 Inputs

The Proponent will source raw materials (batteries) from the telecommunication sector, data centres, power and energy companies including solar generating companies and individual solar users, fleet and logistics companies (truck and buses) and industrial users.

2.8 Products and by-Products

The expected product expected from this process is a refurbished battery which can be used to operate battery powered fleets, transportation fleets, emergency machines, military machines and telecom operators e.g. BTS sites. The by products are Sulphuric Acid which is recycled and reused for the refurbishment of the batteries and pure lead sedimentations which are sold to lead traders.

2.9 Waste Management Arrangements

There will be liquid and solid wastes from the project site.

2.9.1 Solid waste

Solid waste from the facility will mainly include waste from the following two categories:

a. Office waste including used stationary and food waste which will be disposed through a NEMA licensed waste handler serving the facility.
b. Process waste which may be produced from broken pieces of batteries which will be treated as hazardous waste, collected and stored in special bins labeled as hazardous waste, and disposed off through a NEMA licensed hazardous waste handling company. It is worthy to note that the process waste will be rather minimal since damaged batteries will not be accepted for servicing.

2.9.2 Liquid waste

a. The general activities related liquid waste will include greywater and blackwater from the office operations which will be channeled to the existing elaborate wastewater system serving Scarlet Business Park.
b. Water from the battery washing facility that may be contaminated with acid will be channeled to a small treatment unit within the facility for treatment to acceptable limits prior to being disposed as appropriate.
c. The process waste is expected to be handled by the closed system that will ensure all the drained acids are captured and recycled into the refurbished batteries.

2.10 Project cost

The estimated project cost for the proposed project is ***fifteen million Kenyan shillings (Ksh 15,000,000)*** only*.*

2.11 Project utilities

2.11.1 Water

Scarlet Business Park is provided with water from a borehole drilled by the Landlord. Since this water is not safe for drinking, it will be used for cleaning of the warehouse as well as for use in the sanitary facilities. The Proponent will provide potable water for drinking, cooking and cleaning of battery plates.

2.11.2 Electricity

Moderate energy will be used for charging batteries, running machinery and office equipment as well as lighting. The landlord has already connected all warehouses with a three phase electricity system from the Kenya Power Lighting Company (KPLC) Plc mains supply. The Proponent will consider installing a back-up generator for use in the event of power failure.

2.11.3 Storm water drainage

All the buildings with Scarlet Business Park have been provided with peripheral drainage systems that are subsequently connected to the main storm water drain that flows towards Athi River. The landlord is responsible for maintaining all storm water drains within the Park.

2.11.4 Security

The industrial park has been fenced off with a perimeter concrete wall and a main gate with security personnel. CCTV cameras will be provided in the warehouse to beef up security.

3. DESCRIPTION OF BASELINE CONDITIONS OF THE STUDY AREA

3.1 Introduction

This section describes the study area where the proposed project is to be established. It describes the biological, physical and socio- economic environment of the study area.

3.2 Administrative location

Machakos County where the proposed project site is situated is located in Kenya at an altitude of 1138 metres (m) above sea level (ASL). Machakos County is one of the forty seven counties in Kenya and one of the eight counties in the Eastern region. To the North the County borders Embu, Murang'a and Kiambu counties; to the west Nairobi and Kajiado counties; to the south Makueni County; and to the East Kitui County. The County has area of 6208.2 km^2 most of which is semi-arid. The County is divided into eight sub counties/constituencies namely: Masinga, Yatta, Kangundo, Matungulu, Kathiani, Mavoko, Machakos Town and Mwala. The County has a total of 40 Wards and 75 Locations.

The project site falls within the Mavoko Sub County.

3.3 Population

Machakos County's population is rapidly growing and was 1,421,932 as of 2019. People who live in Machakos County are mostly the Kambas though it is a cosmopolitan County. Machakos is surrounded by hilly terrain, with a high number of family farms. The current population of Mavoko Sub County is 322,499 (2019 Census).

Table 3: Population of Machakos County by Sub Counties

TOWN	POPULATION (2019)	POPULATION DENSITY(SQ. KM)
KANGUNDO	97,917	567
MACHAKOS	170,606	609
ATHI RIVER	322,499	390
KATHIANI	111,890	544
MASINGA	148,522	106
YATTA	172,583	162
MWALA	181,896	178
KALAMA	54,462	112
MATUNGULU	161,557	278

* 2019 census. Source

3.4 Physical and Topographic Features

The project site lies well within the Machakos County in a plain with minimal vegetation cover and dark red clay soils. The vegetation cover has also been affected as result of increased industrialization in the area. There is no unique landscape that exists in the area that shall be put at risk as a result of the proposed development.

There are also no residential buildings around the area that could be affected by the proposed project.

3.5 Soils and Geology

Athi River area predominantly comprises of tertiary rocks (Ngong volcanic) overlaying pre Cambrian basement rocks, which is exposed in small area in upper reaches of the Kitengela River. In the north, from Nairobi National Park and eastwards are the Nairobi phonolites, in the west are the Mbagathi Phonolite Trachytes and to the East are Athi tuffs. These rocky basements are usually very important for providing strong foundations for buildings.

3.6 Climate

Athi River, just like many parts in Machakos County experiences a bimodal rainfall pattern. The short rains fall between October and December while the long rains fall between mid-March and May. Annual rainfall is influenced by altitude with a mean annual rainfall of 800 mm. The climate is humid highland subtropical in character with seasonal dry and wet periods. Temperatures vary with altitude rising from the lowest 10^0C in to the highest are 27^0C.

Rainfall Statistics from the meteorological department of Kenya indicates that Athi River has two rainfall maximums: long rains fall between February to May and short spells occur between the months of October to December. The rain is preceded by two dry spells.

3.7 Site Specific Characteristics

3.7.1 General Location Setting

The project site is located in Plot L.R No. 11895/48 (Scarlet Business Park) along Mombasa Road (A104) approximately 700 m from the Kitengela Interchange, Mavoko Sub County, Machakos County. The battery servicing facility will occupy Warehouse number 22 in Scarlet Business Park which is at the following approximate coordinates: Latitude 1° 25' 43.30" S and longitude 36° 57' 34.36" E.

