nema

ACKNOWLEDGEMENT OF ENVIRONMENTAL IMPACT ASSESSMENT PROJECT REPORT

Tel: +254 20 6005522/3/7, 6001945
Wireless: +254 20 210370
Mobile: 0724 253 398, 0733 600 035
E-mail: dgnema@nema.go.ke

Popo Road, Off Mombasa Road
P.O. Box 67839-00200
Nairobi, Kenya
Website: www.nema.go.ke

Application ID : **NEMA/EIA/PSR/13563**

Reference No : **NEMA/PR/5/2/21517**

Date : **08-Apr-19**

Name of Proponent : **SANERGY LIMITED**

Proponent Address : **25523 -00100 NAIROBI**

RE : ACKNOWLEDGEMENT OF ENVIRONMENTAL IMPACT ASSESSMENT PROJECT REPORT

The National Environment Management Authority (NEMA) acknowledges receipt of five (5) copies of

Environmental Impact Assessment Project Report prepared by
EDGAR EREDI MUYESU

(EIA/Audit Lead Experts/Firm of Experts). We have also received 100% / raised an invoice of the 0.1% EIA licensing fee.

The reference number for the EIA project report is **NEMA/PR/5/2/21517**
for any future correspondence.

The report will be reviewed in accordance with the Environmental Impact Assessment and Audit Regulations 2003, and NEMA will communicate its assessment / findings within 28 to 45 working days.

On the interim, please do not commence or proceed with any development of the proposed project until you receive communication from NEMA on the same.

BONFACE MAMBOLEO
HEAD OF EIA SECTION

ENVIRONMENT IMPACT ASSESSMENT (E.I.A) PROJECT REPORT

FOR

THE PROPOSED BLACK SOLDIER FLY BIOWASTE PROCESSING FACILITY ON PLOT L.R. No. 23961 KINANIE, WITHIN EPZA LAND, MACHAKOS COUNTY

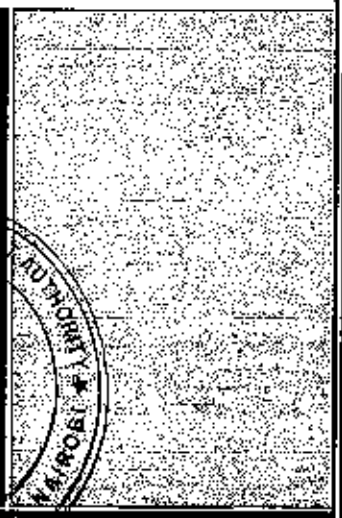
GPS COORDINATES

1°21'04.2"S 37°03'11.7"E
(-1.351155, 37.053242)

2019

PROPONENT

SANERGY LIMITED
P.O. BOX 25523-00100
NAIROBI



CERTIFICATION

CERTIFICATION BY EIA EXPERT

EDGAR AMBAZA (1916) Signature: _____

Ezekiel Olukohe (8379) Signature: _____

Date: 05/04/2019

CERTIFICATION BY PROPONENT

PROPONENT: SANERGY LIMITED

NAME: ALEX K.J. MANYASI

DESIGNATION: DIRECTOR Signature: _____

DATE: 05/04/2019.

SANERGY LTD
Company Seal/Stamp
05 APR 2019
Sign:
P.O. Box 24523-00100 NBI; TEL: 0788511824

ACRONYMS

Acronym	Description
BS	British Standard
dB(A)	Decibels on the A-Scale
EA	Environment Audit
EHS	Environment, Health & Safety
EIA	Environment Impact Assessment
EMCA	Environmental Management and Coordination Act
ESM	Environmentally Sound Management
PMx	Particulate Matter
MSDS	Material Safety Data Sheet
NEMA	National Environment Management Authority
NFPA	National Fire Protection Association – USA
OSHA	Occupational Health and Safety Act
DHP	Designated Health Practitioner
KEBS	Kenya Bureau of Standards
HSEQ	Health Safety Environment and Quality
ISO	International Standards Organization

5-DOL: Abbreviation for Five-Day-Old-Larvae. Keeping the hatchlings in a controlled and protected environment for five days after hatching increases the survival rate and allows the larvae to be counted before they are added to the biowaste.

Adult: The final development stage after pupation. With insects, this is usually called "imago".

Anaerobic digestion: Degradation of organic compounds by microorganisms in the absence of oxygen, leading to the production of biogas.

Ant trap: Protects from ant invasion. Each table leg is placed into a container filled with water and a drop of detergent. The detergent reduces the surface tension of the water.

Attractant: Smelly liquid substance that attracts BSF females to lay eggs nearby. Usually, this contains different smelly substances like fermenting fruit, dead flies or residue. BSF eggs have also been found to act as an attractant. It is, therefore, advisable not to harvest eggs every day as the already laid eggs attract other females.

Batch operation: In batch operation, a defined amount of waste and larvae are added to a container, which is harvested after a certain time. Batch operation is in contrast to continuous operation, where waste and larvae are added continuously to the same container. The container is only emptied once it is full.

Biowaste: Generally, all biodegradable matter. In this particular context, it does not include waste high in cellulose (e.g. garden waste, wood, grass clippings, leaves, etc.) as this cannot be easily digested by the larvae.

BSF: Black soldier fly, *Hermetia illucens*

Coco peat: The powdery material resulting from processing coconut fibre. In this context, it is mostly used for its moisture absorbing properties. It can be replaced by other materials with similar moisture absorbing properties, such as wheat bran, for example.

Compost: Organic matter that has been degraded and transformed by aerobic processes to a soil-like substance and can be used as a fertilizer and soil amendment.

Dark cage: Adult flies emerge in the dark cage where they remain until transferred to the love cage. The darkness keeps the flies calm and prevents mating activity.

Date code: The date code allows for calculating the duration of the ongoing process and is applied to cages and containers. It consists of the calendar week of the year and the day of the week (for example: Tuesday of week 8 is coded as 8.2).

Dry matter: The mass of the matter after all water has been removed. It is usually determined by keeping a sample in an oven at 105°C for at least 12 hours.

Egg: A female fly lays between 400 and 800 eggs from which young larvae will hatch within four days. One egg weighs about 25µg.

Eggie: The media used in an engineered BSF-system to collect eggs. It provides sheltered cavities for egg deposition.

Emerging: When adult flies emerge from a pupa after pupation.

Engineered biosystem: A biological process that has been optimised for a practical use.

Faecal sludge: A waste product from onsite sanitation systems, such as pit latrines or septic tanks. It is usually a combination of excreta and water, often mixed with sand and household trash.

Feeding station: A designated area where waste is added to the larveros. It is advisable that it can be cleaned easily (tiled or sealed floor) as biowaste may be spilled during the feeding operation.

Fishmeal: Fishmeal is a nutrient-rich feed ingredient used in the diets of farmed animals. It is manufactured from wild-caught small marine fish and is a powder obtained after grinding, cooking and defatting the fish. Fishmeal production is a significant contributor to over-fishing.

Food and restaurant Waste: Biowaste from restaurants consists of kitchen scraps and food waste. It typically has a higher nutritional value and a lower water content than market waste or food processing waste.

Food processing waste: Biowaste from the food processing industry. It varies from fruit and vegetable bits to bread crumbs and/or dairy products. It is usually a homogenous and uniform waste source.

Hammer mill: Crushes and shreds material into smaller pieces by repeated strikes of small hammers. It does not cut material. The particle size is defined by the diameter of the outlet screen.

Hatching: The process of young larvae (hatchlings) emerging from the egg.

Hatchling: Larvae that have just hatched from the eggs. Sometimes also called "neonates".

Hatchling container: Hatchlings fall into the hatchling container after hatching where they remain and feed for five days on nutritious feed (chicken feed) to become 5-DOL.

Hatchling shower: Harvested eggies are placed on a rack called a hatchling shower, which is placed over a hatchling container. When young larvae hatch, they fall into the hatchling container, which is replaced regularly (every one to three days).

Human faeces: Excrement that is not mixed with urine or water. A product from urine-diverting dry toilets.

Lab oven: An oven which provides a uniform temperature. In BSF biowaste processing, it is mostly used to obtain dry matter samples from waste, residue and larvae, and operates at 105°C.

EXECUTIVE SUMMARY

This report outlines the results of the EIA study process for the proposed Black Soldier fly Biowaste processing facility to be located on Plot L.R. No. 23961 Kinanie area in Machakos County in compliance with Section 58 of EMCA, Cap 387 and Legal Notice No. 101 of 2003. The project site is located in Kinanie area within land belonging to Export Processing Zone Authority on satellite tagging points 1°21'04.2"S 37°03'11.7"E (-1.351155, 37.053242).

In compliance to section 58 of Environmental Management and Coordination Act Cap 387, the proponent has initiated the undertaking of an Environmental Impact Assessment (EIA) project report for submission to National Environment Management Authority (NEMA) for licensing. The project falls under schedule 2-waste disposal.

The EIA Report is crucial in environmental management systems. An EIA is an information document, which will inform the proponent, licensing Authority, lead agencies, decision makers and the public of the significant environmental effects of the proposed project; identify possible ways to minimize the significant effects; and describe reasonable alternatives to the project. The purpose of this EIA, therefore, is to focus the discussion on those potential effects on the environment of the proposed project which may be significant. In addition, feasible mitigation measures are recommended, when applicable, that could reduce or avoid significant environmental impacts.

This EIA was carried out between the period of 5th February, 2019 and 15th March 2019 through the guidance of the Environmental (Impact Assessment and Audit) Regulation 2003 and other related legislation.

The main purpose was to identify all possible social, economic and environmental impacts that may arise from the construction and operation of this biowaste treatment facility by use of Black Soldier Fly Larvae (BSFL). This ended up with recommendation of mitigation measures for the significantly negative impacts and finally the proposed practical Environmental Management Plan (EMP) for implementation by the contractor and the proponent.

The scope of the study included literature review; describing the location, collecting baseline social, physical, economic and environmental information; identifying phase's, understanding designs and processes and lastly developing an Environmental Management Plan.

The outcome of the study was discussed with the proponent's representative before the report was finalized and submitted to NEMA. The assessment findings are presented in the format prescribed by Legal Notice No. 101 of 2003.

Project activities

The project activities include;

- ✓ Preparing plant layout and engineering designs
- ✓ Acquisition of pertinent approvals from relevant government agencies including an EIA licence
- ✓ Site preparation activities
- ✓ Actual construction and installation of the plant and other auxiliary facilities
- ✓ Operation of the waste processing facility
- ✓ Possible decommissioning of the project

During operation phase, the technology solution consists of feeding segregated biowaste to BSF larvae, which have been reared in a nursery (BSF rearing unit). Larvae grow on the waste feedstock and reduce the waste mass. At the end of the process, larvae are harvested and, if necessary, post-processed into a suitable animal feed product. The waste residue can also be further processed and potentially sold or used as soil amendment with fertilizing properties.

Description of the project

The proposed Black Soldier Fly Biowaste processing facility is to be located on proposed site land Reference 23961-Kinanie measuring approximately 5.1Hectares. This space is a lease from Export Processing Zone Authority to Sanergy Limited for a period of thirty (30) years from 1st November, 2018. From the lease agreement, EPZA has leased the premises to Sanergy limited for construction/expansion of a waste treatment facility. EPZA itself operates a wastewater treatment plant within this premise by use of lagoons. In addition, within a portion of the same land, Sanergy has an existing biowaste treatment facility similar in nature to the proposed BSF Biowaste processing facility. In general, the proposed project is within an appropriate location designated for waste handling.

The proposed project entails establishment of an insect based biowaste processing facility to produce animal feed and organic fertilizer. This technology entails use of Larvae of the black

soldier fly, *Hermetia illucens L.* (Diptera: Stratiomyidae) to transform organic waste into valuable animal feedstuff: in the form of their last larval stage, the so-called prepupa.

The main processing units that will be installed in BSF biowaste processing facility include:

- BSF rearing unit: This ensures that a reliable and consistent amount of small larvae (called 5-DOL) is always available to inoculate the daily amount of biowaste that is received for processing at the treatment facility. Larvae hatchlings are, kept in the rearing unit to ensure a stable breeding population.
- Waste receiving and pre-processing unit: It is critical that the waste received at the facility is suitable for feeding to the larvae. A first step involves a control of the waste to ensure it contains no hazardous materials and no inorganic substances. Further steps then involve a reduction of the waste particle size, a dewatering of the waste if it has too high moisture and/or a blending of different organic waste types to create a suitable balanced diet and moisture (70-80%) for the larvae. In this case, Aeromaster Compost Turner will be employed for use.
- BSF waste treatment unit: This is where the five day old larvae (5-DOL) from the rearing unit are fed with biowaste in containers called "larveros". Here, the young larvae feed on the biowaste, grow into large larvae and, thus, process and reduce the waste.
- Product harvesting unit: Shortly before turning into prepupae, the larvae are harvested from the larveros. The waste residue itself is also a product of value.
- Post-treatment unit (larvae refining and residue processing): Both products, larvae and residue, are further processed. This is called "product refining". Typically, a first step will be to kill the larvae. The larvae will be washed then dried using an oven. A typical step for residue refinement is composting or feeding the residue into a biogas digester for fuel production.

Additional facilities to the proposed project include bins washing station; loading bay; sawdust storage area; power house (generator room and transformer room); boiler; repairs workshop; fertilizer processing plant; fertilizer stores; briquettes stores; water supply (borehole and pump house); canteen; office with changing rooms for both gender; cabro-paved car parking and sorting area.

In general, the process to be followed in biowaste treatment to produce animal feed and briquettes will involve receiving of waste which has to undergo quality check since waste with

hazardous contaminants is not acceptable as this may affect the survival of the larvae. Windrow turner will be used in mixing and cutting waste into smaller pieces, shredder will only be used if large volumes are delivered to the site. This helps to speedup BSF processing as BSF larvae (BSFL) do not have appropriate mouthparts to break apart large chunks of waste, and increasing the surface area fosters the growth of the associated bacteria.

The shredded waste shall be assessed manually to estimate the moisture content. In case the waste has high moisture content than required, then it undergoes dewatering process. The waste is then transferred to the BSF treatment unit where hatched BSFL from BSF rearing unit is brought and put in the containers/crates with organic waste (Larvero). The larvae start to feed on the waste, thus achieving a dry mass volume waste reduction of ~55%. Under ideal conditions with abundant food sources (i.e. waste deposits), larvae can mature in two weeks. Due to high larval densities and the voracious appetite of the larvae, fresh material is processed extremely fast and bacteria growth suppressed or restrained, thereby reducing production of bad odour to a minimum. According to Graczyk etal., 2001, *H. illucens* (BSF) has capacity to repel oviposition of female house flies, a serious disease vector especially in developing countries, where open defecation and inappropriate sanitation account for dangerous sources of pathogens.

After a defined time (preferably twelve days in the larvero), the resulting mixture of grown larvae and residue is then harvested and separated. This can be done by using a manual or automated shaking sieve by which the larvae are easily separated from the residue. With a higher shaking frequency, the mesh size of the sieve can be bigger. This is because the larvae have difficulties to position themselves and cannot crawl through the mesh when there is a high shaking frequency. Automated shaking sieves can achieve higher shaking frequencies than manual sieves and are, therefore, favoured. During the shaking, the larvae remain on the top of the sieve while the residue falls through the sieve into recipients. Given the angle of the sieve, the larvae are guided to the lower angle, which is connected to a bucket where the larvae drop into.

Under certain circumstances, when the initial water content of the waste was higher than ideal (>80%), the larvero at the time of harvesting will contain larvae and a liquid slurry of processed waste with some undigested chunks (instead of a crumbly waste residue). In such a case, another harvesting method with non-shaking flat screens of 5 mm mesh size is recommended. A container is placed below the non-shaking flat screen. The content of the larvero is then spread

out onto the flat screen. The liquid will flow through it as will the larvae because they want to avoid the sunlight, eventually falling into the container below. Larger residue chunks will remain on top of the screen and can be removed. In the container below the flat screen, the mostly floating larvae can be removed with a large strainer spoon, rinsed and then transferred into a drying container with coco peat or some other dry material (e.g. sawdust). The larvae remain in the drying container for around one day. Crawling around in this material helps to clean their skin and gives them time to empty their gut which adds to the quality of the end-product.