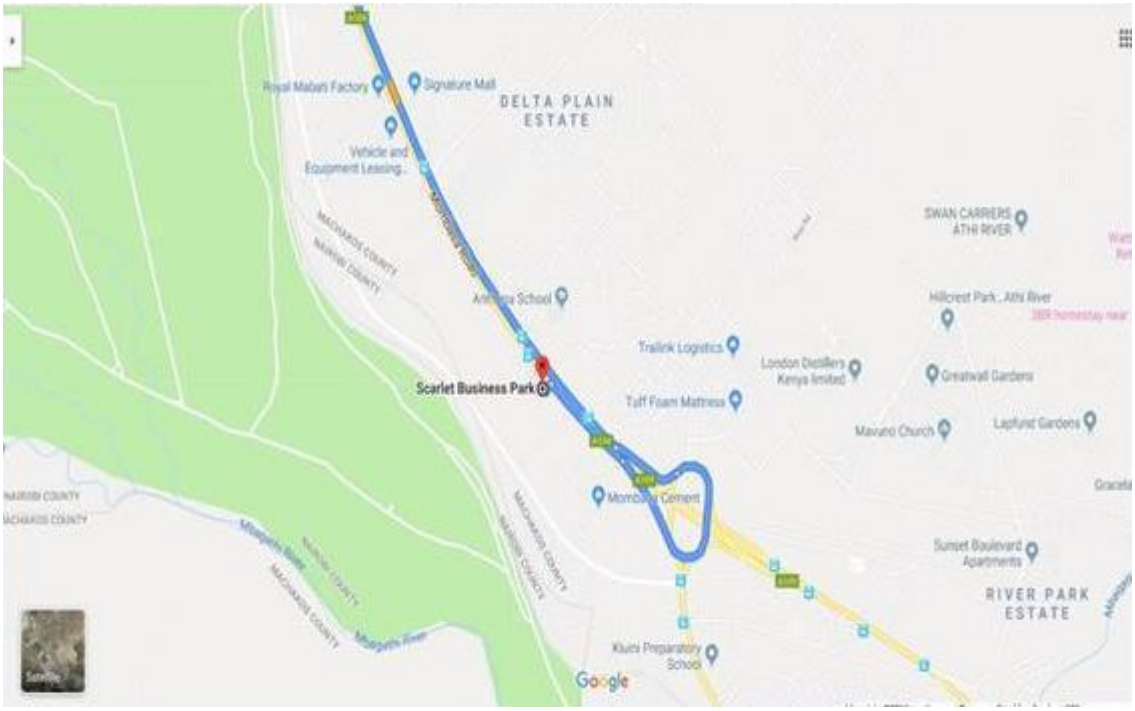


Figure 3: Location Map of the Study Area

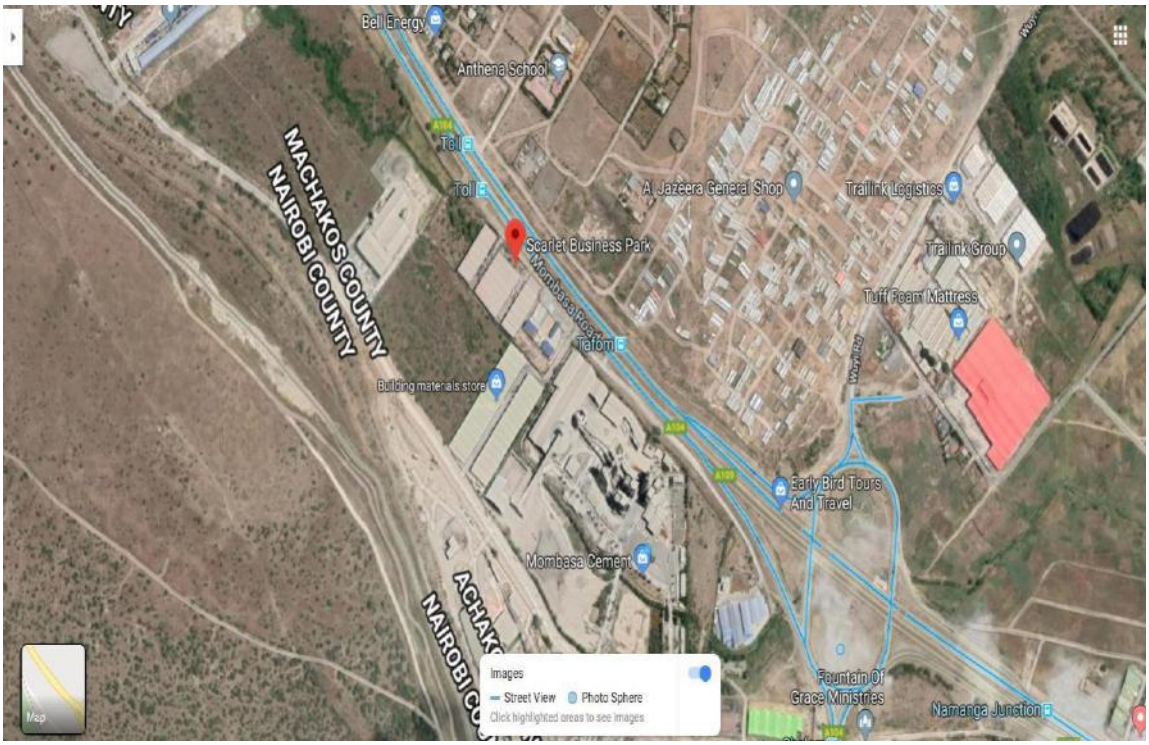
3.7.2 Analysis of Site Characteristics

- **Site zoning**: The area falls under heavy industrial land use having major industrial facilities such as Mombasa Cement Limited, Bamburi Cement Factory, Ndovu Cement, Portland Cement Ltd, Alpharama Tannery, a steel Industry and Savannah Cement.
- **Abutting Land Uses:** Immediate neighboring facility is Petro City Kenya Ltd Service Station. Other facilities include Mombasa Cement Factory and Oasis Business Park. The second row from the facility is the old Mombasa Road that borders Nairobi National Park.
- The Business Park has a total of 12 warehouses. Dominant activities within the Business Park include: fabrication works, packaging works, and storage.
- The immediate neighboring land behind the Business Park is undeveloped.
- **Soils and Drainage:** The Business Park is paved using cabro blocks. Drainage systems are in place to harness and channel all storm water for disposal.
- **Site Vegetation**: No site vegetation as the Business Park is a built up area.

Infrastructure and Utilities

- **Sewer:** The facility utilizes a Biodigester to manage the grey and black wastewater stream.

- **Energy:** The facility will rely on electricity from the KPLC for electricity supply.
- **Water for general use:** The facility is connected to piped water supply.
- **Potable water:** Management will make provision for potable water during plant installation, commissioning and operations.



Source: Google Maps 2019

Figure 4: General Land Use Overview

Figure 5: Photo showing the Scarlet Business Park

4. POLICY, LEGAL AND LEGISLATIVE FRAMEWORK

4.1 Introduction

This section highlights the relevant policies, legislations, safeguards, guidelines and conventions at the local and international front that frame a sustainable approach to any development's activities. They ensure that all project activities are in conformity with the existing laws, guidelines, regulations, and best practices through various stipulations as detailed below.

4.2 Overview of the Policy Framework

4.2.1 Kenya Vision 2030

Kenya Vision 2030 is the Country's development blueprint covering the period 2008 to 2030. It aims at making Kenya a newly industrializing, "middle income country providing high quality life for all its citizens by the year 2030". Vision 2030 is based on three Key pillars i.e. Economic, Social, and Political Pillars. The vision aims at transformation eight key social sectors i.e. Education and Training; Health; Water and Sanitation; the Environment; Housing and Urbanization; as well as in Gender, Youth, Sports and Culture.

4.2.2 National Environment Policy 2014

The National Environment Policy (NEP) promotes an integrated approach towards the planning and sustainable use and management of Kenya's environment and natural resources so as to ensure better quality of life for Kenya's present and future generations. It particularly reiterates the constitutional right to a clean and healthy environment and imposes on the state the duty to safeguard and enhance the environment. However, it balances this with the right to development but with due consideration for sustainability, resource efficiency and economic, social and environmental needs. This therefore, requires the proposed development to reduce impacts on environment to the maximum extent possible, as well as putting in place appropriate mitigation measures.

As part of environmental stewardship which requires a precautionary approach to environmental challenges and the promotion of greater environmental responsibility, infrastructural development and other related developments have to be subjected to the EIA process, in the planning and approval of such projects. This EIA is thus in conformity with this requirement that obligates the responsibility for environmental quality be shared by all those whose actions affect the environment.

4.3 Legislative Framework

4.3.1 The Constitution of Kenya, 2010

The Constitution of Kenya, 2010 is the supreme law in Kenya as far as matters of development, environment, health and safety are concerned. It provides the overarching legal framework to ensure a comprehensive rights-based approach to health services delivery. It recognizes in Section 43 that every person has the right to reasonable standards of sanitation, clean and safe water in adequate quantities.

Chapter Five on Land and Environment, stipulates the principles of sustainable utilization, exploitation, management and conservation of land, the environment and natural resources, as well as equitable sharing of the accruing benefits, for the benefit of the people of Kenya. Article 42 also states that every citizen has a right to clean and health environment.

In Article 69 (2), it imposes an environmental stewardship role on project proponents, requiring them to cooperate with state organs such as NEMA or Water Resources Authority (WRA) to protect and conserve the environment. The state does this through establishing mechanisms to assess and monitor the impacts of project activities like the proposed one. The undertaking of this ESIA is in accordance with these mechanisms detailing appropriate mitigation measures for the proposed development construction, operation and decommissioning activities to ensure that they do not adversely affect the surrounding environment.

4.3.2 Environment Management and Coordination Act Cap 387

EMCA Cap 387 is an Act of Parliament that provides for the establishment of appropriate legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto. Section 7 of the Act establishes NEMA whose object and purpose as per Section 9(1) of the Act is to exercise general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of Government in the implementation of all policies relating to the environment.

Section 24 of the Act establishes a fund to be known as the National Environment Trust Fund whose object shall be to facilitate research intended to further the requirements of environmental management, capacity building, environmental awards, environmental publications, scholarships and grants. Section 25 of the Act establishes the National Environment Restoration Fund whose object shall be to supplementary insurance for the mitigation of environmental degradation where the perpetrator is not identifiable or where exceptional circumstances require the Authority to intervene towards the control or mitigation of environmental degradation.

Section 58 (1) of the Act requires the Proponent notwithstanding any approval, permit or license granted under the 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 the Act, submit a project report to the

Authority. According to Section 58(2) of the Act, the proponent of a project shall undertake or cause to be undertaken at his own expense an environmental impact assessment study and prepare a report thereof where the Authority, being satisfied, after studying the project report that the intended project may or is likely to have or will have a significant impact on the environment, so directs. An environmental impact assessment as per Sections 58(7-9) of the Act shall be conducted in accordance with the environmental impact assessment regulations, guidelines and procedures issued under the Act where any person who upon submitting his application does not receive any communication from the Director-General within three months may start his undertaking.

This ESIA was conducted in accordance with the EIA, Regulations, guidelines and procedures issued under EMCA Cap 387.

Section 125 of the Act establishes the National Environment Tribunal (NET) where any person who is aggrieved by any decision of the Authority (NEMA) may within sixty days after the occurrence of the event against which he is dissatisfied, appeal to the Tribunal. The Act in Section 130 provides an opportunity for any party aggrieved by NET's verdict to make an appeal to the Environment and Land Court whose decision shall be final.

4.3.2.1 Environment Management and Coordination (Amendment) Act, 2015

Is an Act of Parliament to amend the Environmental Management and Co-ordination Act (1999). According to Section 3 of the Act, Every person in Kenya is entitled to a clean and healthy environment in accordance with the Constitution and relevant laws and has the duty to safeguard and enhance the environment. As per Section 5 of the Act, the Cabinet Secretary shall be responsible for policy formulation and directions for purposes of EMCA Cap 387.

Section 18 of the Act mandates the Governor by notice in the Gazette to constitute a County Environment Committee of the County which as per Section 19 of the Act shall: be responsible for the proper management of the environment within the county for which it is appointed; develop a county strategic environmental action plan every five years; and perform such additional functions as are prescribed by EMCA Cap 387 or as may, from to time, be assigned by the Governor by notice in the Gazette.

Section 20 of the Act establishes the National Environmental Complaints Committee whose functions as per Section 21 of the Act shall include: to investigate any allegations or complaints against any person or against the Authority in relation to the condition of the environment in Kenya; and to investigate on its own motion, any suspected case of environmental degradation and to make a report of its findings together with its recommendations thereon to the Cabinet Secretary.

This ESIA was conducted in compliance with this Act which is basically an Amendment to EMCA Cap 387 which the Proponent purpose to abide by.

4.3.2.2 Environmental (Impact Assessment and Audit) Regulations, 2003

According to Regulation 3 of these Regulations, the Regulations shall apply to all policies, plans, programmes, projects and activities specified in Part IV, Part V and the Second Schedule of the Act. The Regulations as read together with her 2016 and 2019 amendments in a nutshell provide the basis for procedures for carrying out EIA and EA.

As per Regulation 4, no proponent shall implement a project likely to have a negative environmental impact or for which an EIA is required under the Act or these Regulations unless an EIA has been concluded and approved in accordance with these Regulations.

According to Regulation 7(5) and 7(6) of the principal Regulations as read together with the 2019 amendments, in preparing a project report under this regulation, the Proponent shall consider the issues specified in the Second Schedule; and a project report prepared under this Regulations shall be prepared by an EIA Expert who is registered under these Regulations.

The Environment (Impact Assessment and Audit) (Amendment) Regulations, 2016 amends Regulation 9 and 10 of the principal Regulations on the project report processing timelines whereby on determination of the project report, the decision of the Authority, together with the reasons hereof, shall be communicated to the proponent within thirty days of the submission of the project report. As per Regulation 10(3) of the principal Regulations, if the Authority finds that the project will have a significant impact on the environment, and the project report discloses no sufficient mitigation measures, the Authority shall require that the proponent undertake an environmental impact assessment study in accordance with these Regulations.

In Regulation 11(1) of the principal Regulations, an EIA study shall be conducted in accordance with TOR developed during the scoping exercise by the proponent and approved by the Authority. An EIA study shall be conducted in accordance with the general EIA guidelines and sector EIA guidelines set out in the Third Schedule to these Regulations as per Regulation 12(1) of the principal Regulation. In Regulation. This ESIA is guided by these Regulations.

4.3.2.3 Environmental Management and Coordination (Water Quality) Regulations, 2006

Described in Legal Notice No. 120 of the Kenya Gazette Supplement No. 68 of September 2006. These Regulations apply to drinking water; water used for industrial purposes, agricultural purposes, recreational purposes fisheries and wildlife and any other purposes. The Regulations outline various water quality standards in relation to use and discharge. The proposed project will lead to increased demand for water, as well as production of wastewater. It is thus fundamental that the source of water, as well as management of liquid waste does not contravene these Regulations.

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

These Regulations guide on waste management and are described in Legal Notice No. 121 of the Kenya Gazette Supplement No. 69 of September 2006. The Regulations offer legal provisions on handling of a variety of wastes emanating from various projects and activities. The waste categories covered by the regulations are: Industrial wastes; Hazardous and toxic wastes; Pesticides and toxic substances; Biomedical wastes; Radio-active substances. These Regulations outline requirements for handling, storing, transporting, and treatment/disposal of all waste categories as provided therein. The proposed project will have to abide by these Regulations in dealing with such wastes.

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

These Regulations prohibit making or causing any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. Under the Regulations the Proponent are prohibited from producing excessive noise and vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment or excessive vibrations which exceed 0.5 centimetres per second beyond any source property boundary or 30 metres from any moving source. Under the Regulations the Proponent will be required to undertake daily monitoring of the noise levels within the project area during the project cycle to ensure compliance.

4.3.2.6 Environmental Management and Coordination (Air Quality) Regulations, 2014

These Regulations 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 and any other impact that will emanate from the proposed project activities.

4.3.3 Water Act, 2016

As per Section 3 of the Act, the purpose of the Act is to provide for the regulation, management and development of water resources and water and sewerage services in line with the Constitution. Section 4 requires the CS, the Authority, the Regulatory Board, County Governments and any person administering or applying this Act to be guided by the principles and values set out in Articles 10, 43, 60 and 232 of the Constitution. Section 5 vest ownership of all land resources to the national government who hold them in trust for the Kenyan people. Section 6 states that "The Authority established in section 1l shall serve as an agent of the national government and regulate the management and use of water resources". Section 11(1)

provides for the establishment of the Water Resources Authority (WRA) whose functions as per Section 12 shall include but not limited to: formulate and enforce standards, procedures and Regulations for the management and use of water resources and flood mitigation; receive water permit applications for water abstraction, water use and recharge and determine, issue, vary water permits; and enforce the conditions of those permits among others. In Section 143(l) of the Act, a person shall not without authority conferred under this Act: wilfully obstruct, interfere with, divert or obstruct water from any watercourse or any water resource, or negligently allow any such obstruction, interference, diversion or abstraction; or throw, convey, cause or permit to be thrown or conveyed, any rubbish, dirt, refuse, effluent, trade waste or other offensive matter or thing into or near to any water resource in such manner as to cause, or be likely to cause, pollution of the water resource.

4.3.4 Water Act (Resources Management) Rules, 2007

In Rule 23, it requires Water Users in Category A to apply to user rights. In Rule 99, Class B, C or D water user, whether for water abstraction or effluent discharge, shall be required to have installed a controlling device and measuring device for the accurate measurement of water abstracted, obstructed or diverted and for effluent discharged.

Rule 101 requires class B, C or D permit holder to maintain a record of the daily abstraction and or effluent discharge, in cubic meters per day, made by him or her. In Rule 104, any person in possession of a valid permit or who is required to have a valid permit for water use, shall be required to pay to the Authority water use charges on the basis of the water abstracted, diverted, obstructed or used including energy derived from a water resource at the appropriate rate as set out in the First Schedule.

These Rules sets the standard procedures and rules to be followed in the utilization of water resources including abstraction controls, modes of use and responsibilities in protection of the resources including effluent treatment standards which the Proponent shall have to abide by.

4.3.5 The Penal Code (Cap. 63)

Section 191 of the Penal Code makes it an offence for any person or institution that voluntarily corrupts, or foils water for public springs or reservoirs rendering it less fit for its ordinary use. Similarly, Section 192 of the same act prohibits making or vitiating the atmosphere in any place to make it noxious to health of persons/institution in dwellings or business premises in the neighbourhood or those passing along a public way. The Proponent will be required to ensure strict adherence to the environmental and social management and monitoring plan throughout the project cycle in order to mitigate against any possible negative impact.

4.3.6 The Public Health Act Cap 242

The Act makes provisions for securing and maintaining health. Part IX, Section 115, of the Act prohibits any person or institution from causing nuisance or a condition likely to cause injury or

which might be dangerous to human health. As well, Section 116 of the Act mandates the relevant departments of the County government to take proceedings at law against any person causing or responsible for the continuance of any nuisance or condition liable to be injurious or dangerous to human health. The Proponent will be required to undertake necessary measures to ensure such nuisances which may arise during the construction are avoided and mitigated as required. All residual waste shall be cleared from site, any excavated sections will be land filled to avoid any injuries to the public and maximum caution undertaken to prevent any accidents to the public during construction.