After harvesting, larvae will undergo some form of post-processing to ensure that they are sanitised, stored and transported easily to the respective customers. The proponent intends to wash using washing machine and dry the larvae using oven. The final larvae is packaged and sold to animal feed manufacturers to use as additives in making of animal feeds. It is suitable for fish meal, pig feeds and poultry feed.

Post-processing of the crumbly residue may be used to produce stable, mature compost.

Solid waste brought to this site can undergo processing to make biowaste briquettes. This will be achieved by starting with size reduction by aid of Aeromaster Compost Turner, adding binder agents and reducing moisture content by use of windrows. From briquettes windrows, the materials are taken to briquetting machines.

For mixing of windrows, Aeromaster Compost Turner will be used. It also helps in shredding of biowaste.

Project objectives, activities and alternatives

The proponent proposes to establish and operate a biowaste treatment facility to produce various valuable products such as animal feed (additive), organic fertilizer and briquettes. In addition to setting up the biowaste treatment facility with associated facilities, the proponent intends to construct an administration block; a building to house canteen.

Pre-construction activities: This involves feasibility studies and location analysis; Conceptualization of development designs and options; Detailed design and seeking for approval from relevant government bodies.

Site preparation: this involves bush clearing; setting up of camp, a site office with store and setting up driveways for construction trucks delivering materials to site.

Construction activities: After meeting all the statutory requirements by obtaining approvals from relevant government agencies, construction activities will start and this will be in phases. It is estimated the construction will take a period of twelve two months.

Operation phase: The biowaste processing will involve transportation of raw materials (biowaste that includes human faecal matter, household organic waste and sawdust etc.) to site then waste will be acted upon by Black Soldier Fly Larvae (BSFL). Conversion of organic waste by larvae of the black soldier fly, into versatile prepupae is an interesting recycling technology, with a potential to give waste the aforementioned value.

Two project alternatives are available namely the (i) 'no project' alternative and (ii) 'yes project' alternative. Under alternative (i), the proposed project would not be constructed and the project site would remain in its current condition, which is scrub land of no commercial land value; whereas under alternative (ii), the county of Machakos would get an additional industry that would create employment, earn the government revenue through taxes and would open up the area for investment.

Foreseeable Environmental impacts

The expected impacts and required mitigations were assessed for different phases of the development. These start with physical planning and detailed design of the biowaste processing plant, construction phases and the operation phase. In this case, biowaste treatment will entail use of BSFL and drying residue products/digestate. This may result in interference with ambient air quality. In addition will be attraction new bird species. Discharge of effluent contaminated with microorganisms will be evidenced. The project contributes to long term, cumulatively significant unavoidable adverse impacts to biological resources due to loss of vegetation in the area during construction that leads to soil erosion, loss of habitat, loss of views and aesthetics.

On a positive note, combination of waste treatment capacity together with generation of valuable products makes the black soldier fly technology a highly promising tool for waste management especially in low and middle-income countries. It offers small entrepreneurs the possibility of income generation without high investment costs, and concurrently reduces the environmental impact.

Additionally, such organic waste treatment will furthermore reduce open dumping, which is still an unfortunate reality in urban settings. Processing biowaste eliminates threats to public health and the environment.

Studies were carried out on Physical environment, ecological environment and socio-economic factors. Reference to previous studies was incorporated in the study. Important of all, consultations were carried out with all affected and interested parties in this project and their inputs have been factored in the ensuing recommendations for the project.

A. Physical Impacts

- ✓ Loss of vacant land: project implementation will require commitment of current vacant land to industrial use and will contribute to the cumulative loss of un-built land in the locality.
- ✓ Change in Topography: The project will slightly alter the physical attributes of the site.
- ✓ Destruction of vegetation: The little vegetation on site will be lost forever to be replaced by project amenities.
- ✓ Drainage impacts: Water volumes in excess (run-off) of that which would have been conveyed offsite prior to the development will impact external sites due to hard surface creation.

  An increase in the turbidity of the runoff leaving the site could occur if uncontrolled surface water flows onto or over unprotected loose substrates or sediment stockpiles
- ✓ Disturbance to soils: Soils will be disturbed during construction. The top soil will be removed during the construction of the project. However, much will be brought back for landscaping purposes.

B. Human Impacts.

- ✓ Increase in population and employment/socio-economic impacts: The coming on stream of this project will lead to an additional people into the locality (Kinanie location and wider Mavoko) who will either be employed directly or indirectly on the project. The development will result in the creation of between 20-60 job opportunities both during and after the construction of the plant. In addition, the development will create business for suppliers and professionals/consultants.
- ✓ Locally, the operationalisation of this plant will boost the economy by paying relevant taxes to the national and county government.
- ✓ Increase in resource demand (water and energy): There will also be demand for water during and after construction. A borehole will be drilled to supply water to the facility. The project will cause greater demand for energy both renewable and non-renewable sources. Oil and other non-renewable energy sources will be used in the construction and subsequent use of

the site as a biowaste treatment facility. Electricity connections will be made to the main trunk power line that runs near the site. A sub-station shall be put in place to ensure electricity demand is met.

- ✓ Waste management: there shall be increase in the generation of solid and liquid waste throughout the project cycle.

C. AESTHETICS

Aesthetic impacts come from air pollution, increased traffic flows, noise, aesthetic impacts etc.

- ✓ Air/dust pollution: There will be an incremental increase in air pollution as a result construction activities and vehicular emissions from trucks ferrying materials and emissions from project operations. Dust may be generated during construction of and in the operation phase. The activities of the facility mar interfere with ambient air.
- ✓ Construction activities are known to contribute to dust pollution. During construction dust most often arises from vehicle movements on unsealed roads and from earth moving operations using construction plant such as excavators. Windrows may also be a source of dust.
- ✓ Noise pollution: Increased traffic, mechanical, industrial and human activities will result in increased noise in the area.

D. Occupational Health and safety

- ✓ Workers accidents and hazards during construction and/or installation of equipment;
- ✓ Workers accidents and hazards during operation phase

Proposed Mitigations

These would include:

Drainage Mitigations:

- The use of permeable surfaces for parking, walkway and roadway areas to facilitate ground infiltration.
- The use of ground-based storm water disposal options where the geology of the area will facilitate its use.
- The control of storm water accessing the site from offsite locations.
- The incorporation of all drainage mitigations, along with a back-up surface drainage proposal, within an overall drainage plan for the development, with specific attention

being placed on the terminal portion of the surface drainage, which may present a flooding risk within the site and it's neighbourhood.

- The employment of drainage mitigation measures to assist in the reduction of the volume and velocity of run-off from the site.
- The covering and berming of stockpiles of materials during rainfall periods to prevent the washing away of these materials.

Aesthetic Mitigations:

✓ **Air pollution mitigations**

➢ Dust generation and air emissions on-site should be controlled through the following activities:

- The imposition of speed limits for vehicular movement on dust sources.
- The enclosing of raw material dumping and stockpiling areas to contain generated dust
- The controlling of wind movement of exposed materials through the use of frequent wetting or the use of dust stabilization products.
- Regular maintenance of vehicles/trucks to ensure emissions meet air quality regulation standards.

➢ Preventing fugitive dust from exiting the construction site through the use of containment barriers at the site's periphery. This mitigation would work in tandem with noise mitigation measures to prevent sound releases into the external environment.

➢ Controlling fugitive dust generation from sources external to the construction site, such as at Concrete Batching plants and from trucks transporting raw materials to the site – using the containment methods.

➢ To effectively reduce any emissions of dust to a level which will not cause nuisance during operation phase.

✓ **Noise Mitigations**

- The use of the lowest noise-emitting equipment appropriate for the given task should be opted for, since this will result in less noise generated on-site.
- Physical noise barriers should be considered for the property.
- Carry out regular sound level measurements

- Check the performance of the major equipment periodically, in order to troubleshooting ant fix the problem by lubricating, repairing and etc.
- Reduce the noise exposure level of the employees especially machine operators or altering their activity zones between safe and unsafe acoustical zones.
- Provision and ensuring appropriate use of personal protective equipment

Solid Waste Mitigations:

- Operational measures should be designed and put in place to guide the process of waste reduction on-site.
- Waste reduction mechanisms should be employing on-site to reduce the volume of any inorganic solid wastes generated.
- The collection and safe storage of solid wastes on-site should be encouraged to facilitate transportation off-site.

Sewage Mitigations:

- The provision of adequate access to toilet and bathroom facilities that meet both numerical standards (to prevent workers from using the neighbours') and treatment standards.
- The separation of sewage and grey water streams to reduce sewage effluent volumes.
- The employment of on-site treatment of wastewater.

Other Mitigations:

- The careful choosing of heavy vehicular access points to the site to reduce obstructions to traffic movement.
- Segregate motor traffic from pedestrian traffic in the design.
- Proper landscaping and planting of trees especially along boundary of plot.

The EIA study observes that the proponent is keen on complying with all legal and environmental requirements in order to mitigate against these probable negative impacts and enhance the positive social, economic and environmental impacts.

Summary of the general anticipated Impacts and Mitigation Measures during establishment and operation activities

Possible Impacts	Mitigation Measures
1. Waste Management (solid and liquid)	▪ Provide solid waste collection facilities and segregation during site preparation. ▪ Suitable method of disposal for each kind of waste will apply ▪ Operational measures should be designed and put in place to guide the process of waste reduction on-site. ▪ Waste reduction mechanisms should be employing on-site to reduce the volume of any solid wastes generated. ▪ The collection and safe storage of solid wastes on-site should be encouraged to facilitate transportation off-site especially for inorganic waste since organic waste is recycled on-site. ▪ The facilitation of safe transport of wastes (inorganic) off-site to authorized solid waste disposal sites should be encouraged. This would discourage accidental waste disposal during transport. ▪ The provision of adequate access to toilet and bathroom facilities that meet both numerical standards (to prevent workers from using the neighbours') and treatment standards. ▪ The separation of sewage and grey water streams to reduce sewage effluent volumes. ▪ The employment of on-site treatment of wastewater.
2. Public and Occupational Health and Safety during establishment and operation	▪ Provision of appropriate protective clothing and equipment (overalls, head-covers/caps, gloves, ear muffs, nose muffs) and training to workers. ▪ Provide suitable equipment during site preparation and operation phase to avoid muscular strains. ▪ Ensure that drinking water is safe for workers. ▪ Ensure workers work in shifts whereby duration of each shift has a maximum of 8 hours. ▪ Provide well equipped First Aid box on site ▪ Ensure First Aid training to employees and two or three First

	Aiders be identified within the workers and their mobile numbers placed at strategic points ▪ Ensure compliance with OSHA 2007 ▪ Segregate motor traffic from pedestrian traffic in the design. ▪ The limiting of unregularized vending at the perimeter of the development to restrict the generation of uncontrolled solid and liquid wastes.
3. Surface Run-off	▪ Ensure that no waste water is directed into surface run-off drains. ▪ Put in place roof catchments so as to harvest rain water ▪ The use of permeable surfaces for parking, walkway and roadway areas to facilitate ground infiltration. ▪ The use of ground-based storm water disposal options where the geology of the area will facilitate its use. ▪ The control of storm water accessing the site from offsite locations. ▪ The incorporation of all drainage mitigations, along with a back-up surface drainage proposal, within an overall drainage plan for the development, with specific attention being placed on the terminal portion of the surface drainage, which may present a flooding risk within the site and it's neighbourhood. ▪ The employment of drainage mitigation measures to assist in the reduction of the volume and velocity of run-off from the site. ▪ The covering and berming of stockpiles of materials during rainfall periods to prevent the washing away of these materials.
4. Security	▪ 24 hours security measures to be provided including inco-operation of technology ▪ Police emergency numbers to be placed at strategic points
5. Drainage system	▪ Ensure effective waste water management as guided by law.

	▪ Avoid as much pollution on the drainage system in the area.
6. Increased resource (water & electricity) demand	▪ Management of water usage. Avoid unnecessary wastage. ▪ Recycling/reuse of water at the establishment time where possible. ▪ Install water-conserving taps that turn off automatically when water is not being used. ▪ Install energy saving electrical appliances to reduce energy consumption ▪ Carry out Energy Audit so as to know areas that need improvement
7. Air, Dust and Noise Pollution (during establishment and opération)	▪ Regular maintenance of operating machines and equipment. ▪ Use of appropriate protective equipment (PPE) such as ear protectors dust masks by workers ▪ Carry out regular sound level (noise) and dust survey ▪ The use of the lowest noise-emitting equipment appropriate for the given task should be opted for, since this will result in less noise generated on-site. ▪ Check the performance of the major equipment periodically, in order to troubleshooting and fix the problem by lubricating, repairing and etc. ▪ Reduce the noise exposure level of the employees especially machine operators or altering their activity zones between safe and unsafe acoustical zones. ▪ Ensure trucks ferrying raw materials (organic waste) to the site are well covered to prevent dust spread ▪ Preventing fugitive dust from exiting the construction site through the use of containment barriers at the site's periphery.
8. Fuel leakage	▪ Ensure fuel storage tank is bunded ▪ Designated staff at storage area to be trained on how to prevent, contain and clean up spills ▪ Ensure provision of spill kits

	▪ Maintenance workshop to be paved
9. Resource efficiency	▪ Monitor electricity and water use ▪ Put in place energy and water saving procedures and targets ▪ Install energy saving motors; water saving devices

Conclusion and recommendations

For success of this project, supply of adequate waste materials as inputs and the market demand for the output products. Advancing on biowaste treatment is an ideal entry point for overall municipal solid waste and sewerage management improvements. It reduces public health threats and environmental burden by returning resource value of waste into economy through recovery while at the same time considering new business opportunities and economic growth. This proposal therefore considers the waste processing facility beneficial on the fact that it is also located within a premise where sewage waste is treated.

The technology, equipment and facilities that will be employed in by the Proponent Sanergy Limited are within the category of Best Available Technology and are environmentally friendly. It is for this reason that the project will cause very limited significant negative impacts in view of the choice of equipment and facilities.

The communities within the area were consulted and majority were in support of the project though raised concerns on ambient air and increased population of houseflies which are serious disease vectors.

The potential impacts of the project will be minimized to acceptable levels by a number of measures recommended in the Environmental Management Plan.

We therefore recommend that the project be granted environmental clearance to proceed in line with the provisions of the Environmental Management and Coordination Act, Cap 387.

TABLE OF CONTENTS

1. BACKGROUND OF THE PROJECT

1.1 Introduction

Due to rapid urbanisation, changes in demographics and consumer behaviour, County Governments (especially those with major cities) and decision makers are confronted with new challenges in solid waste management. Over the past decade, numerous cities have increased their efforts at finding sustainable solid waste management solutions, especially in developing integrated solid waste management strategies, including construction and operation of sanitary landfills. Recycling organic waste material (biowaste) is still fairly limited.

The state of poor sanitation, inadequate water and related diseases outbreaks are making the lives of the residents of the sprawling slums in Nairobi harder. Inadequate, unsafe water and improper waste disposal are a big threat to the lives of the residents due to the risk of contracting water-borne diseases such as typhoid, cholera, diarrhoea etc.

When it comes to food security, one realizes that Kenya's agricultural productivity has declined steadily since the 1960s, and at the same time, the Kenyan population has been adding about 1 million people per year, most of them in urban areas. These trends are creating an untenable situation: Already, over 10 million Kenyans are food insecure, while 80 percent of the population relies on agriculture to earn their livelihoods. Unless farmers focus on restoring soil health, crop production will continue to decline. The most effective way to restore nutrients to soil is to apply organic fertilizer to replace the organic matter that the soil is missing.

Sanergy Ltd is keen on providing a solution to these problems by providing an integrated system based waste management solution. It co-composts the faecal waste with organic waste collected from in and around Nairobi to create a nutrient-rich and pathogen-free organic fertilizer and animal feeds (additive). In addition are the briquettes that will be used to fuel the boiler to be installed within the facility.

In compliance with Section 58 of EMCA Cap 387 and Legal Notice No. 101 of 2003, the proponent herein referred to as Sanergy Limited contracted us to undertake an Environmental Impacts Assessment study for the proposed project and prepare an Environmental Impact Assessment Project report for submission to NEMA. This report outlines the results of the EIA

study process for the proposed Black Soldier Fly Biowaste processing to be located on Plot L.R. No. 23961-Kinanie measuring approximately 5.1 Hectares. This space is a lease from Export Processing Zone Authority to Sanergy Limited for a period of thirty (30) years from 1st November, 2018. From the lease agreement, EPZA has leased the premises to Sanergy limited for construction/expansion of a waste treatment facility. The site is geo-referenced 1°21'04.2"S 37°03'11.7"E (-1.351155, 37.053242).

The assessment findings are presented in the format prescribed by Legal Notice No. 101 of 2003.

The site holds already existing waste water treatment plant operated by EPZA and in addition, Sanergy Ltd being the proponent of the proposed project runs a similar facility at a different location within the same land leased from EPZA. This proposed biowaste treatment plant is to increase capacity so as a bigger volume of waste can be handled. Adjacent lands are free from residential buildings. The proposed site borders river Mbagathi.

From the soil tests carried out by Spectralab in November 2017, the results showed there was contamination of zinc and chromium and hexavalent chromium heavy metals, arsenic, total petroleum hydrocarbons and speciated polyaromatic carbons.

1.2 Project Definition

This is an Environmental Impact Assessment Project Report for proposed Development of a Black Soldier Fly Biowaste processing facility to be developed by Sanergy Limited. The proposed project entails feeding segregated biowaste to BSF larvae, which have been reared in a nursery. Larvae grow on the waste feedstock and reduce the waste mass. At the end of the process, larvae are harvested, sterilized and dried for supply to animal feed millers especially those making animal feeds for poultry, fish or pigs. The waste residue can also be further processed and potentially sold or used as soil amendment with fertilizing properties. In addition is making of briquettes which will be used as biomass fuel to run the boiler.

The E.I.A for the project was conducted by Zebah Company Limited; a firm of expert is being coordinated by registered lead of Experts. The firm has been appointed by the proponent to carry out the EIA project report in accordance with Legal Notice 101: Environment (Impact Assessment and Audit) Regulations 2003 promulgated under the

Environment Management and Coordination Act Cap 387. The proposed project is also expected to comply with:

1. Environmental Management and Co-Ordination (Environmental Impact Assessment/ Environmental Audit) regulations, 2003
2. Environmental Management and Co-Ordination (Air Quality) regulations, 2014
3. Environmental Management and Co-Ordination (Waste Management) regulations, 2006
4. Environmental Management and Co-Ordination (Water Quality) regulations, 2006
5. Occupational Safety and Health Act 2008
6. Public Health Act
7. Water Act, 2016
8. Fertilizers and Animal Foodstuffs Act Cap 345
9. Kenya Bureau of Standard (KS), British Standard (BS), International Standards (ISO) and East Africa Standards (EAS)
    i. KS lSO 17225-7:2014 solid biofuels – Fuel specifications and classes: Determines the fuel quality classes and specifications of graded non-woody briquettes.
    ii. KS 2290:2011-Organic Fertilizer-Specifications: specifies requirements and prescribes methods of test for organic fertilizer
10. The Energy Act 2006 and its subsidiary legislations.
11. Occupational Safety and Health Act (OSHA 2007)
12. County Government Act, 2013
13. County Government of Machakos By-laws

Under the classification of projects in the Environmental Management and Coordination Act (EMCA) Cap 387, for the purposes of Environmental Impact Assessment/Audit (EIA/EA), the proposed project falls under the second schedule, category 12: Waste Disposal.

1.1.1. Location

The project is located on Plot L.R. No. Plot L.R. No. 23961-Kinanie measuring approximately 5.1 Hectares. This space is a lease from Export Processing Zone Authority (EPZA) to Sanergy Limited for a period of thirty (30) years from 1st November, 2018. From the lease agreement,

EPZA has leased the premises to Sanergy limited for construction/expansion of a waste treatment facility. The site is geo-referenced 1°21'04.2"S 37°03'11.7"E (-1.351155, 37.053242). (*See attached lease agreement*).

The proposed site is located in an area that is sparsely populated and of mixed land use where minimal disturbance to neighbours is expected. The site already has an operational wastewater treatment plant operated by EPZA. In addition, the proponent operates a biowaste treatment plant in the vicinity within the same land belonging to EPZA.

The neighborhood is characterized by privately secured undeveloped parcel of land, sit is adjacent to river Mbagathi, and there exists few homesteads a distance from the actual area the project is to be located. A tannery is understood to be present to the northeast.

1.1.2. Project Proponent

The project proponent is Sanergy Limited headquartered in Nairobi. The organization strives to clean cities by managing waste collected from different sources in different Counties, including feacal waste from a sister company Fresh Life. The waste is then turned into useful end-products by either converting the waste through composting as an input to organic fertilizer and energy generation or as an input to the black soldier fly project to produce insect-based animal feeds, and the residue used as an input to compost manure. (*See attached copy of Certificate of Incorporation and PIN certificate of the proponent).*

1.1.3. Project Objective and Scope

The objective of the proposed project is to establish and operate a biowaste treatment facility to produce various valuable products such as animal feed (additive), organic fertilizer and briquettes. The facility will entail:

- BSF rearing unit (Black soldier flies structure): This ensures that a reliable and consistent amount of small larvae (called 5-DOL) is always available to inoculate the daily amount of biowaste that is received for processing at the treatment facility. Larvae hatchlings are, kept in the rearing unit to ensure a stable breeding population.
- Waste receiving and pre-processing unit: It is critical that the waste received at the facility is suitable for feeding to the larvae. A first step involves a control of the waste to

ensure it contains no hazardous materials and no inorganic substances. Further steps then involve a reduction of the waste particle size, a dewatering of the waste if it has too high moisture and/or a blending of different organic waste types to create a suitable balanced diet and moisture (70-80%) for the larvae. In this case, Aeromaster Compost Turner will be employed for use.

- BSF waste treatment unit (Feedstock): This is where the five day old larvae (5-DOL) from the rearing unit are fed with biowaste in containers called "larveros". Here, the young larvae feed on the biowaste, grow into large larvae and, thus, process and reduce the waste.
- Product harvesting unit: Shortly before turning into prepupae, the larvae are harvested from the larveros. The waste residue itself is also a product of value.
- Post-treatment unit (larvae refining and residue processing): Both products, larvae and residue, are further processed. This is called "product refining". Typically, a first step will be to kill the larvae. The larvae will be washed then dried using an oven. A typical step for residue refinement is composting or feeding the residue into a biogas digester for fuel production.
- Windrow/windrow turner: Used to mix waste/Co-composting waste
- Storage warehouse for fertilizer
- Storage warehouse for briquettes
- Bin washing station: Has a pressure washer, ensures that containers are washed thoroughly and disinfected.
- Site office with changing room for both gender separately
- Waste sorting area.
- Sawdust storage area;
- Power house (generator room and transformer room);
- Boiler;
- Repairs workshop;
- Fertilizer processing plant;
- Canteen;
- Cabro-paved car parking

The proponent intends to drill a borehole and install a pump house to supplement for water supply.

In this regard therefore, the specific objectives of this EIA study are outlined as follows.

- To provide a description of the project cycle activities and the required legislative compliance
- To predict and/or determine the potential impacts of the biowaste treatment facility development in terms of the economic, social and environmental considerations
- To propose appropriate mitigation measures to minimize or eliminate the environmental challenges associated with the installation and commissioning of the biowaste processing facility
- To undertake a public consultative process aimed at obtaining the views of project stakeholders so as to mainstream their concerns and impact mitigation proposals into the Environmental Management Plan (EMP) developed for the project cycle

1.1.4. Justification of project

Urban solid waste management is considered one of the most serious environmental problems confronting urban governments especially in developing countries. The severity of this challenge will increase in the future given the trends of rapid urbanisation and growth in urban population. Recycling organic waste material (biowaste) is still fairly limited, even though this is by far the largest fraction of all generated municipal waste. Efforts are therefore necessary to impart not only an idealistic value to the organic fraction, focusing on its nutrient recovery and environmental protection potential, but also to emphasise its inherent economic value.

Another central issue is the management of faecal sludge (FS). FS accumulating in septic tanks, latrines and other on-site sanitation facilities contains high levels of nutrients and also pathogens. Despite its nutritional value, sludge generated in urban and peri-urban areas is frequently not reused in agriculture. The reasons are attributed to long distances between sludge producers and potential users of the treated sludge and to its complex treatment that reduces the economic viability of proper faecal sludge management. In most cases, sludge is discharged into surface waters or reused without adequate treatment as soil conditioner and nutrient source in (peri-

urban) agriculture. Such practices expose farmers and consumers alike to considerable health risks from the extremely high pathogenic contamination of the sludge.

Conversion of organic waste by larvae of the Black Soldier Fly, *Hermetia illucens L.* into versatile prepupae is an interesting recycling technology, with a potential to give waste the aforementioned value.

Several key attributes make BSF technology an attractive treatment option for biowaste and they include:

- ✓ Waste reduction of up to 80% on wet weight basis has been demonstrated from previous project. Such organic waste treatment furthermore reduces open dumping, which is still an unfortunate reality in low- and middle-income settings. It reduces public health threats and environmental burden
- ✓ Waste biomass is converted into larvae and residue. The residue, a substance similar to compost, contains nutrients and organic matter and, when used in agriculture, helps to reduce soil depletion. The larvae consist of ±35% protein and ±30% crude fat. This insect protein is of high quality and is an important feed resource for chicken and fish farmers. All this products can be sold thus being a source of income.
- ✓ There is no need for sophisticated high-end technology to operate such a facility. Therefore, it is suitable for low-income settings that rely mostly on simple technology and unskilled labour.
- ✓ BSF has the capacity to repel oviposition of female house flies , a serious disease vector
- ✓ Due to high larval densities and the voracious appetite of the larvae, fresh material is processed extremely fast and bacteria growth suppressed or restrained, thereby reducing production of bad odour to a minimum.
- ✓ The project will promote waste segregation at source thus encouraging recycling of inorganic waste since they will be less contaminated. This will result to manufacturing companies especially for plastic to consider recycling plastic that can be used as raw material in processing

1.1.5. Terms of Reference

Prior to carrying out an EIA Project Study, it is a requirement that the Terms of Reference (TOR) for the Study are developed by the project proponent. For the current project study, this requirement was fulfilled. In summary, the TOR normally covers the following: -

- Brief project background;
- Project definition and project objectives;
- Identification of anticipated environmental impacts;
- Review of relevant policies, legislation and institutional framework;
- Review of set standards in relation to waste disposal and treatment;
- Neighbours/Public/stakeholder views;
- Laboratory analysis reports carried out for air, soil and water:
- Desktop review of similar projects
- The EIA process to be followed and experts to carry out the study.

1.1.6. EIA Study

In carrying out this study, various activities were undertaken including detailed field surveys for acquisition of biophysical socio-economic data and public/stakeholder consultation. Other sources of information included existing database, Government Agencies, professionals, and neighbours. The employees of Sanergy Limited did give a step by step guide on the waste treatment process including rearing of BSF.

1.2. EIA Process Followed

This Environmental Impact Assessment (EIA) refers to a critical examination of the effects of the proposed project on the environment before its implementation. Impacts describe any negative and positive environmental influence caused by a project. EIA is applied on the basic principle that the effect of a project on the environment needs to be established before it is implemented. The basic assumption is if a proper EIA is carried out then, the safety of the environment can be properly managed during the projects implementation, commissioning, operation and decommissioning. A project is defined as a specific set of human activities in a particular location and time frame and intended to achieve an objective(s).

The term environment is used in its broadest possible sense to embrace not only physical and biological systems but also socio-economic systems and their inter-relationships. The EIA process took into account operational, social, cultural, economic, legal and administrative considerations. The process will include the following:

- Identifying the anticipated environmental impacts of the project and the scale of the impacts;
- Identifying and analysing alternative methods or technologies for implementing the proposed project;
- Proposing mitigation measures to be undertaken during and after the implementation of the project;
- Developing an Environmental Management Plan (EMP), with mechanisms for monitoring and evaluating the compliance and environmental performance, cost for mitigation and time frame of implementing the measures.

1.2.1. E.I.A Team

The EIA team was coordinated by a registered qualified Environmental Impact Assessment/Environmental Audit Lead Expert in collecting data and information and prepare the EIA Project Report as provided for in the Environmental (Impact Assessment and Audit) Regulations of June 2003. The E.I.A team consisted of the following:-

- ✓ Edgar Ambaza – EIA/EA Lead Expert
- ✓ Edgar Eredi – EIA/EA Lead Expert
- ✓ Steve Amunga Akwabi – EIA/EA Expert
- ✓ Ezekiel Olukohe – Environmental Expert
- ✓ Hastings Sifuma – Environmentalist and specialist in Occupational Health and Safety
- ✓ Nelly Wanjiku – Bsc. Public Health
- ✓ Josephine Kanyeria – Associate expert (BSc. Environmental Science with I.T.
- ✓ Evans Totona-Occupation Health and Safety adviser
- ✓ Purity Kariuki - Associate Expert (BSc. Environmental Studies and Community Development)

1.2.2. Detailed EIA study

This involved, but was not limited to, the following:

- Collection of baseline data and information;
- Description of affected environments;
- Participation of stakeholders;
- Identification and assessment of potential impacts (both negative and positive) of the project to the environment;
- Proposal of possible mitigation measures to curb any potential negative impacts, while outlining interventions to enhance the positive impacts; and
- Development of an appropriate Environmental Management Plan (EMP).

The role of the stakeholder participation was to:

(a) Establish common stakeholder needs and ensure that the project continues to satisfy these needs or even enhance the needs;

(b) Provide background information which will form an important part of baseline data; and

(c) Create awareness amongst the stakeholders and sensitise them on environmental issues related to the project.

1.2.3. Preparation of the EIA Project Report

This EIA Study Report prepared for the project contains detailed information on the project, including on the following;

- Location of the project;
- The objectives of the project;
- Baseline information such as descriptions of the natural, social and operational environments, the current policy and legal framework and the administrative arrangement under which the project will operate;
- The technology, procedures and processes to be used in implementation of the project;
- Alternative technologies and processes available and reasons for preferring the chosen technology and processes;
- The wastes to be generated by the project and ways of handling;
- A description of potentially affected environments;
- 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;

- An EMP proposing measures for eliminating, minimising or mitigating adverse impacts on the environment, while enhancing the positive effects; 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;
- Measures to prevent health hazards and to ensure security in the working environment (safe working environment) for the employees and users of the facility, and for management of emergencies;
- An economic and social analysis of the project;
- An identification of gaps in knowledge and uncertainties which were encountered in compiling the information; and
- A non-technical summary outlining the key findings, conclusions and recommendations of the study.

2. BASELINE INFORMATION ON THE PROJECT AREA

2.1. Introduction

Machakos County whose capital is its largest town, Machakos, the country's first administrative headquarters. The county borders Nairobi and Kiambu counties to the west, Embu to the north, Kitui to the east, Makueni to the south, Kajiado to the south west, and Muranga and Kirinyaga to the north west.

The county has eight constituencies namely:

1. Masinga Constituency
2. Yatta Constituency
3. Kangundo Constituency
4. Matungulu Constituency
5. Kathiani Constituency
6. Mavoko Constituency
7. Machakos Town Constituency
8. Mwala Constituency

2.2. Physiographic and Natural Conditions

2.2.1. Geology and Topography

The soil layer over most of the site is shallow, about 1000mm in depth, and in some areas much less. Soils found within the project sites include red lateritic/loam and the black cotton soils. The site slopes gently to the Athi River and falls gradually and northwards and eastwards into the tributary valleys allowing for good drainage.