4.3.7 Physical and Land Use Planning Act No. 13 of 2019

An Act of Parliament to make provision for the planning, use, regulation and development of land and for connected purposes. Section 55(1) of the Act provide the objectives of development control as: to ensure orderly physical and land use development; to ensure optimal land use; to ensure the proper execution and implementation of approved physical and land use development plans; to protect and conserve the environment; to promote public safety and health; to promote public participation in physical and land use development decision-making; to ensure orderly and planned building development, planning, design, construction, operation and maintenance; and to promote the safeguarding of national security.

In Section 56 of the Act, the Urban Areas and Cities Act (2011) and the County Governments Act (2012), the County Governments shall have the power within their areas of jurisdiction to: prohibit or control the use and development of land and buildings in the interests of proper and orderly development of its area; control or prohibit the subdivision of land; consider and approve all development applications and grant all development permissions; ensure the proper execution and implementation of approved physical and land use development plans; formulate by-laws to regulate zoning in respect of use and density of development; reserve and maintain all the land planned for open spaces, parks, urban forests and green belts in accordance with the approved physical and land use development plans; and consider and determine development planning applications made in respect of land adjoining or within reasonable vicinity of safeguarding areas.

In Section 57 of the Act, a person who commences any development without obtaining development permission commits an offence and is liable on conviction to a fine not exceeding five hundred thousand shillings or to imprisonment for a term not exceeding two months or to both. The Act further states that in case one has commenced a development without obtaining development permission to restore the land on which the development is taking place to its original condition or as near to its original condition as is possible and that such restoration shall take place within ninety days. If no action is taken, then the relevant County Executive Committee Member will restore the land and recover the cost incurred thereto from the developer. In addition, the same section also states that no person shall carry out development within the area of a local authority without development permission granted by the relevant County Executive Committee Member.

The Third Schedule states that any Planning Authorities shall require applications for major developments to be subjected to ESIA. The Proponent shall have to apply for approval from the relevant authorities including the County Government of Machakos and secure approvals prior to commencement.

4.3.8 The Occupational Safety and Health Act, 2007

This is an Act of Parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces, as well as the establishment of the National Council for Occupational Safety and Health and for connected purposes. In Section 3, the Act shall apply to all workplaces where any person is at work whether temporarily or permanently, purposely to: secure the safety, health and welfare of persons at work; and to protect persons other than persons at work against risks to safety and health arising out of, or in connection with, the activities of persons at work.

In Section 6(6) the duty of the Occupier include ensuring the safety, health and welfare at work of all persons working in his workplace, and to register his workplace unless such workplace is exempted from registration under the Act among others.

According to Section 13 of the Act, every employee while at the workplace shall ensure his own safety and health and that of other persons who may be affected by his acts or omissions at the workplace; co-operate with his employer or any other person in the discharge of any duty or requirement imposed on the employer or that other person by this Act or any regulation made hereunder; at all times wear or use any protective equipment or clothing provided by the employer for the purpose of preventing risks to his safety and health among others.

Part VI of the Act gives general health provisions including Cleanliness, overcrowding, ventilation, lighting, drainage of floors, sanitary conveniences, and duty of OSH Officer as to sanitary defects. Part VII covers machinery safety including but not limited to safe use of plant, machinery and equipment, hand held and portable power tools and equipment, hoists and lifts, cranes and other lifting machines, examination and testing of plants. Part VIII of the Act is on safety general provisions namely vessels containing dangerous liquids, storage, ladders, ergonomics at the workplace, safe means of access and safe place of employment, fire prevention, precautions in places where dangerous fumes likely, precautions with respect to explosive or inflammable dust or gas, safety provisions in case of fire, and evacuation procedures. Part IX covers chemical safety specifically on the handling, transportation and disposal of chemicals and other hazardous substances materials, material safety data sheets, labelling and marking, classification of hazardous chemicals and substances, corrosive substances, exposure limits to hazardous substances, control of air pollution, control of noise and vibration, and redeployment on medical advice. Part X of the Act covers welfare general provisions which include supply of drinking water, washing facilities, accommodation for clothing, facilities for sitting, and first aid. Part XI of the Act is on special provisions on health, safety and welfare packaged as permit to work, work processes which may harm persons below eighteen years, supervision of apprentices and indentured learners, training and supervision of inexperienced

workers, meals in certain dangerous trades, protective clothing and appliances, protection of eyes in certain processes, and medical surveillance. Part XII of the Act covers special applications premises where part of building is separate workplace, premises in which steam boilers are used, premises in which hoists or lifts are used, and platforms erected over water. Part XIII of the Act is on offences, penalties and legal proceedings being offences, general penalty, penalty in case of death of injury, forgery, false declaration, penalties on persons committing offence for which occupier is liable, exemption of occupier or owner on conviction of actual offender, proceedings against persons other than occupiers or owners, prosecution of offences, special provisions as to evidence, power to modify agreements, and power to apportion expenses and finally Part XIV of the Act presents the miscellaneous provisions namely posting of abstract of Act, general registers, preservation of registers and records, return of persons employed, approval of plans of workplace premises, occupational safety and health fund, safety and health regulations, power to direct formal investigation of accidents and cases of disease, then repeal and savings.

4.3.9 The County Government Act, 2012

This is an Act of parliament to give effect to Chapter 11 of the Constitution of Kenya, 2010; to provide for County Governments' powers, functions and responsibilities to deliver services and for connected purposes. The Act gave credence to all 47 County Governments by repealing the Local Authority Act. The County Government will perform one of its functions in the form of approving the development. The building plans must be approved by the Machakos County Government (County Physical Planning Officer).

4.3.10 Public Health (Drainage and Latrine) Rules of 1958

Rule 85 provides that every owner or Occupier of every workshop, workplace or other premises where persons are employed shall provide proper and sufficient latrines for use by employees.

Rule 87 requires every Contractor, builder or other person employing workmen for the demolition, construction, reconstruction or alteration of any building or other work in any way connected with building to provide, in an approved, position sufficient and convenient temporary latrines for use by such workmen. Rule 91 provides that no person shall construct a latrine in connection with a building other than a water closet or a urinal, where any part of the site of such building is within 200 feet of a sewer belonging to the local authority which is at a suitable level, and where there is sufficient water supply.

5. ANALYSIS OF PROJECT ALTERNATIVES

5.1 Introduction

This section outlines the main alternatives considered by the Proponent, an evaluation of the impacts of each alternative with clear information on the criteria used to assign significance and an indication of the main reasons for choosing the development proposed taking into account the environmental impacts.

5.2 No Project Alternative

The no development option entails abandoning the whole concept, and leaving the site as it is. The implication of this would be maintenance of status quo. As the Country grows into a middle income economy, as well as increased uptake of solar energy at household, institutional and commercial level, the challenge of managing lead acid batteries will continue to grow. This is guided by the fact that batteries have an average lifespan of 3 years depending on use, after which they have to be replaced. This generates the need for manufacture of new batteries which puts a pressure on environmental resources, while also generating the need for environmentally sound disposal of used batteries. This has partly contributed to mushrooming of informal battery recyclers who have in the past contributed to cases of pollution from lead recycling.

The no project option translates to no intervention which means the demand for lead acid battery will continue to grow, further placing more pressure on need to invest in proper battery disposal facilities.

5.3 Recycling of Batteries

The process of battery recycling poses key environmental and health risks if adequate controls are not put in place. The process entails dismantling used batteries to recover the electrolytes, acid, metal separators and most importantly lead. This process has the risk of emissions corrosion from sulphuric acid, emission of fugitive lead fumes and dust, as well as contamination of land and water by lead. Lead is highly toxic to the environment and human risk. This means that very stringent measures have to be put in place in recycling plants. The risk of informal recycling is also high due to the demand for lead, as well as availability of large quantities of used batteries. This option offers significant risk to the environment.

5.4 Alternative Sites

The proposed site is in a warehouse, in an area that is zoned generally as a heavy industrial area with almost no residential houses thus reducing the risk factor of lead poisoning. Alternative sites will require availability of space in an equally industrial zone with no human settlements, thus this leaves the current site ideal for the project.

5.5 Project Implementation with Mitigation Measures

The proposed facility is not a battery recycling plant, but a servicing facility that adds life to spent batteries thus reducing the need to procure or manufacture new lead acid batteries. The technology uses an organic polymer that is harmless to the environment as well as to human health to restore and regenerate old batteries to work as efficiently as new ones. Offering similar warranties to new batteries.

The technology will use a closed production system that reduces waste thus reducing risk of emissions to air land and water. This offers a chance to make use of best available technology for best environmental practices in management of lead acid batteries.

If well implemented, the risk to the environment and human health will be minimal, while offering greater environmental benefits.