The regional topography of the site is within the Kapiti plateau and has undulating topography. This undulating is evidenced by by the meandering of the mbagathi river that has low water levels during the dry season.

The geology of the site area is characterized by the Athi series rocks, Kapiti phonolites and the basement system rocks. Major aquifers in the area are in Upper Athi Series formation due to the presence of tuffs, lake beds and sediments in between the phonolites.

The geology of the site area consists of recent deposits mostly clay with sand derived from residual weathering deposits on the surface.

2.2.2. Ecological Conditions

2.2.2.1. Flora

The type of vegetation cover found is predominantly of the Mimosoideae family of Acacia trees. Acacia species are dominant where man, fire or animals have destroyed tree cover. Common Acacia species include the Yellow fever tree and the Whistling Thorn. There is also extensive grass cover. Grasses include the Tetrapogonbidentatus and Chrysopogonancheri species.

2.2.2.2. Fauna

Over 70% of the wildlife in Kenya occurs outside protected areas, such as the dispersal areas. The majority of wildlife found in the dispersal areas are migratory species, including giraffe, zebra, and wildebeests. Other animals found in the dispersal areas include impala, Grants gazelle, Thompson's gazelle, topi, and occasionally lions. There are a wide variety of bird species including starlings, crowned guinea fowl, egrets, go-away bird, cranes and secretary birds.

2.2.3. Climate

The climate of Machakos County is semi-arid with hilly terrain and an altitude of 1000 to 2000 metres above sea level.

Rainfall is inadequate and unreliable; water from the permanent rivers and dams is not fully harnessed. Ground water resources are low and mainly saline because of the basement rock systems.

2.2.4. Economy and Land-use Activities

Subsistence agriculture is mostly practiced with maize and drought-resistant crops such as sorghum and millet being grown due to semi-arid climate. In-between Athi River to Kinanie there are flower farms, ranch, upcoming trading centers small scale farming and a forest inside EPZA wastewater treatment site.

Tourist-related activities include camping, hiking safaris, ecotourism and cultural tourism.

2.2.5. Population Structure and Distribution

According to the 1999 Kenya Population Census report Machakos District has a population of 906,644 people consisting of 442,891 males and 463,753 females representing 48.8 and 51.2 percent of the population respectively.

Machackos County had a population of 1,098,584 as per the census carried out in 2009 The population is expected to increase to 1,056,535 by 2008 (Machakos District Development Plan, 2002-2008). The increase in population will exert more pressure on the available land thus leading to a further reduction in agricultural production and depletion of water catchment areas.

Kinanie falls within Mavoko Municipality and as of 1999, the municipality had a population of 48,260.

2.2.6. Health

The biggest challenge facing the County is the increasing cases of HIV/AIDS in spite of the awareness level of over 85% of the population. The district faces a challenge of providing medical care and support for the infected and affected. For those already infected, the district intends to provide subsidized treatment for opportunistic infections (Machakos District Development Plan, 2002-2008).

It is not possible to know the exact number of HIV/AIDS cases since most of the infected go for check-ups only when they are seriously sick. It is estimated that there are over 15,000 children who are in the need for special care. Most of the HIV/AIDS patients are found in Machakos Town and in all the towns along the Mombasa highway, and most of the latter cases are attributed to the long distance truck drivers/touts and commercial sex workers (Machakos District Development Plan, 2002-2008).

3. Policy and Legal Framework

The following legislations are relevant to the proposed project

- The Physical Planning Act;
- The Local Authority Act;
- The Public Health Act;
- The Environmental Management and Coordination Act of 1999;
- The Environmental Management and Coordination (Water Quality) Regulations, 2006;
- The Environmental Management and Coordination (Waste Management) Regulations, 2006;
- The Environmental Management and Coordination (Waste Management) Regulations, 2006;
- The Employment Act 2007;
- The Labour Institutions Act 2007;
- The Work Injuries Benefits Act 2007;
- The Occupational Safety and Health Act 2007; and
- The Energy Act 2006.
- Water Act, 2016
- Fertilizers and Animal Foodstuffs Act Cap 345
- Kenya Bureau of Standard (KS), British Standard (BS), International Standards (ISO) and East Africa Standards (EAS)

Table 1: Compliance with Relevant Legislation

Parameter	Established Regulations	Regulator	Compliance (Yes/No)	Remarks
Site Location	1. The Physical planning Act Cap 286. • Change of user 2. The Registration of Titles Act Cap 281 • Title deeds	Ministry of Lands County Govt. of Machakos EPZA	Yes	The parcel of land belongs to EPZA and has been designated for wastewater treatment plant Sanergy Ltd has a organic waste treatment facility operating within a section of this land and

				it has proved successful The proponent in the process of obtaining relevant approvals
Operational Licenses	1. Local Authorities By-Laws • Single Business permit 2. EMCA Cap 387 and the related regulations 3. Standards Act Cap 496	County Govt. of Machakos NEMA KEBS	In process	Operational licences from the CGK and other Authority should be obtained E.I.A being conducted for the proposed project Waste treatment license and waste transport license to be applied before operationalisation
Building Code	1. The Physical planning Act Cap 286 2. The Land Control Act Cap 302 3. Building and Development Control Rules Plan approval / certificate of occupation	County Govt. of Machakos	Partially	Site designs/plans submitted to County Government of Machakos for approval
Health and Safety	1. The Public Health Act Cap 242 2. Occupational Health and Safety Act 2007 3. Company quality and Environmental policies 4. County Government of Machakos (Department of Public Health)	Mininistry of Health Ministry of Labour CGM	To be implemented	Approval letters from relevant ministries to be obtained upon completion of installation and before operationalisation.
Wastewater	1. Environmental management coordination Cap 387. 2. Effluent discharge permits from NEMA.	NEMA	To be implemented	Approvals to be sought from the relevant authorities upon operationalizing facility.

Air	1. Environmental Management and Coordination (Air Quality) Regulation, 2014	NEMA	To be implemented	Measures shall be put in place to ensure emissions meet the set standards. Regularly carry out ambient air quality analysis
Noise	1. International Labor Organization Quality Standards. 2. World Health Organization Quality Standards 3. Environment Management Coordination (Noise and Excessive Vibration control) Regulation, 2009.	NEMA CGM DOSH	To be implemented	Measures to be put in place to ensure insignificant noise levels and reduced exposure to noise by employees. Carry out frequent monitoring of sound level

3.1. The Physical Planning Act

The Physical Planning Act governs how development is to be carried out in major towns and urban centres. The Department of Physical Planning, in the Ministry of Lands and Settlement, administers the Act. Under the Act, the Department of Physical Planning first approves all Partial Development Plans (PDPs) of infrastructure and other developments before the projects are implemented.

This Act provides for the preparation and implementation of physical development plans for connected purposes. It establishes the responsibility for the physical planning at various levels of Government in order to remove uncertainty regarding the responsibility for regional planning. It provides for a hierarchy of plans in which guidelines are laid down for the future physical development of areas referred to in specific plan. The ostensible intention is that the three tier order plans, the national development plan, regional development plan, and the local physical development plan should concentrate on broad policy issues.

The Act also promotes public participation in the preparation of plans and requires that in preparation of plans, proper consideration be given to the potential for economic development, socio-economic development needs of the population, the existing planning and future transport

needs, the physical factors which may influence orderly development in general and urbanization in particular, and the possible influence of future development upon natural environment. The innovation in the Act is the requirement for Environmental Impact Assessment (EIA). Any change of use of the actual development without authority constitutes an offence.

The proposed site is located within an area designated for waste management and is operated by EPZA. The layouts will be submitted to the department of planning and development in Machakos County.

3.2. The Local Authorities Act

Under the Local Authorities Act, Machakos County Government assumes a number of roles in its area of jurisdiction, including the project site area which is Kinanie, in Mavoko. The roles include issuance of licenses for businesses, collection of refuse, setting up of adequate lighting, provision of water and sewerage services in the area, among others. The County Government also approves development plans as per zonation.

Such a project is an advantage to the County Government of Machakos because since there is no NEMA licensed Municipal waste disposal site in Nairobi and Machakos, the proponent in collaboration with the CGM can solve the problem of poor solid waste management in Machakos County and surroundings. The project will promote waste segregation at source thus encouraging recycling of inorganic waste since they will be less contaminated.

The project concept and layout will be submitted to CGM for approval.

3.3. The Public Health Act (Cap 242)

The Public Health Act outlines how different aspects of a project have to be undertaken to ensure the safety and health of users and neighbours. The Act gives guidelines on establishment, maintenance and inspection of drainage system, septic tanks, cesspool or latrines. In implementing the proposed project, the developer has to carry out work in line with requirements and provision of this Act.

Section 119 states that a medical officer may require the owner of dwelling causing nuisance to remove the nuisance in the dwelling failure to which legal proceedings may be taken against the owner of the dwelling and penalties. Under section 126 the act includes The Public Health (Drainage and Latrine) Rules which in section 63 deals with sewerage and prohibits the disposal of solid or liquid sewage or sewage effluent in such a manner or in such a position as to cause or be likely to cause dampness in any building or part thereof, or to endanger the purity of any water supply, or to create any nuisance.

The main contractor will be required to provide sanitary facilities and solid waste containers for use by the construction workers on site during construction phase. A licensed solid waste transporter will also be contracted to collect all inorganic solid waste from the site for dumping at approved sites. Waste water from the proposed project during its operational phase will be discharged into on-site conservancy tank.

3.4. Environmental Management and Co-ordination Act (EMCA), Cap 387

The EMCA, Cap 387 provides the legal framework for management of the environment and other related issues in Kenya. It is the policy of the Government of Kenya that EIA be conducted for planned projects that are likely to cause, or will have, significant impacts on the environment, so that adverse impacts can be foreseen, eliminated or mitigated. It is also policy of the government that the EIA process be interdisciplinary, fully transparent so that the stakeholders have access and can express their views. This is in order that the process serves to provide a balance between environmental, economic, social and cultural values for purposes of sustainable development of the entire country. The policy therefore, through the use and application of EIA, seeks to integrate environmental concerns in all development policies, plans, projects and programs at national, regional, district and local levels with full public participation of all stakeholders.

The undertaking and administration of the EIA process for the proposed project will be in accordance with the Environmental (Impact Assessment and Audit) Regulations, 2003 of the Kenya Gazette Supplement No. 56 that was published on 13th June 2003. Some of the administrative procedures are as follows:

- The EIA process will be applicable to both public and private sector development projects and programs.
- The projects to be subjected to EIA are specified in the second schedule of the EMCA, Cap 387.
- The Act gives the Governor powers to constitute County Environment Committee through a Gazette Notice. The CEC shall (a) be responsible for the proper management of the environment within the county for which it is appointed; (b) develop a county strategic environmental action plan every five years.
- NEMA will initiate public participation through uses of public notices and meetings with regard to proposed EIA studies and review of reports.
- A scheduled activity will not receive the necessary authorisation from NEMA to proceed, until all EIA requirements have been fulfilled and accepted by NEMA and relevant lead agencies.
- EIA License will be granted when NEMA is satisfied that an EIA has been satisfactorily conducted and that an Environmental Management Plan of the activity has been sufficiently developed.
- Complains with regard to compliance with EIA licensing requirements and procedures that NEMA may not resolve will be subject to a review by the Environment Tribunal. Under the Act there are general provisions for appeal to high courts and to bring proceedings in a court of law where necessary, for judicial review by third parties including concerned citizens and/or organisations other than the Government.

The project proponent has caused an E.I.A project report be done for the proposed project.

3.5. The Environmental Management and Coordination (Water Quality) Regulations, 2006

This regulation is meant protect all water resources. Relevant features of this regulation as far as this study is concerned include:-

- Every person shall refrain from any act which will directly or indirectly cause pollution and it shall be immaterial whether or not the water resource was polluted before the enactment of these regulations;

- No person shall throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such substance as to cause pollution;
- Discharge of effluent from any facility must be licensed according to the EMCA, 1999 and the subject regulation;
- Water abstraction must only be done after approval of an Environmental Impact Assessment report is submitted to NEMA and approved;
- The regulations also set out standards to be followed for effluent discharge to the environment.

The proponent shall comply with these regulations.

3.6. The Environmental Management and Coordination (Waste Management) Regulations, 2006

Relevant parts of this regulation include

- Prohibition of any waste disposal on a public highway, street, road, recreation area or in any public place except in designated waste receptacle;
- All waste generator to collect, segregate and dispose such waste in a manner provided for under these regulations;
- All waste generators to minimize waste generated by adopting cleaner production methods;
- All waste transporters to be licensed according to the Act;
- All vehicles used to transport waste to be labelled in such a manner as may be directed by the Authority;
- Collection and transportation of the waste to be done in such a manner no to cause scattering of the waste;
- The vehicle and equipment for waste transportation to be in such a manner not to cause scattering of or flowing out of waste; and
- The vehicles for transportation and other means of conveyance of waste to follow the scheduled routes approved by the authority from the point of collection to the disposal site.

- Any operator of a waste disposal/treatment site shall apply for a license from the NEMA to operate the disposal facility. Any person granted a licence under the Act and any other licence that may be required by the relevant Local Authority to operate a waste disposal site or plant, shall comply with all conditions imposed by NEMA to ensure that such waste disposal site or plant operates in an environmentally sound manner.
- Every licensed owner or operator of a waste disposal site or plant shall carry out an annual environmental audit pursuant to the provisions of EMCA.

The proponent shall ensure that inorganic solid waste is collected by a NEMA licensed waste handler and that recyclable waste to be recycled within the facility. The proponent shall ensure they acquire all the relevant licenses for waste handling before operationalising of facility

3.7. The Environmental Management and Coordination (Air Quality) Regulations, 2014

The objective of these Regulations is to provide for the prevention, control and abatement of air pollution to ensure clean and healthy ambient air.

These regulations apply to:-

a) All internal combustion engines,
b) All premises, places, processes, operations, or works to which the provisions of the Act and Regulations made thereunder apply, and
c) Any other appliance or activity that the Cabinet Secretary may by order in the Gazette, specify.

The regulation prohibits any person from:-

- Acting in a way that directly or indirectly causes, or is likely to cause immediate or subsequent air pollution;
- Emit any liquid, solid or gaseous substance or deposit any such substance in levels exceeding those set out in the First Schedule.
- Causing emission of the priority air pollutants prescribed in the Second Schedule to exceed the ambient air quality limits prescribed in the First Schedule.
- Causing the Ambient Air Quality levels specified in the First Schedule of these Regulations to be exceeded.

- Causing or allowing particulate emissions into the atmosphere from any facility listed under the Fourth Schedule to these Regulations in excess of those limits stipulated under the Third Schedule.

Section 35 of these regulations states that 'No person shall cause or allow stockpiling or other storage of material in a manner likely to cause ambient air quality levels set out under the First Schedule to be exceeded'.

The regulation makes it mandatory for persons whose operations cause or are likely to cause the emission of pollutants in excess of the limits set out in the regulations to use air pollution control systems set out in the seventh schedule of the regulation.
Part 1 of fifth schedule of these regulations exempts sewerage treatment facilities.

3.8. The Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009

Part II of the general prohibition of this regulation state that except as otherwise provided for in this regulations, no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. Part (2) of the general prohibitions stated that in determining whether noise is loud, unreasonable, unnecessary or unusual the following factors may be considered:-

- Time of the day;
- Proximity to residential area;
- Whether the noise is recurrent, intermitted or constant;
- The level and intensity of the noise;
- Whether the noise has been enhanced in level or range by any type of electronic or mechanical means; and
- Whether the noise can be controlled without much effort or expense to the person making the noise.

Part 2 of section III states that any person wishing to operate or repair any machinery, motor vehicle, construction equipment or other equipment, pump, fan, air-conditioning apparatus or

similar mechanical device or engage in any industrial activity which is likely to emit noise or excessive vibrations shall carry out the activity or activities within relevant levels prescribed in the first schedule to these regulations. Part III section 13 (1) states that except for the purpose specified in sub-Regulation (2)... no person shall operate construction equipment (including but not limited to any pile driver, steam shovel, pneumatic hammer, derrick or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the second schedule of the regulations.

3.9. Employment Act 2007

The proponent will adhere to all the regulations under this Act

3.9.1. General Principal

The Act constitutes minimum terms and conditions of employment of an employee and any agreement to relinquish vary or amend the terms set shall be null and void.

No employer shall discriminate directly or indirectly, against an employee or prospective employee or harass an employee or prospective employee on the following grounds; race, colour, sex, language, religion, political or other opinion, nationality, ethnic or social origin, disability, pregnancy, mental status or HIV status.

An employer shall pay his employees equal remuneration for work of equal value.

3.9.2. Part IV Rights and duties of employment

The provisions of this part and part VI constitute basic minimum and conditions of contract of service. The employer shall regulate the hours of work of each employee in accordance with provisions of this Act and any other written law. Subsection (2) of section 27 states that an employee shall be entitled to at least one rest day in every period of seven days. An employee shall be entitles to not less that twenty-one working days of leave after every twelve consecutive months.

3.9.3. Maternity Leave

Section twenty nine of the Act stipulates that a female employee shall be entitled to two months maternity leave with full pay and an employer who has paid a female employee wages for two months during her maternity leave shall be reimbursed by the National Social Security Fund, the equivalent of wages paid by the employer during maternity leave or a lesser amount as may be determined by the Minister in rules made by the Minister for that purpose. Subsection 8 of section 29 further states that no female employee shall forfeit her annual leave entitlement on account of having taken her maternity leave.

3.9.4. Section 37 (conversion of casual employment to term contract)

Where a casual employee works for a period or a number of continuous working days which amount in the aggregate to the equivalent of not less than one month; or performs work which cannot reasonably be expected to be completed within a period, or a number of working days amounting in the aggregate to the equivalent of three months or more. The contract of service of the casual employee shall be deemed to be one where wages are paid monthly. In calculating wages and the continuous working days, a casual employee shall be deemed to be entitled to one paid rest day after a continuous six days working period and such rest day or public holiday which falls during the period under consideration shall be counted as part of continuous working days.

3.9.5. Work Injuries Benefits Act 2007 (WIBA)

Section 7 of the Act stipulates that every employer shall obtain and maintain an insurance policy, with an insurer approved by the Minister in respect of any liability that the employer may incur under this Act to any of his employees.

Every employer carrying on business in Kenya shall within the prescribed period and in the prescribed manner register with the Director of Occupational Health and Safety Services and any other information as the Director may require. Subsection 4 of section 8 of the Act states that where an employer carries on business in more that one workplace, or carries on more than one class of business, the Director may require the employer to register separately in respect of each place or class of business.

An employee who is involved in an accident resulting in the employee's disablement or death is subject to the provisions of this Act, and entitled to the benefits provided for under the Act.

A written or verbal notice of any accident shall be given by or on behalf of the employee concerned to the employer and a copy to the Director of occupational health nod Safety within twenty-four hours of its occurrence in case of fatal accident.

3.9.6. Occupational Safety and Health Act 2007

In Section 6 (1), it is stated that the occupier shall ensure the safety, health and welfare at work of all persons working in his work place.

Without prejudice to the generality of an occupier's duty under sub section 1 above, the duties of the occupier includes:-

- ✓ The provision and maintenance of systems and procedures of work that are safe and without risk to health;
- ✓ Arrangements for ensuring safety and absence of risks to health and connection with the use, handling, storage and transport of articles and substances;
- ✓ The provision of such information, instruction, training and supervision as is necessary to ensure the safety and health at work of every person employed;
- ✓ The maintenance of any workplace under the occupier's control, in a condition that is safe and without risks to health and the provision and maintenance of means of access to and egress from it that are safe and without such risks to health;
- ✓ The provision and maintenance of a working environment for every person employed that is, safe, without risks to health, and adequate as regards facilities and arrangements for the employees welfare at work;
- ✓ Inform all persons employed of:-
  - Any risks from new technologies; and
  - Imminent danger; and
- ✓ Ensuring that every person employed participates in the application and review of safety and health measures.

3.10. Energy Act 2006 <The Energy (Energy Management) Regulations, 2012>

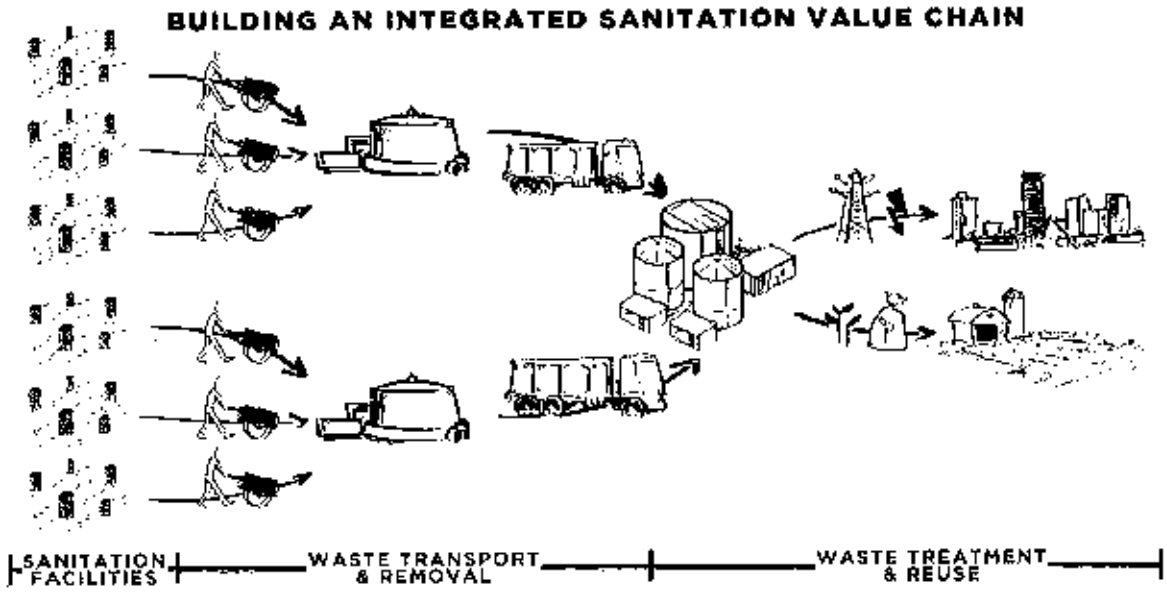
The regulation requires among other things that:-

1. All designated energy consuming facilities shall carry out energy audits at least once every three years;
2. All energy audits will be carried out by an energy auditor licensed by ERC;
3. All energy audit reports, Implementation plans and Energy Policies shall be submitted to ERC;
4. The designated facilities will be required to implement at least 50% of the energy audit recommendations within three years.

4. PROJECT DESCRIPTION AND ALTERNATIVES

4.1. Concept/Design

The organization strives to clean cities by managing waste collected from different sources in different Counties, including feacal waste from a sister company Fresh Life. The waste will then be turned into useful end-products by either converting the waste through composting as an input to organic fertilizer and energy generation or as an input to the black soldier fly project to produce insect-based animal feeds, and the residue used as an input to compost manure.



4.2. Manufacturing Process

The proposed Black Soldier Fly Biowaste processing facility is to be located on proposed site land Reference 23961-Kinanie measuring approximately 5.1Hectares. This space is a lease from Export Processing Zone Authority to Sanergy Limited for a period of thirty (30) years from 1st November, 2018. From the lease agreement, EPZA has leased the premises to Sanergy limited for construction/expansion of a waste treatment facility. EPZA itself operates a wastewater treatment plant within this premise by use of lagoons. In addition, within a portion of the same land, Sanergy has an existing biowaste treatment facility similar in nature to the proposed BSF Biowaste processing facility. In general, the proposed project is within an appropriate location designated for waste handling.

The proposed project entails establishment of an insect based biowaste processing facility to produce animal feed and organic fertilizer. This technology entails use of Larvae of the black soldier fly, *Hermetia illucens L.* (Diptera: Stratiomyidae) to transform organic waste into valuable animal feedstuff: in the form of their last larval stage, the so-called prepupa.

The main processing units that are key to a BSF processing facility include:

- BSF rearing unit: This ensures that a reliable and consistent amount of small larvae (called 5-DOL) is always available to inoculate the daily amount of biowaste that is received for processing at the treatment facility. Larvae hatchlings are, kept in the rearing unit to ensure a stable breeding population.
- Waste receiving and pre-processing unit: It is critical that the waste received at the facility is suitable for feeding to the larvae. A first step involves a control of the waste to ensure it contains no hazardous materials and no inorganic substances. Further steps then involve a reduction of the waste particle size, a dewatering of the waste if it has too high moisture and/or a blending of different organic waste types to create a suitable balanced diet and moisture (70-80%) for the larvae. In this case, Aeromaster Compost Turner will be employed for use.
- BSF waste treatment unit: This is where the five day old larvae (5-DOL) from the rearing unit are fed with biowaste in containers called "larveros". Here, the young larvae feed on the biowaste, grow into large larvae and, thus, process and reduce the waste.
- Product harvesting unit: Shortly before turning into prepupae, the larvae are harvested from the larveros. The waste residue itself is also a product of value.
- Post-treatment unit (larvae refining and residue processing): Both products, larvae and residue, are further processed. This is called "product refining". Typically, a first step will be to kill the larvae. The larvae will be washed then dried using an oven. A typical step for residue refinement is composting or feeding the residue into a biogas digester for fuel production.

Additional facilities to the proposed project include bins washing station installed with pressure washer; loading bay; sawdust storage area; power house (generator room and transformer room); boiler; repairs workshop; fertilizer processing plant; fertilizer stores; briquettes stores; water

supply (borehole and pump house); canteen; office with changing rooms for both gender; cabro-paved car parking and sorting area.

In general, the process to be followed in biowaste treatment to produce animal feed and briquettes will involve receiving of waste which has to undergo quality check since waste with hazardous contaminants is not acceptable as this may affect the survival of the larvae. After quality check, there is sorting (rough sorting) whereby non-organics contained in the waste are removed and this is followed by shredding. The waste in buckets/containers is fed to shredder through hopper and at this point, non-organic components are also removed if any and stored in bins labelled inorganic waste bins. The waste resulting from shredding machines is stored in waste holding containers and weighed and weight of each container recorded. Upon completion of shredding activity, the shredder and its surrounding shall be washed using high pressure washer. The goal of the shredding is to reduce particle size and homogenise the input material. This helps to speedup BSF processing as BSF larvae (BSFL) do not have appropriate mouthparts to break apart large chunks of waste, and increasing the surface area fosters the growth of the associated bacteria.

Moisture content in the shredded waste shall be assessed/estimated manually. In case the waste has high moisture content than required, then it undergoes dewatering process. The waste is then transferred to the BSF treatment unit where hatched BSFL from BSF rearing unit is brought and put in the containers/crates with organic waste (Larvero). The larvae start to feed on the waste, thus achieving a dry mass volume waste reduction of ~55%. Under ideal conditions with abundant food sources (i.e. waste deposits), larvae can mature in two weeks. Due to high larval densities and the voracious appetite of the larvae, fresh material is processed extremely fast and bacteria growth suppressed or restrained, thereby reducing production of bad odour to a minimum. According to Graczyk etal., 2001, *H. illucens* (BSF) has capacity to repel oviposition of female house flies, a serious disease vector especially in developing countries, where open defecation and inappropriate sanitation account for dangerous sources of pathogens.

After a defined time (preferably twelve days in the larvero), the resulting mixture of grown larvae and residue is then harvested and separated. This can be done by using a manual or automated shaking sieve by which the larvae are easily separated from the residue. With a higher

shaking frequency, the mesh size of the sieve can be bigger. This is because the larvae have difficulties to position themselves and cannot crawl through the mesh when there is a high shaking frequency. Automated shaking sieves can achieve higher shaking frequencies than manual sieves and are, therefore, favoured. During the shaking, the larvae remain on the top of the sieve while the residue falls through the sieve into recipients. Given the angle of the sieve, the larvae are guided to the lower angle, which is connected to a bucket where the larvae drop into.

Under certain circumstances, when the initial water content of the waste was higher than ideal (>80%), the larvero at the time of harvesting will contain larvae and a liquid slurry of processed waste with some undigested chunks (instead of a crumbly waste residue). In such a case, another harvesting method with non-shaking flat screens of 5 mm mesh size is recommended. A container is placed below the non-shaking flat screen. The content of the larvero is then spread out onto the flat screen. The liquid will flow through it as will the larvae because they want to avoid the sunlight, eventually falling into the container below. Larger residue chunks will remain on top of the screen and can be removed. In the container below the flat screen, the mostly floating larvae can be removed with a large strainer spoon, rinsed and then transferred into a drying container with coco peat or some other dry material (e.g. sawdust). The larvae remain in the drying container for around one day. Crawling around in this material helps to clean their skin and gives them time to empty their gut which adds to the quality of the end-product.

After harvesting, larvae will undergo some form of post-processing to ensure that they are sanitised, stored and transported easily to the respective customers. The proponent intends to wash and dry the larvae using oven. The final larvae is packaged and sold to animal feed manufacturers to use as additives in making of animal feeds. It is suitable for fish meal, pig feeds and poultry feed.

Post-processing of the crumbly residue may be used to produce stable, mature compost.

Solid waste brought to this site can undergo processing to make biowaste briquettes. For this process, there is a separation process whereby wet biomass is routed to a direct thermal process where its moisture is reduced from 55% to approximately 10%. this dry residue is characterised by moisture content of 10%; ash contenet of 25%; Carbon 37.5%; hydrogen 4.18%; nitrogen

2.78%; sulfur 0.36%; oxygen 22.36% and calorific value of 3780 Kcal/kg. The dry residue is then conveyed to an industrial briquetting press which densifies the biomass. This briquetting machine uses piston press technology to compress the biomass and this ensures sufficient binding of material to form solid cylindrical blocks. The briquettes are used in the boiler as biomass fuel. This has less harmful emission to environment.

For mixing of windrows, Aeromaster Compost Turner will be used. It also helps in shredding of biowaste.

4.2.1. BSF rearing

The egg starts a BSF life cycle and at the same time marks the end of the previous life stage: a fly laying a cluster of eggs (also called ovipositing). The female fly lays a package of eggs close to decomposing organic matter, into small, dry, sheltered cavities. Shortly after having laid the eggs, the female dies. The closeness of the eggs to the decomposing organic matter ensures that the larvae have their first food source nearby after hatching. The sheltered cavities protect the eggs from predators and prevent dehydration of the egg packages by direct sunlight.

On average, the eggs hatch after four days and the emerged larvae, which are barely a few millimetres in size, will search for food and start feeding on the organic waste nearby. The larvae feed voraciously on the decomposing organic matter and grow from a few millimetres size to around 2.5 cm length and 0.5 cm width, and are of cream-like colour. After having gone through five larval stages, the larvae reach the final larval stage: the prepupa. When transforming into a prepupa, the larva replaces its mouthpart with a hook-shaped structure and becomes dark brown to charcoal grey in colour. It uses this hook to easily move out and away from the food source towards a nearby dry, humus-like, shaded and protected environment that it deems safe from predators and is where the imago emerge from the pupa and fly off without significant hindrance.

Under optimal conditions with ideal food quality and quantity, the growth of the larvae will require a period of 14-16 days.

The larval stage is the only stage during which the BSF feeds and, therefore, it is during this time of larval development that enough fat reserves and protein are stored that allow the larvae to undergo pupation, emerge as flies, find mates, copulate and (as a female) lay eggs before dying.

it is important that all egg packages are concentrated in one specific location as this will significantly facilitate harvesting of the eggs.

For this, BSF nursery shall be supplied with cages with a suitable medium (called "eggies") whose purpose is to satisfy the flies' requirements regarding a safe location (i.e. sheltered cavities) for egg deposition, as well as an "attractant" which mimics decomposing organic matter that attracts the female to lay eggs close by. Once the egg packages are deposited into the eggies, they are harvested before any larvae hatch.