6. IMPACT IDENTIFICATION, ANALYSIS AND MITIGATION MEASURES

6.1 Introduction

The impact assessment section of the ESIA study systematically identifies, characterizes and evaluates the potential impacts arising out of the proposed project and prioritizes them through a semi-quantitative system so that an EMP can be developed and effectively address them. The proposed project involves establishment of a battery servicing plant with its ancillary facilities. Potential environmental impacts may arise from various sequential activities, which form an integral part of the proposed project. Impacts are examined under two categories i.e. negative impacts and positive impacts. The various impacts in these two categories are then examined in order of their level of importance and significance. They are also examined in categories of their time of occurrence (design cum construction or operational phase).

The inputs used for identifying all project aspects include review of proposed project documentation and consultations with the Proponent and the community at large. Environmental and socio-economic components were identified based on review of legislation and baseline environment, site reconnaissance visits, and discussions with stakeholders and the Consultant's professional judgment.

This section begins with a summary of identified possible pollution sources, before detailing the methodology used to identify the possible impacts, then analysis of possible impacts and their mitigation measures.

6.2 Possible Pollution Sources

Pollutants generated due to the project activities during both the construction and operation phase are solid, liquid and gaseous in nature. Generation of pollutants can be continuous, periodic or accidental. Sources of pollutants and their characteristics during the design and operation phase are as summarized in the table below.

Table 4: Summary of possible pollution sources

Phase/Stage	Pollution Source
Receiving and inspection of batteries	Possible spillages of sulphuric acid
Cleaning of Batteries	Possible contamination of cleaning water with acid and traces of lead
Charging and discharging	None
Addition of Polymer	None
Storage of Batteries	Possible spills in case of breakages

6.3 Summary of identified impacts

The tables below summarizes the impacts identified, both positive and negative. The table also outlines the impacts that have been scoped out of this study, so as to allow for detailed analysis of significant impacts only.

Table 5: Summary of Identified Impacts

Design & Construction Phase	
Positive Impacts	**Negative Impacts**
Employment opportunities	Noise pollution
Promote trade	Dust pollution
	OSH concerns
	Poor aesthetics
Operation Phase	
Positive Impacts	**Negative Impacts**
Employment opportunities	OSH concerns
Solution to battery waste management	Waste generation
Reduction of demand for new batteries thus reduced demand for lead	
Decommissioning Phase	
Positive Impacts	**Negative Impacts**
Employment opportunities	Increased solid waste
Recycling opportunities	OSH concerns
Opportunity for land redevelopment/optimization	Energy demand

6.4 Detailed Analysis of Impacts

6.4.1 Positive Impacts during Construction & Installation Phase

I. **Employment:** The proposed project will require both skilled and unskilled labour during the construction phase. This will generate employment opportunities for masons, machine operators, plumbers, electricians, mechanical personals, casual labourers, engineers, among others.

   In addition to this, the need for support facilities during construction will further generate additional employment in the form of vendors who will supply provide goods and services to construction workers at the site.

II. **Revenue Generation:** The proposed project relies on the BSI technology that will be imported. This will translate to taxes and duties thus revenue. Material sourcing and procurement, wages and salaries, as well as payment of various statutory charges will also contribute to revenue.

III. **Create Market for Construction Material Dealers:** Various construction materials e.g. cement, couplers, welding materials, wood, sheet metal, metal bars, paint, among others as may be necessary to fit and fix the plant as designed in the warehouse. Most of these materials will be sourced locally hence promoting the respective local dealers save for the ones which will be imported as may be inevitable given that the BSI technology to be used is an 'import' whereby the foreign dealers too will be beneficiaries.

IV. **Skill Transfer:** The BSI technology to be adopted is a new technology hence local staff shall benefit from the training which shall be offered by the foreign technicians/experts who have good knowledge and experience on the BSI technology during plant installation and also operation.

6.4.2 Negative Impacts during Construction & Installation Phase

I. **Noise Pollution and Vibration:** Noise and vibrations from light construction activities during fitting and fixing the plant as designed in the warehouse shall be inevitable.

Mitigation Measures: *By virtue of the plant being predesigned and assembled for fixing in the already existing warehouse, noise during this phase will be minimal and within acceptable limits. In the interest of environmental conservation, it is advisable that the Proponent during the plant installation commissions a noise survey so as to document the baseline noise status at the workplace for future reference.*

II. **Dust Pollution:** Partitioning of the warehouse will involve some activities e.g. wall building, wall drilling, wall chipping, cleaning, among others which shall generate some dust.

Mitigation Measure: *The dust likely to result from the installation phase of the plant will be minimal given that the plant will be installed in an already existing warehouse. Water shall be sprinkle on any loose surface as applicable to ensure dust resulting from the installation and partitioning tasks is suppressed.*

III. **OSH concerns:** The site will assume the status of a workplace immediately installation/construction works starts. Workplace incidents e.g. near miss, dangerous occurrence, accidents and occupational diseases will be likely.

Mitigation Measures: *The Proponent will strictly adhere to the provisions of OSHA, 2007 so as to ensure optimal levels of safety and health at the workplace. This will include:*

- *Inculcating the culture of Risk Assessment at the workplace to shape decision making,*
- *Appointment of a Safety Supervisor as provided in the Factories (Building Operations and Works of Engineering Construction) Rules, 1984,*
- *Conducting Job Safety Analysis to tasks as may be applicable;*

- *Subscribing to the Permit to Work System at the workplace,*
- *Recruiting competent persons and ensuring workers requiring training are trained and those requiring supervision are supervised to curb workplace incidents,*
- *Providing appropriate PPE to workers as task may demand and ensuring they are compulsorily used,*
- *Ensuring statutory training to workers are effected at the workplace, among others.*

IV. Waste Generation: The installation/construction works will generate some wastes though minimal. Liquid waste to result from installation phase activities will be general waste e.g. cleaning and sanitation liquid waste, etc. Solid waste will include wooded and metallic off cuts, packaging wastes, etc.

Mitigation Measures: *The liquid waste arising from the installation/construction phase activities shall be managed through the existing elaborate liquid waste management system serving Scarlet Business Park. Solid waste anticipated will be collected through the help of labeled and strategically placed waste bins at the workplace. The solid waste will be re-used at the project to the extent feasible, re-sold where applicable and the waste which remains as waste will be disposed through a NEMA licensed entity at minimum.*

6.4.3 Positive Impacts during Operation Phase

I. Employment: The facility will generate employment both directly and indirectly. Technical and non-technical staff will have to be recruited to work in the facility. In addition, sourcing for, transportation and delivery of batteries will generate additional employment. Services of various consultants will be required to offer various services including statutory obligations spelt out in EMCA Cap 387, OSHA (2007), among others.

II. Waste Reduction: Battery waste is significant since thousands of lead acid batteries run out of their life span every year. This has generated a market of informal recyclers who have contributed to lead pollution. This technology gives life to dead batteries thus reducing the quantities of waste batteries that need to be recycled or disposed.

III. Reduced Lead Pollution: Giving batteries new life will translate into reduced demand for new production of batteries thus reduced demand for lead which is a toxic heavy metal. The BSI technology to be employed discourages informal battery recycling rampant locally. This effectively reduces the challenge of lead pollution in the Country.

IV. Lowering Diseases Burden: Poisoning by lead or a compound of lead is among the prescribed occupational diseases in the Second Schedule of OSHA, 2007 laws of Kenya. Lead is believed to result in 0.6% of the world's disease burden, with

adult lead poisoning mainly being of occupational origin (Needleman H., 2004). Lead toxicity as per Gracia R. C. and Snodgrass W. R. (2007) remains a significant public health concern. The BSI technology to be employed safeguards the worker from lead exposure by ensuring that the system is automated and closed. Further the BSI technology has given battery servicing edge over battery recycling hence discouraging informal battery recycling facilities which globally are known in the occupational and public health corridors for rising poisoning by lead burden.

6.4.4 Negative Impacts during Operation Phase

I. Poor Air Quality: Conventional lead recycling facilities face the risk of lead emissions to air during smelting process. With regards to the proposed project, the process does not involve smelting or recovery of lead. Further an automated closed system shall be at play to actualize the process save for the battery inspection phase which will be exempted from the closed system. Thus the possibility of degrading air quality at the workplace from the process agents is low.