The BSF nursery (rearing unit) has the following in it:

- Love cage to collect flies, let them mate and lay eggs. Love cages are removed after six days of use. No more eggs will be laid after one week because most females die within one week.
- Dark cage: Pupation containers are placed into a dark cage where flies will emerge and eventually move to a love cage.
- Hatchling shower: This is where Eggies will be placed where newly hatched larvae fall into the hatchling container. The hatchling container will always be replaced regularly and the cohort of larvae feeds in the same container until when it will be taken to feedstock (after five days) after which the 5-DOL will be separated from the residue and their number determined.
- Nursery containers: These provide the prepupae, which go into the pupation containers to maintain the necessary adult population. The required number of 5-DOL are fed for approximately two and a half weeks until they turn into prepupae. The prepupae, crawling out from the nursery containers, are placed into the pupation containers which later will be put into the dark cage.

BSF nursery will be constructed to ensure conducive environment is provided for BSF lifecycle. The company has developed a standard operation procedure (SOP) that was being used for their first project and will be used in this project. All new employees will be inducted on SOP.

4.3. Products

The products of the proposed project during the operational phase will be a yield of:

- Prepupae (larvae) of the black soldier fly- used as additive to animal feeds
- Residue or digestate- Composting the residue for a period of two months will result in a stable mature compost/organic fertilizer. This can be used as a soil conditioner.
- Briquettes to be used to fuel boiler.

4.4. By-products

During the operational phase of the project it is not expected that there will be any by- products generated rather than inorganic waste resulting from process of waste segregation.

4.5. Waste

Effluent Waste

The following wastewater will be generated during Project operations:

- Storm water run-off.
- Contaminated waste water from the truck parking area from potential spills which together with the storm water will be directed through an oil water separator prior to discharge to on-site treatment plant.
- Waste water from sanitary facilities shall be channeled to already installed bio-digester within the site
- Contaminated waste water from bins washing station, shredder washing and larvae washing.

Waste

Some of the domestic waste to be generated at the facility will include office waste such as paper, empty cans among others. During maintenance of machines and servicing of trucks in the workshop, waste oil shall be generated. Since there will be segregation of waste to ensure no inorganic waste is processed, a good quantity of waste shall result.

Sewage Waste

The employees of the Proponent; and visitors who will be based within the project area are expected to generate sewage waste which will be channeled septic tank and liquid waste from pretreatment directed to the existing sewerage plant operated by EPZA.

4.6. Fire protection

The facility will have a comprehensive firefighting system covering all hazardous areas and the other areas of the facility. This ensures that any fire within is quickly surpassed and extinguished.

4.7. Project Alternatives

Two project alternatives are available namely the 'no project' alternative and 'yes project' alternative. Analysis of each alternative is as follows.

4.7.1. The "no project" alternative

This option will mean that the project will not be undertaken. This implies that the proposed BSF biowaste processing facility establishment will not be undertaken. This implies that all possible rising of standards for safety, health and environment will not be affected.

This option was not considered viable because:

- This would mean no job creation: The current government policy on employment and wealth creation aims at creating jobs annually will not be realized by encouraging and supporting projects such as the proposed one. If the 'no option project' was to be considered then this government target may not be realized.
- Income to government: Income in form of taxes to the government from the increased profits will not be realised;
- Improved sanitation in slums and proper waste management in urban setting especially Nairobi city will not be achieved.
- The area will not open up for other investments which will also be a source of employment for the locals
- Available land already in use for waste handling use would not have been put to optimal use.
- Manufacturers of animal feed will not be in a position to get additives to the animal feed at reasonable cost since previous supplies have even diminished.

4.7.2. The 'yes project alternative'

This option was considered viable as opposed to the 'no option' because:

- More jobs will be created;
- Available land will be optimally utilized
- It will ensure availability of affordable and quality animal feed especially for pigs, fish and poultry. The demand of animal feed is ever increasing due to the rapid urbanisation and population growth;
- Reduces importation of animal feed to meet demand and exporting finished product to neighbouring countries thus boosting foreign exchange;
- The project will increase land value of the area as more industrialists would want to invest in the area;
- The project will come with benefits such as infrastructure development in the area;
- It will result in further development and improvement of local business;
- There will be increased revenue inform of taxes to the government.

4.7.3. Alternative Use of Proposed Project Site

Alternative use of proposed site was not considered because of the following: -

- ✓ The proposed project site is within a sparsely populated area and the land in which it is to be implemented has been designated for sewage management by EPZA;
- ✓ The site already meets the necessary requirements for waste handling facility establishment;
- ✓ The facility will cater for a lot of needy families in the area through provision of employment and business opportunities;
- ✓ The necessary safety and security measures have been assessed within the neighbourhood.

4.7.4. Technology Alternatives

The most challenging issues of establishment work are observance of safety and health issues. The contractor who will be awarded establishment tender will be required to use appropriate technology that will not result in noise pollution and that will conform to operating with full implementation of safety and health matters relating to establishment.

Composting of waste to produce manure would be a cheap technology but the disadvantage would be the resulting odour. It has also been evidenced that there is lack of interest because of the effort required to collect, separate and transform organic waste, yet the profit is relatively small. With compost, for example, the product generated is handicapped by high transport costs in relation to product value and a competitive chemical fertiliser market. From this, only one product (biofertilizer) is produced.

Production of biogas may be an alternative technology to be employed. However, economically viable middle and large-scale projects are often hindered by a lack of framework conditions for use and sale of the gas itself or its secondary products (electricity, heat). Efforts are therefore necessary to impart not only an idealistic value to the organic fraction, focusing on its nutrient recovery and environmental protection potential, but also to emphasise its inherent economic value.

4.7.5. Preferred Technology

The proponent intends to optimise use of Black Soldier Fly Larvae to feed on organic waste for a period of two weeks, resulting to a dry mass volume waste reduction. The larva mature to prepupae which are rich in proteins, energy, fat and chitin and is thus good for animal feeds especially chicken (poultry), fish and pigs. Besides the yield of prepupae, the black soldier fly treatment process generates a second product, i.e. the residue or digestate which can also be further processed and potentially sold or used as soil amendment with fertilizing properties.

Additionally, waste will be composted and through use of mechanical method be used to make briquettes that will be used to fuel for boiler.

Due to high larval densities and the voracious appetite of the larvae, fresh material is processed extremely fast and bacteria growth suppressed or restrained, thereby reducing production of bad odour to a minimum. In addition, BSF has the capacity to repel oviposition of female house flies which is a serious disease vector where open defecation and inappropriate sanitation account for dangerous sources of pathogens. This makes the technology preferable to others.

Table 3: The General Anticipated Impacts and Mitigation Measures during establishment and operation activities

The organic waste treatment facility establishment and operation will be carried out by experienced personnel familiar with their duties. The work will include all safety features, foundation, concrete, brick work etc. plus all electrical installations for lighting.

Possible Impacts	Mitigation Measures
Waste Management (solid and liquid)	▪ Provide solid waste collection facilities and segregation during site preparation. ▪ Suitable method of disposal for each kind of waste will apply ▪ Operational measures should be designed and put in place to guide the process of waste reduction on-site. ▪ Waste reduction mechanisms should be employing on-site to reduce the volume of any solid wastes generated. ▪ The collection and safe storage of solid wastes on-site should be encouraged to facilitate transportation off-site. ▪ The facilitation of safe transport of wastes off-site to authorized solid waste disposal sites should be encouraged. This would discourage accidental waste disposal during transport. ▪ The provision of adequate access to toilet and bathroom facilities that meet both numerical standards (to prevent workers from using the neighbours') and treatment standards. ▪ The separation of sewage and grey water streams to reduce sewage effluent volumes. ▪ The employment of on-site treatment of wastewater.
Public and Occupational Health and Safety during establishment and operation	▪ Provision of appropriate protective clothing and equipment (overalls, head-covers/caps, gloves, ear muffs, nose muffs) and training to workers. ▪ Provide suitable equipment during site preparation to avoid muscular strains. ▪ Ensure that drinking water is safe for workers. ▪ Ensure workers work in shifts whereby duration of each shift has a maximum of 8 hours. ▪ Provide well equipped First Aid box on site ▪ Ensure First Aid training to employees and two or three First Aiders be identified within the workers and their mobile

	numbers placed at strategic points ▪ Ensure compliance with OSHA 2007 ▪ Segregate motor traffic from pedestrian traffic in the design. ▪ The limiting of regularized vending at the perimeter of the development to restrict the generation of uncontrolled solid and liquid wastes.
Surface Run-off	▪ Ensure that no waste water is directed into surface run-off drains. ▪ Put in place roof catchments so as to harvest rain water ▪ The use of permeable surfaces for parking, walkway and roadway areas to facilitate ground infiltration. ▪ The use of ground-based storm water disposal options where the geology of the area will facilitate its use. ▪ The control of storm water accessing the site from offsite locations. ▪ The incorporation of all drainage mitigations, along with a back-up surface drainage proposal, within an overall drainage plan for the development, with specific attention being placed on the terminal portion of the surface drainage, which may present a flooding risk within the site and it's neighbourhood. ▪ The employment of drainage mitigation measures to assist in the reduction of the volume and velocity of run-off from the site. ▪ The covering and berming of stockpiles of materials during rainfall periods to prevent the washing away of these materials. ▪ The recycling of sediment-loaded wash-water from batching plants to prevent the discharge of these waters into the environment.
Security	▪ 24 hours security measures to be provided including inco-operation of technology ▪ Police emergency numbers to be placed at strategic points
Drainage system	▪ Ensure effective waste water management as guided by law. ▪ Avoid as much pollution on the drainage system in the area.
Increased resource (water & electricity) demand	▪ Management of water usage. Avoid unnecessary wastage. ▪ Recycling/reuse of water at the establishment time where possible.

	▪ Install water-conserving taps that turn off automatically when water is not being used. ▪ Install energy saving electrical appliances to reduce energy consumption ▪ Carry out Energy Audit so as to know areas that need improvement
Air, Dust and Noise Pollution (during establishment and opération)	▪ Regular maintenance of operating machines and equipment. ▪ Use of appropriate protective equipment (PPE) such as ear protectors dust masks by workers ▪ Carry out regular sound level (noise) and dust survey ▪ The use of the lowest noise-emitting equipment appropriate for the given task should be opted for, since this will result in less noise generated on-site. ▪ Check the performance of the major equipment periodically, in order to troubleshooting ant fix the problem by lubricating, repairing and etc. All operational and process deficiencies be eliminated ▪ Reduce the noise exposure level of the employees especially machine operators or altering their activity zones between safe and unsafe acoustical zones. ▪ Ensure trucks ferrying raw materials to the site are well covered ▪ Preventing fugitive dust from exiting the construction site through the use of containment barriers at the site's periphery.
Increase in traffic	▪ Provision of adequate parking within the compound ▪ Comply with traffic regulations such as speed limits at the site ▪ Provide bill boards at the site/entrance to notify other motorists in the area about the project ▪ Develop a traffic management plan
Fuel leakage	▪ Ensure fuel storage tank is bunded ▪ Designated staff at storage area to be trained on how to prevent, contain and clean up spills ▪ Ensure provision of spill kits
Resource efficiency	▪ Monitor electricity and water use ▪ Put in place energy and water saving procedures and targets ▪ Install energy saving motors; water saving devices

4.8. Introduction

Consultation with the neighbours especially those drawn from the proposed project site and the immediate neighbourhood on the proposed project was conducted. The consultation was vital and served to:-

- Inform neighbouring community of the proposed development within their locality;
- Explain to the neighbouring community the nature of the proposed project, its objectives and scope;
- Give neighbouring communities especially those drawn from the proposed project site an opportunity to present their views, concerns and issues regarding the proposed project; and
- Obtain suggestion from the neighbouring community and other stakeholders on possible ways potential negative impacts can be effectively mitigated.

4.9. Mode of consultation

The consultation was twofold namely;

- Informal interviews and discussions; and
- Questionnaire survey.

5. OCCUPATIONAL SAFETY AND HEALTH

Occupational Safety and Health (OSH) is of paramount importance at establishment sites. It is important for mechanisms to be put in place to predict potential risks, incidents and hazards in the said working environment. This is because the occupational environment directly affects employees involved in establishment, the neighbourhood, visitors, contractors, sub-contractors and the general public. Therefore before commissioning the establishment, a number of safety measures have to be in place to ensure the safety of employees, neighbours and the general public. Employees and visitors to the establishment site may be exposed to a variety of personal health and safety risks. The type and level of exposure is generally related to factors controlled by the employer/ developer. Such factors include design, equipment, tools, work procedures, establishment materials, and employee training.

Managers, Supervisors and Hosts shall analyze work for hazards, authorize work to proceed, and ensure that work is performed within established controls.

Managers, Supervisors and Hosts shall ensure that the scope of work properly considers all elements of the workshop's operational priorities.

All authorized machine users shall identify, evaluate, and control hazards in order to ensure that work is conducted safely and in a manner that is compliant, and protects the environment and the public.

5.1. General Equipment Requirements

Operating Controls

A mechanical or electrical power control must be provided on each machine to make it possible for the operator to cut off the power from each machine without leaving his position at the point of operation.

Power controls and operating controls should be located within easy reach of the operator while s/he is at his/her regular work location, making it unnecessary for him/her to reach over the cutter to make adjustments. This does not apply to constant pressure controls used only for setup purposes.

Machine Guarding

i. One or more methods of machine guarding must be provided to protect the operator and other workers in the area of the machine from hazards such as those created by points-of operation, ingoing nip points, rotating parts, flying chips and sparks. Examples of guarding methods are barrier guards, two-hand tripping devices, electronic safety devices, etc. Point of operation guarding must be so designed and constructed as to prevent the operator from having any part of their body in the danger zone during the operating cycle. All guarding will be in compliance with OSHA and manufacturer specifications,

ii. Special hand tools for placing and removing material must be such as to permit easy handling of material without the operator placing a hand in the danger zone. Such tools must not be in lieu of guarding requirement and only provide supplemental protection.

iii. The following are some of the machines which usually require point-of-operation guarding: cutters, shears, alligator shears, power presses, jointers, table saws, pedestal grinders, chop saws, and belt/disc sanders.

iv. All mechanical power transmission apparatus, including belts, pulleys, gears, shafts and moving parts, must be guarded. All horizontal belts pulleys, flywheels, and fan blades and those portions of vertical and inclined belts seven (7) feet or less from the floor (or working level) are required to be enclosed by a guard when worker exposure is possible. Flywheel guards must be placed no less than 15 inches or more than 20 inches from the rim. If wheels are in a pit or within 12 inches of the floor, a toe board is required. **Note:** If workers are naturally guarded from exposure to hazardous areas by location of the belt/components (such as walls and mechanical structures), no additional guard enclosure is required.

v. Guards must be affixed to the machine where possible and secured elsewhere if for any reason attachment to the machine is not possible. The guard must be such that it does not offer an accident hazard in itself.

vi. Guard construction and design must comply with OSHA 2007,

Anchoring fixed machinery

i. Machines designed for a fixed location must be securely anchored to prevent walking or moving.

Emergency Stops

Fixed machine tools, other than those operated with constant pressure switches, require a minimum Type 1 emergency stop that complies with OSHA and manufacturer specifications, and is easily accessible from the normal operator position(s). This requirement is effective immediately for all procurement of new fixed machine tools. In accordance with the implementation plan and HAEPZL Fixed Machine Tool Improvement Program. The installed emergency stop should be selected so as to not add or increase the hazard of the machine.

Anti-restart Devices

Provision must be made to prevent fixed machine tools from automatically restarting upon restoration of power after a loss of power. This requirement is effective immediately for all woodworking tools and procurements of new fixed machine tools. Fixed machine tools, other than woodworking tools, at HAEPZL at the time of promulgation of this subject area must be brought into compliance by the Line Organization in accordance with the implementation plan and HAEPZL Fixed Machine Tool Improvement Program.

Before operating a specific machine for the first time that day, each authorized user must conduct a Pre-use Inspection and completely review the machine to ensure that safe operation of the equipment can be performed. The operator should utilize the available machine operator aid to identify critical inspection points and settings. Operator aids must identify existing controls that address predominate hazards of machine use.

5.2. Internal Safety Matters

Once the factory establishment is complete, a comprehensive occupational safety and health management system should be developed/reviewed for the workplace. Internal safety needs will need to be addressed right from the establishment phase through to the operational phase of this project exercise. Some of the things that need to be in place include; -

5.2.1. Emergency Preparedness

There is a fire plan in place for the existing facility. An integrated emergency response plan should now be developed.

- ✓ Each emergency exit must always be clear of any obstruction;
- ✓ Each emergency exit must be clearly marked;

- ✓ There should be an elaborate fire-fighting system in place with the following fire-fighting equipment, potable fire extinguishers, horse reel, fire blanket, sprinkler, CO_2 flooding, and fire alarm;
- ✓ An evacuation procedure should be in place in case of a fire or other occurrence. The procedure should be available to all workers who must familiarise themselves with it;
- ✓ Fire drills should be conducted periodically.

5.2.2. First-Aid

- Proponent/Contractor to ensure First Aid services are provided to employees at all times;
- An appropriately equipped First-Aid station to be easily accessible at the establishment site;
- A written Emergency Procedure to be in place.
- Training of employees on First Aid

5.2.3. Personal Protective Equipment

- Proponent/Contractor to identify and provide appropriate Personal Protective Equipment (PPE) such as helmets, gloves, safety boots, ear muffs and dust masks, that will offer adequate protection to the workers and occasional visitors without incurring unnecessary inconveniences;
- The proponent/contractor to actively enforce use of PPE;
- The proponent/contractor to ensure PPE are cleaned when dirty, properly maintained and replaced when damaged or worn out.

5.3. Ambient factors in the establishment site

5.3.1. Noise

- Employees not to be exposed to noise levels greater than 85dB(A) for a duration of more than 8 hours per day;
- No unprotected ear to be exposed to peak sound pressure level (instantaneously) of more than 140 dBA; and
- The use of ear protectors must be actively enforced.

5.3.2. Dust

- Exposure to dust to be controlled by ensuring dust accumulation at workplace is controlled;
- Employee exposed to dust to be provide with disposable dust masks.

5.4. Fire Fighting

Fire extinguishers and other fire-fighting equipment will be available as close as practicable within the plant premises.

6. PONTENTIAL ENVIRONMENTAL IMPACTS

6.1. Positive impacts

Positive impacts likely to result from implementation of the proposed project include the following: -

- ✓ Job opportunities;
- ✓ Support of local businesses;
- ✓ Revenue to government.

6.1.1. Employment opportunities

Establishment sites are a major source of employment. Although the jobs are not permanent, a considerable number of casuals and contracted people are able to get employment opportunities. The proposed project if implemented will likely create employment opportunities due to increased production. The probable number to be employed either directly or indirectly is estimated to 150 people.

The company will provide market for suppliers and professionals.

6.1.2. Support of local businesses

The proposed project will require the services of different expertise during the implementation stage. This will include contractors, electricians, and consultants who will be hired for various works. Others will be transporters, suppliers and other services providers to the project. This will contribute to support of local businesses. The company will require security and cleaning services all of which will be outsourced thus creating business.

Investors will have the confidence of investing in residential developments as people who will work in this company will require accomodation.

6.1.3. Community Social Responsibility

Sanergy Ltd management will ensure that the community benefits from the project being within this location. Some of the benefits the company intends to pass to the community include:

- ✓ Carrying out agricultural extension so as neighbourhood can have a reliable source of income
- ✓ Supporting local community facilities such as medical facilities and public schools one
- ✓ Offer internships to college students from within the locality.

6.1.4. Government revenue

Once implemented, the proposed project will boost revenue collection to the central government and local city council. This will be in form of permits, licence fees and other government taxes.

6.2. Negative impacts

Potential negative impacts likely to result from the proposed project include:

- Noise disturbance to neighbours and employees;
- Dust disturbance to employees and neighbour;
- Injuries;
- Waste resulting from establishment and operation phase.
- Air emissions and distorted ambient air
- There would be influx of workers during construction phase which could lead to pressure on key local infrastructure such as water, healthcare, electricity.

7. ENVIRONMENTAL MANAGEMENT PLAN

7.1. Introduction

To safeguard the environment, the project proponent together with the contractor will need to undertake the following:-

- Develop and document Environmental Management Policies that will guide establishment work and other site operations during and after establishment. The policies should address environmental conservation measures to be put in place, occupational safety and health matters of workers and management of sewage and other waste.
- The project proponent to avail required finances for implementation of EMP; and
- Contractor to ensure that establishment work is done within the requirements of Occupational Safety and Health regulations.

7.2. Environmental Management Plan (EMP)

This EMP covers four identified potential negative impacts of noise, dust, occupational hazards, waste. The issues of this EMP are in management plans that will need to be put in place concurrently with project implementation. The Management Plans are as follows: -

- ✓ Noise Management Plan;
- ✓ Dust Management Plan;
- ✓ Occupational Hazards Management Plan; and
- ✓ Waste Management.

7.3. Noise Management Plan

7.3.1. Objective

The objective of the Noise Management Plan (NMP) is to ensure that the proposed organic waste treatment facility does not generate and result in significant noise pollution to employees, neighbours and the general public. The NMP covers site establishment activities that are likely to result in noise and ways of reducing possible noise. The NMP is to be achieved by continuous monitoring of noise levels on site, implementation of recommendations and mitigation measures made in this report in respect to noise pollution and ensuring the conditions subjected to licence approval with respect to noise management are adhered to.

7.3.2. Enforcement

The NMP guiding principle will be continuous and sustained improvement in site establishment work and associated activities, safety and environmental performance, supported by regular feedback from neighbours and general public through consultative meetings, management reviews and evaluations.

7.3.3. Background

Elements of operation during the implementation of the proposed plant establishment that are likely to result in noise pollution are routine use of machinery, presence of large human labour force and actual establishment work.

Quieter machines and use of silencers on machines will be employed.

7.3.4. Route use of machinery

Routine machine use and movement of machine on site can produce much noise. Quieter machines and use of silencers would assist in noise reduction.

Some machines have inbuilt mechanisms that ensure that when operational they do not produce much noise. Some of these mechanisms include silencers. Other machines have options of fitting noise reduction devices. Use of machines with this technology at site will significantly reduce noise pollution.

Of concern will be windrow turner, generator, compressor and conveyors.

7.3.4.1. Noise management action plan

Activity	Potential Environmental Impacts	Proposed Mitigation measures	Monitoring	Actors	Timeframe	Cost Estimates (KSh)
Route use of machinery	Noise pollution to employees Noise pollution to neighbours Noise pollution to the general public	– Have noise producing machines be fitted with silencers – Provide employees with ear protectors – Ensure construction of generator house within the compound – Construction of compressor house	Survey of noise levels	Project proponent, contractors.	Throughout project cycle	50,000 for fitting silencers 75,000 for providing ear protectors to employees 20,000 to carry out noise level survey 600,000 to construct generator and compressor house

7.4. Occupational Hazards Management Plan

The objective of the Occupational Hazards Management Plan (OHMP) is to ensure that the proposed plant establishment does not result in occupational hazards. The OHMP covers possible occupational hazards such as falls, dust inhalation, high noise levels, cuts and burns. The plan is to be achieved by continuous monitoring of work standards at site, implementation of recommendations and mitigation measures made in this report in respect to occupational hazards and ensuring the conditions subjected to licence approval with respect to occupational hazards are adhered to.

Reduce the exposure time/level of the employees especially those exposed to hazards such as noise, dust and machines.

7.4.1.1. Action Plan

Concern	Potential Environmental Impacts	Proposed Mitigation Measures	Monitoring	Actors	Timeframe	Estimated Cost (KSh)
Falls	Injury to employees on site Injury to visitors/ clients	Employees working at height to be provided with appropriate working gear Use appropriate working platforms Discourage installation/use of stairs/steps within workshop	Constant site inspections to ensure that required site working conditions are followed to the later.	Proponent, Contractors, Site Engineer, Occupational Health and Safety Officer and NEMA officials	From onset of the project and then throughout the project life.	20,000 for provision of appropriate working gear
Inhalation of dust(metal dust)	Dust related ailment to employees	Provide employees with dust masks Reduce exposure time of employees exposed to dust Put in place pollution control devices (filters) during operation phase	Sampling and analysis of site particulate matter content	Proponent, Contractors, Site Engineer, Occupational Health and Safety Officer and NEMA officials	From onset of the project and then throughout the project life.	10,000 for dust protective clothing
High noise levels	Hearing effects to Employees on site	Carry out site noise survey	Reports of noise survey, feedback from employees,	Proponent, Contractors,	From onset of the project and then	95,000 for ear protectors and noise survey

	Hearing impediments to neighbours and the general public	Provide employees with ear protectors	neighbours and general public	Site Engineer, Occupational Health and Safety Officer and NEMA officials	throughout The project life	
Cuts and burns	Accidental cuts to employees by machines and poorly stored metal plates Accidental burns to employees especially at furnace and during welding	Provide employees with appropriate protective clothing e.g. safety boots, overalls and gloves. Installation of machine guards Authorised personnel to be allowed to access furnace area Provision of fully equipped First Aid Box Provision of incidence recording book	No. of accidents reported Availability of first aid box	Proponent, Contractors, Site Engineer, Occupational Health and Safety Officer and NEMA officials	Throughout project cycle	100,000/=

7.5. Waste Management Plan

Solid waste will start to be produced once the project is commissioned. This will be in the form of general office and household waste; medical waste from dispensary, scrap metal, used tyres and used oil

Measures should be put in place with the objective of ensuring that handling, management and disposal of solid waste for the proposed cement manufacturing plant establishment does not result in environmental pollution.

7.5.1. Action Plan

Concern/issue	Potential environmental impact	Proposed mitigation measure	Environmental monitoring	Actor	Time frame	Cost estimate (KSh)
Waste disposal	Poor disposal practice can result in Environmental pollution	Licensed waste handler to be contracted to collect waste (inorganic). Waste bins to be located in Strategic places for placement of litter Recyclables to be	Record of waste collection and disposal by licensed company	Contractor, Management, Public Health Officer and NEMA	From the onset of implementation of the project.	Part of contract fee

		recycled. Waste oil, medical waste and scrap metal to be handled by a registered handlers for the respective wastes.				

7.6. Air quality management plan

The objective of the Air Quality Management Plan is to ensure that the proposed facility establishment does not result in air pollution. It covers management of odour and dust emission. The plan is to be achieved by continuous monitoring of emission standards, implementation of recommendations and mitigation measures made in this report in respect to air quality and ensuring the conditions subjected to licence approval with respect to air quality are adhered to. The plan shall ensure air emissions meet the set standards in the Environmental Management and Coordination (Air Quality) regulation, 2009.

Employees shall be provided with adequate personal protective clothing and the cement fill shall be fitted with bag filters.

During operation of an organic waste treatment facility, dust particles may be emitted from the following processes/activities:

- ✓ Windrows and windrow mixing
- ✓ Packing of organic fertilizer
- ✓ Transport between the processes
- ✓ Transport to and from the site

The following pollutants are also considered to be of concern for the production of organic fertilizer:

- ✓ Methane
- ✓ Particulate matter .
- ✓ Nitrogen oxides (NO_x) and other nitrogen compounds;
- ✓ Sulphur dioxide (SO_2) and other sulphur compounds;

The accurate prediction of dust impacts is very difficult given the changing natural dust levels; an appropriate way of dealing with this subject is:

- ✓ To identify the main sources of dust attributable to the development and the scale on which dust may arise;

- ✓ To identify the people or resources that may be affected by this dust and the level of any nuisance caused; and
- ✓ To consider what measures should be taken to reduce dust from sources associated with the development to an acceptable level.

This approach is effectively based on reducing any emissions to a level which will not cause nuisance rather than attempting to predict impacts with precision.

Optimization of management and control of an industrial process is necessary in order to achieve general objectives of environmental protection.

It can be distinguished two main types of actions:

- ✓ Process monitoring (chemical, physical parameters like pressure, temperature, flow rates, etc.), aimed at controlling the performance of the plant, within fixed values;
- ✓ Monitoring of source emissions;
- ✓ Monitoring of the impacts (level of pollutants and their effects in the influenced area, inside and outside the factory.

8. ENVIRONMENTAL MONITORING AND AUDITING

8.1. Introduction

Monitoring to be undertaken will be both active and reactive. Active monitoring will include the following:-

- Monitoring of the achievements of Specific plans of the EMP, performance criteria and fulfilment of objectives;
- Systematic inspection of work place;
- Surveillance and monitoring of the work environment, including the organization of work and activities involved;
- Monitoring of workers' health; and
- Monitoring of compliance with laws, regulations and other requirements.

Reactive monitoring will include the following:-

- Work related injuries, ill health (including record keeping and monitoring of sickness/absence, disease and Accidents;
- Losses such as damage to property;
- Deficient safety and health performance including OHSMS failures;
- Workers rehabilitation and health restoration programmes.

8.2. Monitoring schedule

Description of parameter	Monitoring schedule and duration
Solid waste	Daily throughout project Life
Noise level	After every six months
Effluent discharge	Quarterly a year
Air quality	After every six months

8.3. Environmental Auditing

Annual Environmental Audits should be carried out as provided for in the Environmental (Impact Assessment and Audit) Regulations of June 2003. The Audits will serve to confirm the efficacy and adequacy of the proposed Environmental Management Plan. The audits should include but not limited to the following;

- Waste generation, management and disposal,
- Operations,
- Utilities,
- Views and comments from neighbours and progress in implementation of Environmental Management Plan.

Water quality monitoring

Water quality monitoring is critical for the conservation of the surface and ground water around the plant area. The water collecting at the site should be sampled and analyzed for presence of pollutants that may have been exposed by excavation using the recommended protocol required by Water Quality Regulations, 2006.

Laboratory Analysis

This will include the determination of the following effluent characteristics.

- Total Suspended Solids
- Heavy metals
- Total Nitrites
- Total phosphates
- BOD
- COD
- E. Coli
- Total and Fecal Coliform

9. DECOMISSIONING PHASE

During decommissioning, for the demolition option, the following should be done:

- ✓ The general public to be informed of demolition exercise well in advance by placing notices in public places concerning the intended demolition at least two weeks in advance;
- ✓ The site must be sealed off from public access;
- ✓ The firm commissioned to demolish must have enough relevant machines and equipment such as high cranes, fleet of dumpers, dozers that will enable the work be undertaken smoothly and be completed within stipulated time;
- ✓ The firm must have experienced labour force to undertake the exercise;
- ✓ Adequate measures are in place to minimise environmental degradation;
- ✓ Site supervision from relevant Central Government Departments and The Kilifi County Government must be in place throughout the exercise;
- ✓ Waste materials resulting from demolished must be handled and disposed according to environmental requirements and procedures;

10. Recommendations and Conclusion

For success of this project, supply of adequate waste materials as inputs and the market demand for the output products. Advancing on biowaste treatment is an ideal entry point for overall municipal solid waste and sewerage management improvements. It reduces public health threats and environmental burden by returning resource value of waste into economy through recovery while at the same time considering new business opportunities and economic growth. This proposal therefore considers the waste processing facility beneficial on the fact that it is also located within a premise where sewage waste is treated.

The technology, equipment and facilities that will be employed in by the Proponent Sanergy Limited are within the category of Best Available Technology and are environmentally friendly. It is for this reason that the project will cause very limited significant negative impacts in view of the choice of equipment and facilities.

The communities within the area were consulted and majority were in support of the project though raised concerns on ambient air and increased population of houseflies which are serious disease vectors.

The potential impacts of the project will be minimized to acceptable levels by a number of measures recommended in the Environmental Management Plan.