Mitigation Measures

- *The Proponent shall ensure that the plant operates optimally all through to address any accidental release of emission at the workplace and to extension the environment,*
- *The Proponent shall ensure that exposure of indoor air pollutants does not exceed the exposure limits stipulated under the Factories and Other Places of Work (Hazardous Substances) Rules, 2007 or under any other relevant law,*
- *The Proponent shall ensure that measurements of the substances in the air are carried out at least once every twelve months by a certified air quality monitor, in order to determine the prevailing occupational exposure levels, and*
- *The Proponent shall at minimum abide by the provisions of the Environmental Management and Coordination (Air Quality) Regulations, 2014.*

II. Water Pollution

- During the cleaning process, there is risk of traces of lead contaminating the water used in case of broken batteries,
- During draining of acid from the batteries there is risk of spillage of sulphuric acid contaminated with lead,
- When industrial batteries are opened up for cleaning there is risk of lead contaminates spillages, and
- This spillages if in significant quantities and if not well managed may be washed during cleaning and find their ways into water bodies leading to pollution.

Mitigation measures:

- *Spoilt batteries will not be accepted for Servicing,*
- *The facility will begin operations with normal lead acid batteries that do not require opening thus reducing risks of lead exposure,*

- *The main technical staff will undergo training from the equipment supplier prior to set-up,*
- *All staff to undergo sensitization and training on safe practices within the plan,*
- *The activities within the plan are automated in a closed system to reduce the risk of spillages,*
- *All the acid is captured within the system and recycled back thus no need for disposal effectively reducing the pollution risk, and*
- *The organic compound used for refurbishment is environmentally safe thus no risk to health and environment (certifications provided in annexes).*

III. Emissions to Land

Emissions to land may occur if contaminated materials are not properly handled and disposed. This may include acids from the batteries, contaminated electrolytes and lead. The facility will handle lead acid batteries thus need for proper handling and storage to reduce spillages and waste.

Mitigation measures:

- *All batteries will be inspected for physical damage prior to being accepted for refurbishment. This will reduce the need to dispose spoilt batteries,*
- *All workstation floors shall be resin impermeable flooring so as to prevent liquids penetrating into the soil,*
- *All operations shall be strictly limited at the resin impermeable floor workstations so as to prevent liquids penetration into the soil*
- *Preferably colour coded waste bins or an equivalent shall be provided strategically at the workplace to facilitate solid waste management,*
- *Solid waste production and disposal records shall be kept at the workplace for future reference,*
- *Process related liquid waste by design shall be isolated from the black and greywater streams:*
    - *The process wastewater will be directed into the plant's designated wastewater treatment plant under management of a NEMA licensed company for hazardous waste for treatment to acceptable limits and disposal as may be appropriate, whereas, and*
    - *The blackwater and greywater from the facility will be disposed through the elaborate wastewater system serving Scarlet Business Park (relying on a Biodigester) within which the facility shall be located.*
- *Solid waste management at the facility shall be strictly guided by the provisions of the Environmental Management and Coordination (Waste Management) Regulations, 2006, and*
- *Liquid waste management at the facility shall be strictly guided by the provisions of the Environmental Management and Coordination (Water*

Quality) Regulations, 2006.

IV. Occupational Safety and Health Concerns

The operational phase of the proposed project will fully assume the status of a workplace and like any other place where people are working, workers may encounter a work related incident in the course of work e.g. contract an occupational disease like lead poisoning, fire outbreaks leading to injuries or even death, back injuries, muscle strain, skin inflations, slip, trip, falls, etc.

Mitigation Measures:

- *The Proponent shall ensure that the plant operates optimally all through for optimal safety and health at the workplace,*
- *The Proponent will maintain appropriate work procedures which all employees must follow while at work,*
- *The Proponent will ensure that thorough examinations and tests of all engineering control measures are carried out at intervals not exceeding 24 months by an engineering controls examiner, a report issued and the recommendation therein fully implemented,*
- *The Proponent shall inform the workers of the hazards associated with exposure to chemicals used at the workplace and shall facilitate the training of the worker on safety,*
- *The Proponent shall ensure that workers undergoes medical examination in accordance with the requirements of the Factories and Other Places of Work (Medical Examination) Rules (2005),*
- *Proponent shall provide appropriate PPE to workers as per the task demand,*
- *Prohibition of smoking, eating or drinking at the production area at the workplace and have designated area(s) for the latter;*
- *Proponent shall maintain an updated inventory of MSDS for all chemicals used at the workplace for future reference,*
- *Proponent shall avail MSDS for all chemicals used at the workplace to the users who shall compulsorily adhere to the provisions therein,*
- *The Proponent shall strictly adhere to the provisions of the Factories and Other Places of Work (Hazardous Substances) Rules (2007), and*
- *The Proponent shall strictly adhere to the provisions of OSHA, 2007 for optimal safety and health at the workplace.*

7. PUBLIC CONSULTATION AND PARTICIPATION

7.1 Introduction

Public consultation and participation is basically concerned with involving, informing and consulting the general public and the directly affected persons in planning, management and other decision-making activities. The Environmental Impact Assessment and Audit Regulations, 2003 requires comprehensive public participation to be done during the EIA process.

Public participation for the proposed project was carried out with the following main aims:

- To inform the project area people, directly affected traders, leaders and other stakeholders about the proposed project and its objectives,
- To seek views, concerns and opinions of people in the project area concerning the proposed project
- To establish whether the project area people anticipate any positive or negative impacts from the proposed project, and the applicable mitigation measures for the identified negative impacts, and
- To ensure that all stakeholder interests are identified and incorporated in the proposed project.

7.2 The Public Participation Methodology

The following methodology was adopted during the public participation exercise:

7.2.1 Stakeholders Identification

The ESIA team identified the key stakeholders for the proposed project. The stakeholders included immediate neighbours operating within Scarlet Business Park (a total of five tenants were identified and targeted); neighbouring industries and business establishments within the proposed project vicinity which included Jumbo Quality Products, Petro City Service Station, Oasis Business Park, Ndovu Cement, Bamburi Cement Factory, Mombasa Cement and the Sabaki Residents.

7.2.2 Public Participation Avenues

The public participation avenues that were used to get information from the stakeholders included:

- Initial Interviews,
- A virtual meeting, and
- Administration of a predesigned questionnaires.

7.3 Public Participation Findings

7.3.1 The Stakeholders' Virtual Meeting

In an effort to comply with the Government's directive suspending all public gatherings, meetings and events following the outbreak of Coronavirus disease (COVID-19) pandemic in the country. The Proponent in consultation with the study team and the stakeholders opted to hold a virtual/online meeting via zoom. The virtual/online meeting was held on Thursday, May 21, 2020 from 1200hrs to 1315hrs.

The participants unanimously agreed that since the proposed project is merely a battery serving facility and not a battery recycling or manufacturing facility, the anticipated negative impacts can be adequately mitigated and the positive impacts enhanced for sustainable development. The virtual public participation meeting minutes for the proposed project duly signed by representatives of all parties are attached to this report.

7.3.2 The Predesigned Questionnaire

The environmental experts administered twenty (20) copies of the questionnaire to the key stakeholders and affected persons. Of the administered questionnaire copies, sixteen (16) were filled and returned to the study team. The table below summarizes the key issues raised by the 16 respondents who filled and returned the questionnaire to the study team; see the filled questionnaires as attached to this report.

Table 6: Summary of comments made by the questionnaire respondents

S/N	Name of Participant	Organization	Address/Contacts	Comments
1.	Mohammed Altah	Exon Industries (PTY) Limited	P.O Box 10186-00200, Nairobi	Project is good.
2.	Dunn Kimiti Mwangi	Eurostar Industrial Limited	29978-00100 Nairobi	The project will not affect our company and our surrounding in anyway, so I have no problem with the proposed project.
3.	Peter Gitahi	Axiom Manufacturers Limited	Scarlet Business Park	Project will not affect us. To proceed with business.
4.	Omboko Fredrick Onyango	Consultant, Development Studies	Shaba Village A50	Project will allow reuse of batteries reducing cost of batteries, create employment as well as help protect environment from effects associated with disposal of used batteries. It is a step in the right direction in helping reduce carbon footprint and protect our environment.
5.	Jacob Odeny	Area Resident	Sabaki	It seems a simple noble project geared towards helping solve environmental issues posed by battery disposal.
6.	Dinya Lubricants Chemical Limited	Neighbour	Scarlet Business Park	It is a good project.
7.	Rainbow Mabati Factory	Neighbour	P.O Box 62602-00200, Nairobi	No form of pollution expected from the proposed project.
8.	Benard Muli	Petro City Enterprises Limited	P.O Box 41961, Nairobi	It will have a positive impact in our area by creating jobs for the jobless. It will also affect us positively by being one of our customers.
9.	Ivonne Juma	Automaxx Services Limited	P.O Box 701-00242, Kitengela	Project should ensure proper waste management. Minimal pollution expected from air, soil and water pollution.
10.	Rushein Delwash	Mombasa Cement Limited	P.O Box 551-00204, Athi River	The project will improve employee welfare, create employment and increase GDP as well as taking care of

S/N	Name of Participant	Organization	Address/Contacts	Comments
				environment. The proponent should allow for periodic checks by related government agencies including OSH and environmental audits. The project will definitely improve our social and economic welfare of the County as well as Nation.
11.	Rupen M. Budheo	Jumbo Quality Products	Scarlet Business Park B	The main concern is waste disposal, if that is well managed then it looks like a safe project.
12.	Emmanuel Mushira	Davis and Shirtliff	Oasis Business Park	The project will curb in reducing environmental degradation.
13.	Margaret Karanja	Mold Plast Kenya Limited	Oasis Business Park	It will create employment opportunity which will contribute to economic growth.
14.	Mohammed Shin	Sana Holdings Limited	Oasis Business Park	It's a good project because it creates jobs for the jobless youths in the country.
15.	Gladys Mwikali	Miss Beauty Co. Limited	P.O Box 1676-90100, Machakos	The project should be approved.
16.	Nguitui John	Greenleaf Services Limited	P.O Box 61206-00200, Nairobi	We believe it is a noble project that will help in reducing the impact on the environment.

8. ENVIRONMENTAL MANAGEMENT PLAN

8.1 Introduction

This EMP is a site-specific document which has been developed to ensure that the Proponent can implement the proposed project in an environmentally sustainable manner. Additionally, the EMP through the documentation of the anticipated impacts, mitigation measures, assigning of responsibilities, and the relative cost element attached to implementation of the mitigation measures guide in ensuring sustainable development all along the project cycle.

The EMP includes four major elements;

- Commitment & Policy: The Administration will strive to provide and implement the EMP that incorporates all issues related to air, land and water for the proposed project,
- Planning: This includes identification of environmental impacts, legal requirements and setting environmental objectives,
- Implementation: This comprises of resources available to the developers, accountability of contractors, training of operational staff associated with environmental control facilities and documentation of measures to be taken, and
- Measurement & Evaluation: This includes monitoring, corrective actions, and record keeping.

8.2 Design/construction and operational phase EMP

The EMP for the proposed battery serving facility during the design/construction and operational phase as proposed is shown in table 7 below.

Table 7: Design/Construction and Operational Phase Environmental Management Plan

Development Stage	*Potential Impact*	*Recommended Mitigation Measures*	*Responsibility & Timeframe*	*Targets and Cost Estimates*	*Monitorable Indicators*
Installation/ Design Phase	Environmental Pollution	Ensure contractor undertaking on environmental considerations, Monitor trends on safety and health of design workers and neighbourhood, Sprinkle water to harness dust during offloading of construction materials, and Contractor to maintain material balance records at all times.	Proponent and Contractor Continuous throughout design period	Sustainable design No direct cost involved	-Complaints from neigbourhood, -Concerns from environmental authorities and local authorities.
	Waste Management	Disposal of waste be done in accordance to the Waste Management Regulations (2006) and Water Quality Regulations (2006), Colour coded waste handling bins should be provided within the premise and arrangements made for frequent emptying, Ensure good housekeeping to ensure reduction of litter, Contractor to undertake safe waste disposal, verify legality of waste disposal destination,	Proponent and Contractor Continuous throughout design period	Safe design waste management **Kshs. 50,000**	Compliance with the Waste Management Regulations (2006) and Water Quality Regulations (2006)

		The liquid waste arising from this phase activities shall be managed through the existing elaborate liquid waste management system serving Scarlet Business Park, and Solid waste will be re-used at the project to the extent feasible, re-sold where applicable and the waste which remains as waste will be disposed through a NEMA licensed entity at minimum.			
	OSH Concerns	Provide workers with appropriate PPE, Train workers on manual handling techniques, Train workers on first aid administration, Provide and maintain adequately stocked first aid kit(s) at the workplace, Inculcate a culture of Risk Assessment at the workplace to shape decision making, Appointment of a Safety Supervisor as provided in the	Proponent and Contractor During design	Reduced accidents and costs **Kshs. 100, 000**	Accident reports

		Factories (Building Operations and Works of Engineering Construction) Rules, 1984, Conducting Job Safety Analysis to tasks as may be applicable, Subscribing to the Permit to Work System at the workplace, Recruiting competent persons and ensuring workers requiring training are trained and those requiring supervision are supervised to curb workplace incidents, Providing appropriate PPE to workers as task may demand and ensuring they are compulsorily used, and Ensuring statutory training to workers are effected at the workplace, among others.			
	Social Aspects	Address concerns of neighbouring land users and tenants as per this report, Integrate public safety in the design	Proponent and Contractor Initiate action	Social harmony No direct cost involved	Residents complaint Public opinion

		process, Utilize local labor for design to enhance social harmony.	with design		
	Noise pollution and vibration	Noise during this phase will be minimal and within acceptable limits. The Proponent will commission a noise survey so as to document the baseline noise status at the workplace for future reference.	Proponent	**Kshs. 35,000**	Complaints from neighboring tenants Noise survey report
	Dust Pollution	Sprinkle water on any loose surface as applicable to ensure dust resulting from the installation and partitioning tasks is suppressed.	Proponent and Contractor	**Kshs. 10,000**	Complaints from neighbouring tenants.
Operation Phase	Environmental Pollution: *-Possible spillages of sulphuric acid,* *-Possible contamination of cleaning water with acid and traces of lead*	Equipment specifications to conform with environmental standards, Integrate environmental components in the site design (waste management, emission controls, etc.), Apply to the extent possible provisions of the Water Quality Regulations (2006), Machakos County by-laws, Public Health Standards, etc., and Enhance in-house awareness and sensitization on environmental protection initiatives,	Proponent Immediately and continuous.	Integration of environmental components/ideas in the site operations. **Kshs. 200,000** per year	Discharges into the public drainage system, Related health effects to the site operators, Public complaints
	Solid Waste Management	Contract NEMA registered waste handler.	Proponent Immediately and	Streamlined waste flow paths.	Waste categories and separation,

		Waste handling bins preferably colour coded should be provided within the premise and arrangements made for frequent emptying, Ensure good housekeeping to ensure reduction of litter, Solid waste production and disposal records shall be kept at the workplace for future reference, Embrace the 3R's concept (Reduce, Reuse and Recycle) at the workplace, Reuse of packaging materials, Raise awareness among the staff about waste minimization, Compliance to the Waste Management Regulations (2006), In-house training on waste management options for managers and supervisors, and Provide leadership in waste recycling and re-use.	continuous.	**Kshs. 200,000** per year	Mode of transfer Final destinations.
	Water Pollution *-risk of traces*	Spoilt batteries will not be accepted for Servicing,	Proponent Immediately and	Streamlined management of waste water.	Effluent Discharge License

	of lead from broken batteries, *-Risk of sulphuric acid spillage during draining of acid from the batteries*	The facility will begin operations with normal lead acid batteries that do not require opening thus reducing risks of lead exposure, The staff will undergo training from the equipment supplier prior to set-up, All staff to undergo sensitization and training on safe practices within the plan, The activities within the plan are automated in a closed system to reduce the risk of spillages, All the acid is captured within the system and recycled back thus no need for disposal effectively reducing the pollution risk, The organic compound used for refurbishment is environmentally safe thus no risk to health and environment (certifications provided in annexes), Regular monitoring of drainage channels, Avoid materials that block the drainage	continuous.	**Kshs. 150,000** per year	Analysis reports

		system, and Ensure compliance to Water Quality Regulations of 2006.			
	Emissions to land *(Acids from the batteries, contaminated electrolytes and lead)*	All batteries will be inspected for physical damage prior to being accepted for refurbishment, All workstation floors shall be on resin impermeable flooring to prevent liquids penetrating into the soil, All operations shall be strictly limited at the resin impermeable floor workstations to prevent liquids penetration into the soil, Process related liquid waste shall be isolated from the black and greywater streams, The process wastewater will be directed into the plant's designated wastewater treatment plant under management of a NEMA licensed company for hazardous waste for treatment to acceptable limits and disposal as may be appropriate, and	Proponent Immediately and continuous.	Streamlined management of wastes. Operating in harmony with surrounding tenants and communities **Kshs. 180,000** annual estimates	Effluent Discharge License Analysis reports

		The blackwater and greywater from the facility will be disposed through the Biodigester system serving Scarlet Business Park.			
	Air Quality	Address any accidental release of emission at the workplace and to extension the environment, Exposure of indoor air pollutants should not exceed the exposure limits stipulated under the Factories and Other Places of Work (Hazardous Substances) Rules, 2007 or under any other relevant law, Air quality measurements of the substances in the air should be carried out at least once every twelve months by a certified air quality monitor to determine the prevailing occupational exposure levels, and Abide by the provisions of the Environmental Management and Coordination (Air Quality) Regulations, 2014.	Project Manager Throughout operation	Reduced concentrations of aerial pollutants **Kshs. 80,000** per year.	Public complaint No occupational related diseases
	Social Aspects	Draw of-site contracts to enhance socially acceptable procedures, Involve more independent interested parties (licensed waste collectors) in	Proponent Upon commissioning then continuous	Social acceptability and co-existence. No cost	Health problems and degradation of environmental resources,

		establishing options for waste recycling,			The public opinion, Satisfaction to the relevant authority
	Occupational Safety and Health Concerns *(lead poisoning, fire outbreaks leading to injuries or even death, back injuries, muscle strain, skin inflations, slip, trip, falls)*	Ensure the plant operates optimally all through for optimal safety and health at the workplace, Maintain appropriate work procedures which all employees must follow while at work, Thorough examinations and tests of all engineering control measures should be carried out at intervals not exceeding 24 months by an engineering controls examiner, Inform workers of hazards associated with exposure to chemicals at the workplace and facilitate the training of the worker on safety, Ensure workers undergo medical examination in accordance with the requirements of the Factories and Other Places of Work (Medical Examination) Rules (2005),	The proponent Immediately and continuous	Quick and effective response to emergencies. Annual budget of **Kshs. 150,000**	The security and safety of the neighbouring premises, Safety cases over a period of time, Response period on safety and medical aspects.

		Provide appropriate PPE to workers as per task demand, Prohibition of smoking, eating or drinking at the production area at the workplace and have designated area(s) for the latter, Maintain an updated inventory of MSDS for all chemicals used at the workplace for future reference, Strictly adhere to the provisions of the Factories and Other Places of Work (Hazardous Substances) Rules (2007), Strictly adhere to the provisions of OSHA, 2007 for optimal safety and health at the workplace, Maintain safety reticulation (e.g. fire detection and fighting equipment), Install all machines and equipment with protective guard rails at the moving parts, Adequately stocked First Aid box(es) should be provided and should be readily accessible,			

		There shall be most current emergency telephone number poster displayed within the premise, Enough space must be provided within the premises to allow natural ventilation, and Floors should be free of debris, spillages and any tripping hazard.			
	Noise levels	Initiate a noise mapping programme and keep monitoring, and Train, provide ear muffs and enforce compliance.	The Supervisors Upon commissioning and continuous.	Compliance Kshs. **50,000** for equipment and professional guidance.	Occupational levels of 90 dBA, External receptors as defined under the Noise and Excessive Vibration Pollution Control Regulations, 2009
	Compliance aspect	Develop an environmental policy, Establish a legal register on critical relevant environmental laws, Annual environmental audits as required by law, and Develop Standard Operation Procedures focusing on environment,	The proponent Continuous	An all time compliance **Kshs. 150,000** per year	To ensure compliance with laid down guidelines at all times

		health and safety.			
	Institution Framework	Adapt environmental aspects in administrative framework, Review the contracting arrangement at all levels of the operations, Establish a monitoring and reporting protocol on environmental conservation, and Engage a professional to oversee environmental management.	The proponent Continuous	Coordinated environmental management No direct costs anticipated	To ensure that all actions on environment are integrated in the future corporate business plans
	Energy use	Encourage the use of energy saving bulbs, Switching off lights when not in use, Consider the use of other renewable energy forms such as solar to supplement energy use in the building, and Installation of only type approved gadgets within the premises.	The proponent Continuous	Efficient energy use To be determined	To ensure proper and documented targets of energy used.
	Water use	Put in place measures for quick detection and repair of pipe leaks, Ensure taps are not left running, Install water conserving taps that turn off immediately when not in use, and	The proponent Continuous	Efficient water use To be determined	Amount of water used

		Ensure close monitoring of the water used.			
	Capacity Building (*Documentation and human resources capacity*)	Establish an information resource point (for reference by the site operators), Document in-house guidelines and procedures on environmental management, Develop a training programme for workers on safety, health, and environment, and Engage a qualified staff to oversee environment, health and safety.	The proponent Continuous.	Sustainability and sharing with others.	To provide necessary knowledge, tools and awareness to all workers for effective human resource capacity development.
	Physical infrastructural capacity	Establish a waste collection, transfer and storage mechanisms, Characterize and identify all waste streams up to final destinations, Monitor the carrying capacity of the environmental infrastructure receiving the wastes, and Install monitoring facilities along the waste pathways.	The proponent Continuous.	No direct costs involved.	This provide organized system for the workers with respect to environment, health and safety protection
	Collaboration	Collaborate with other players on environmental protection, waste	The proponent	Sustained capacity building	Relevant government

		management programmes.			bodies
Decommissioning	Compost impacts		The proponent, NEMA, CGM and environmental expert. Process to take a month on a pre-agreed schedule	Rehabilitated site Costs to be Identified through the decommissioning audit report	Air quality and soil status in the area. Social and economic implications in the area Destination of waste material disposal.

8.3 Project Decommissioning

Decommissioning refers to the final disposal of the project and its associated materials at the expiry of the project lifespan. It is the last stage involving winding up of the operational activities of a particular project and safe removal of all materials resulting from the decommissioning activities.

Decommissioning releases valuable assets and sites for alternative use, recycling and reuse of materials and the restoration of environmental amenity. It aims at achieving an end-point that is sensible in technical, social and financial terms, that properly protects workers, the public and the environment as well as complying with the basic principles of sustainable development. In this period, the proponent should:

- Notify NEMA and other relevant authorities on intension to stop operations at least 3 months in advance
- Carry out a decommissioning audit and submit report to NEMA for review six months in advance
- Close down equipment and participate in the plan for site inspection
- Initiate removal following strictly recommendations of the decommissioning audit report
- Initiate a programme to rehabilitate the site to near its original state
- Monitor the site on related parameters for 1 year

Table 8: Decommissioning Phase Environmental Management Plan

Expected Negative Impacts	Recommended Measures	Responsible Party	Time Frame
Scrap materials and other debris (overburden soil, used internet and electrical cables, steel metals, reflector materials, etc.)	• Use of an integrated solid waste management system i.e. through a hierarchy of options. • Wastes generated as a result of facility decommissioning activities will be characterized in compliance with standard waste management procedures. • The contractor will select NEMA approved disposal locations and the county government based on the properties of the particular waste generated.	Proponent & Contractor	During decommissioning

Expected Negative Impacts	Recommended Measures	Responsible Party	Time Frame
	• All facility, machinery, equipment, structures and hand tools that will not be used for other purposes should be removed and reused or rather sold/given to scrap material dealers.	Proponent & Contractor	During decommissioning
	• Where recycling/reuse of the machinery, equipment, structures and other waste materials is not possible the materials should be taken to NEMA approved dumpsites by a duly registered waste transporter.	Proponent & Contractor	During decommissioning

9. CONCLUSION AND RECOMMENDATION

9.1 Conclusion

This ESIA report has been prepared for this project based on baseline environmental data collected for the study area. Identification and prediction of significant environmental impacts due to the proposed project with an Environmental Impact Statement followed by delineation of appropriate impact mitigation measures in an EMP are included in the ESIA Study Report.

The proponent should commit to adhere to issues raised in this report and fully implements the aforesaid mitigation measures and ensures full compliance with environmental laws and regulations. The implementation of the EMP forms basic tenets of successful implementation of the project and the proponent promises to ensure its full application.

9.2 Recommendations

- Need to undertake ambient lead levels in air quality within the facility.
- Adhere to the provisions of the formulated Environmental Management and Monitoring Plan to mitigate the predicted negative environmental and social impacts during construction, operation, and decommissioning phases.
- Conduct statutory annual environmental audits through licensed experts during operation phase.
- During full operation of the proposed development, adhere to waste management regulations i.e. through contracting solid waste handler to manage all the waste generated within the premises.
- Ensure that all operation permits and licenses have been acquired and strict adherence to various law provisions observed accordingly.
- Modification and construction of proper storm water drainage systems simulating the natural landscape and drainage patterns to ensure for proper storm water flow within and outside the premises.

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APPENDIX

1. Rolta East Africa Limited's NEMA Practicing License.
2. EIA/EA Lead Experts' NEMA Practicing License.
3. Plant Layout and Designs.
4. Public Participation Questionnaires.
5. Evidence of Approval of EIA Study TOR by NEMA.
6. Minutes of the Virtual Public Participation Meeting.
7. Land Ownership Documents.
8. Polymer ISO Certification.

PICTORIAL PRESENTATION

Neighbouring Petro City Service Station and Mombasa Cement

Part of the Rented Warehouse where the proposed Plant will be Located

Neighbouring Jumbo Quality Products Limited

Part of Scarlet Business Park