We therefore recommend that the project be granted environmental clearance to proceed in line with the provisions of the Environmental Management and Coordination Act, Cap 387.

KENYA REVENUE AUTHORITY

Taxpayer Registration Certificate

Document Number: 3920339

General Data of the Taxpayer

Name	SANERGY LIMITED		
Taxpayer PIN	P051365181I	**TaxPayer Category**	DOMESTIC
Registration Date	Aug 12, 2011		
Activity	Collection of non-hazardous waste		

Contact Information

District	NAIROBI NORTH	**City/Town**	NAIROBI CITY (NORTH)
Street / Road	GEM LANE KILELESHWA	**Building**	37
Area Name	20	**LR Number**	
P.O. Box	00100 - 26527		
Main Email Address	info@mgkconsult.co.ke		

Tax Obligation	**Obligation Register Date**
INCOME TAX COMPANY (IT2C)	DEC 31, 2010

*This certificate is computer generated and therefore not signed. It is valid certificate issued under the authority of KRA.

No. CPR/2011/53263

CERTIFICATE OF INCORPORATION

I hereby CERTIFY, that -

SANERGY LIMITED

is this day Incorporated under the Companies Act (Cap. 486) and that the Company is **LIMITED.**

GIVEN under my hand at Nairobi this **5 th** day of **August** Two Thousand and **Eleven**

Registrar Of Companies

EPZA
EXPORT PROCESSING ZONES AUTHORITY | KENYA
Your Investment & Trade Partner

EPZA/CONF/BP/311/CORP **21st December 2018**

Director
Sanergy Limited
P.O. Box 24523-00100
NAIROBI

RE: LEASE OF LAND REFERENCE 23961 - KINANIE

Following confirmation of your interest to lease the above-mentioned property, we set out below the terms and conditions upon which the Authority will grant you a lease.

LESSOR: Export Processing Zones Authority
P.O. Box 50563-00200
NAIROBI

LESSEE: Sanergy Limited
P.O. Box 24523-00100
NAIROBI

DEMISED PREMISES: All that land known as L.R. 23961 - Kinanie, measuring approximately five decimal one hectares (5.1Ha) or thereabout.

LEASE TERM: The term of Lease will be thirty (30) years commencing on 1st November 2018 at a full exclusive rent with effect from 1st November 2018.

USE: The premises will be used for construction/expansion of a waste treatment facility subject to terms and conditions of the business permit issued by the Export Processing Zones Authority.

RENT: The rent payable shall be United States Dollars Twenty Thousand Four Hundred only {(US $ 20,400) exclusive of VAT} per annum exclusive of service charge payable in advance on the 1st day of November 2018 by way bank transfer to the Lessor's bank account.

The rent exclusive of service charge shall be payable as follows: -

For the period 1st November 2018 to 31st October 2023- United States Dollars Twenty Thousand Four Hundred only {(US $ 20,400) exclusive of VAT} per annum

Administration Building, Viwanda Road, Off
Nairobi - Namanga Highway, Athi- River, EPZA
P.O. Box 50563 - 00200 Nairobi, KENYA
ISDN: +254-45-6621 000
Tel: +254-45-6621 117
Office Cell: +254 -786 683 222/733 683 222
+254713 051 172/713 051 173
Email:information.desk@epzakenya.com
Website:www.epzakenya.com

ISO:14001:2004 ISO:9001:2008

For the period 1st November 2023 to 31st October 2028- United States Dollars Twenty Four Thousand Four Hundred and Eighty only {(US $ 24,480) exclusive of VAT} per annum

For the period 1st November 2028 to 31st October 2033- United States Dollars Twenty Nine Thousand Three Hundred and Seventy Six only {(US $ 29,376) exclusive of VAT} per annum

For the period 1st November 2033 to 31st October 2038- United States Dollars Thirty Five Thousand Two Hundred and Fifty One and Cents Twenty only {(US $ 35,251.20) exclusive of VAT} per annum

For the period 1st November 2038 to 31st October 2043- United States Dollars Forty Two Thousand Three Hundred and One and Cents Forty Four only {(US $ 42,301.44) exclusive of VAT} per annum

For the period 1st November 2043 to 31st October 2048- United States Dollars Fifty Thousand Seven Hundred and Sixty One and Cents Seventy Three only {(US $ 50,761.73) exclusive of VAT} per annum

RENT ESCALATION: The Annual rent payable SHALL escalate at a rate of twenty per cent (20%) every five years.

STAND PREMIUM: That upon acceptance of this offer you shall make a one term payment as stand premium to the Authority of United States Dollars Twenty Five Thousand Five Hundred only {(US $ 25,500) exclusive of VAT}.

SERVICE CHARGE: In addition to the rent, which will be payable annually in advance, service charge will be levied to cover all Lessor's outgoings, operations and overheads (excluding water and electricity charges, which shall be the Lessee's sole responsibility).

The service charge will be based on the assessment of fifteen percent (15%) of the amount of rent payable and will be paid as hereunder:-

For the period 1st November 2018 to 31st October 2023 - United States Dollars Three Thousand and Sixty only {(US $ 3,060) exclusive of VAT} per annum

For the period 1st November 2023 to 31st October 2028- United

States Dollars Three Thousand Six Hundred and Seventy Two only {(US $ 3,672) exclusive of VAT} per annum

For the period 1st November 2028 to 31st October 2033- United States Dollars Four Thousand, Four Hundred and Six and Cents Forty only {(US $ 4,406.40) exclusive of VAT} per annum

For the period 1st November 2033 to 31st October 2038- United States Dollars Five Thousand Two Hundred and Eighty Seven and Cents Sixty Eight only {(US $ 5,287.68) exclusive of VAT} per annum

For the period 1st November 2038 to 31st October 2043- United States Dollars Six Thousand Three Hundred and Forty Five and Cents Twenty Two only {(US $ 6,345.22) exclusive of VAT} per annum

For the period 1st November 2043 to 31st October 2048- United States Dollars Seven Thousand Six Hundred and Fourteen and Cents Twenty Six only {(US $ 7,614.26) exclusive of VAT} per annum

which will be levied annually in advance on the same days as the rent.

VAT: VAT shall be payable on Rent, Service Charge and Stand Premium at the rate of 16%.

SECURITY DEPOSIT: Upon acceptance of this offer, you shall be required to pay a security deposit of United States Dollars Five Thousand Eight Hundred and Sixty Five only (US $ 5,865) which deposit shall be refundable at the expiry of the lease period.

ANNUAL RENT PAYMENTS: The first annual rent and Service Charge shall be payable on or before the 1st of November 2018.

DEVELOPMENT PERIOD: You shall be required to develop the premises within 24 months from the date of the lease in accordance with the requirements of the EPZ Act (Cap 517 of the Laws of Kenya) failure to which the Authority shall repossess the land.

STANDARD LEASE: The standard lease will include all the terms referred to in this letter in addition to the standard clauses set out therein.

EXECUTION OF LEASE/BREACH OF THE COVENANTS:

Until such time as the standard form of lease hereafter referred to has been executed and registered, all the covenants and conditions and the rent agreed shall be deemed to be incorporated in this letter.

You will undertake to maintain the premises to the highest possible standard and the Lessor reserves the right to specify such standards and implement the same. If you will not comply, you may be required to vacate the premises.

If the rent agreed or any part thereof shall at any time remain unpaid for seven (7) days after becoming payable (whether lawfully demanded or not), or if at any time hereafter you are in breach of any covenants or conditions referred to in the standard lease, it shall be lawful for the Lessor to re-enter the premises or any part thereof in the name of whole and thereupon this Agreement of Lease shall be terminated absolutely.

TELEPHONE AND ELECTRICITY:

The Lessee will pay to the suppliers for telephone, water and electricity consumed at or in relation to the premises. It shall be the responsibility of the Lessee to meet the costs of installing meters for electricity and water at the demised premises.

SUB-LETTING:

The Lessee shall not transfer, assign, sub-let or part with possession of the premises or any part thereof.

GUARANTEE:

The guarantors to the Lease shall be the directors of **Sanergy Limited**. They (the guarantors) shall be required to join in the Lease to guarantee payments and fulfillment of your obligations as stipulated therein.

VALIDITY OF OFFER:

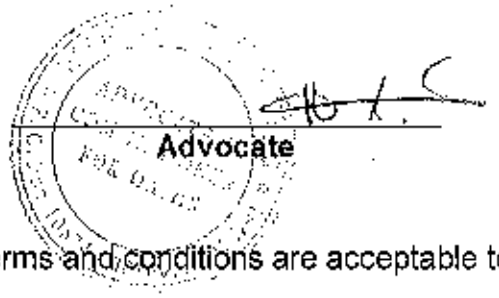
This offer is valid until 20th January 2019 after which the same will lapse and the land will be available for rent to other Lessees

If the above terms and conditions are acceptable to you, kindly sign and return to us the attached copy of this letter.

Yours faithfully,

GEORGE MAKATETO
Ag. CHIEF EXECUTIVE OFFICER

I certify that the above named GEORGE MAKATEU
Appeared before me on the 21st day of DECEMBER 2018 and that he/she freely and voluntarily executed this letter of offer and understood its contents.



Advocate

We confirm that the above terms and conditions are acceptable to us.

Director
Sanergy Limited

18/01/2019
Date

I **CERTIFY** that the above named Anirudh Vantabhaneni
Appeared before me on the 18th day of January 2019 and that he/she freely and voluntarily executed this letter of offer and understood its contents.

Advocate

PUBLIC CONSULTATION FOR THE PROPOSED EXTENSION TO WASTE HANDLING FACILITY

QUESTIONAIRE TO GATHER NEIGHBOUR'S VIEWS COMMENTS AND CONCERNS FOR ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED EXTENSION OF AN ALREAADY EXISTING WASTE PROCESSING FACILITY LOCATED ON PLOT No. 29961 KINANIE AREA, MAVOKO SUB-COUNTY, MACHAKOS COUNTY.

Sanergy Ltd herein referred to as the proponent intend to carry out expansions to the already existing waste processing plant on the above mentioned plot. The company operates a waste processing facility involved in processing of both domestic and human waste to produce organic fertilizer. It is in this regard that the proponent has engaged an Environmental Impact Assessment/Audit Firm as stipulated under Environmental (Impact Assessment and Audit) Regulations, 2003 to seek the views of neighbours who may be affected or concerned by the proposed project.

Your contribution will add value in the decision making for licensing of the proposed project.

Kindly give your views by filling this questionnaire. Note that if no feedback/comments are given within thirty days from 22nd February, 2019 or from date of receipt of this questionnaire, it shall be assumed you have no objection to the commencement of the proposed project.

1. Are you a resident or just operate your business operations in this area? (How far do you live/operate your business from this plot (proposed site)- *Je, wewe ni mkaazi wa eneo hili?*)

   ND

2. Are you aware of the activities carried out by Sanergy limited within this area? (*Je, una ufahamu wowote wa mradi unaoendelezwa na kampuni ya Sanergy?*)

   Yes.

3. What are the major environmental issues that may have effect on you or your premises once the proposed project starts? (*Wahisi ni changamoto zipi utakazokumbana nazo oparesheni ya mradi huu ukianza?*)

   Effect of the smell

FOR ENQUIRIES, CONTACT: 0724 634 944 / 0732 766 984
zebahltd@gmail.com

4. Are there any features or areas of historic/cultural importance; public utilities that need protection? *(Je, kuna sehemu zenye umuhimu wa historia ama mila na tamaduni; mali ya uma ambazo zahitaji kutambulika na uhifadhi?)*

5. What are your comments/concerns on the proposed project?*(mitigation measures to impacts noted/whether it should proceed or not/what you need done/benefits of the project)- (mapendekezo yako kuhusiana na mradi huu)*

to help the area with jobs

Name: Emmanuel muli

Area of Residence: Ndithini **Contacts:** 0702 683976

Signature: [signature] **Date:** 22/2/19

FOR ENQUIRIES, CONTACT: 0724 634 944 / 0732 766 984
zebahltd@gmail.com

PUBLIC CONSULTATION FOR THE PROPOSED EXTENSION TO WASTE HANDLING FACILITY

QUESTIONAIRE TO GATHER NEIGHBOUR'S VIEWS COMMENTS AND CONCERNS FOR ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED EXTENSION OF AN ALREAADY EXISTING WASTE PROCESSING FACILITY LOCATED ON PLOT No. 23961 KINANIE AREA, MAVOKO SUB-COUNTY, MACHAKOS COUNTY.

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1. Are you a resident or just operate your business operations in this area? (How far do you live/operate your business from this plot (proposed site)- *(Je, wewe ni mkaazi wa eneo hili?)*

Kolea

2. Are you aware of the activities carried out by Sanergy limited within this area? *(Je, una ufahamu wowote wa mradi unaoendelezwa na kampuni ya Sanergy?)*

Yes

3. What are the major environmental issues that may have effect on you or your premises once the proposed project starts? *(Wahisi ni changamoto zipi utakazokumbana nazo ogresheni ya mradi huu ukianza?)*

the smell from the company only

FOR ENQUIRIES, CONTACT: 0724 634 944 / 0732 766 984
zebahltd@gmail.com

4. Are there any features or areas of historic/cultural importance; public utilities that need protection? *(je, kuna sehemu zenye umuhimu wa historia ama mila na tamaduni; mali ya uma ambaza zahitaji kutambulika na uhifadhi?)*

No

5. What are your comments/concerns on the proposed project?*(mitigation measures to impacts noted/whether it should proceed or not/what you need done/benefits of the project)- (mapendekezo yako kuhusiana na mradi huu)*

It should proceed there are no effects on the environment.

Name: Joseph Kyalo

Area of Residence: KINANIE **Contacts:** 0727654621

Signature: [signature] **Date:** 28/2/2019

PUBLIC CONSULTATION FOR THE PROPOSED EXTENSION TO WASTE HANDLING FACILITY

QUESTIONAIRE TO GATHER NEIGHBOUR'S VIEWS COMMENTS AND CONCERNS FOR ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED EXTENSION OF AN ALREAADY EXISTING WASTE PROCESSING FACILITY LOCATED ON PLOT No. 23961 KINANIE AREA, MAVOKO SUB-COUNTY, MACHAKOS COUNTY.

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1. Are you a resident or just operate your business operations in this area? (How far do you live/operate your business from this plot (proposed site)- (*Je, wewe ni mkaazi wa eneo hili?*)

Do business in the Area but a resident

2. Are you aware of the activities carried out by Sanergy limited within this area? (*Je, una ufahamu wowote wa mradi unaoendelezwa na kampuni ya Sanergy?*)

Yes

3. What are the major environmental issues that may have effect on you or your premises once the proposed project starts? (*Wahisi ni changamoto zipi utakazokumbana nazo opareshení ya mradi huu ukianza?*)

May be Air pollusion

FOR ENQUIRIES, CONTACT: 0724 634 944 / 0732 766 984
zebahltd@gmail.com

4. Are there any features or areas of historic/cultural importance; public utilities that need protection? *(Je, kuna sehemu zenye umuhimu wa historia ama mila na tamaduni; mali ya uma ambazo zahitaji kutambulika na uhifadhi?)*

I dont know.

5. What are your comments/concerns on the proposed project?*(mitigation measures to impacts noted/whether it should proceed or not/what you need done/benefits of the project)- (mapendekezo yako kuhusiana na mradi huu)*

Job opportunities, infrastructure in place, economic empowerment.

Name: Mutsa Ndekwa

Area of Residence; Iswaumbas Contacts: 0791 831967

Signature: [signature] Date: 28-7-219

FOR ENQUIRIES, CONTACT: 0724 634 944 / 0732 766 984
zebahltd@gmail.com

PUBLIC CONSULTATION FOR THE PROPOSED EXTENSION TO WASTE HANDLING FACILITY

QUESTIONAIRE TO GATHER NEIGHBOUR'S VIEWS COMMENTS AND CONCERNS FOR ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED EXTENSION OF AN ALREAADY EXISTING WASTE PROCESSING FACILITY LOCATED ON PLOT No. 23961 KINANIE AREA, MAVOKO SUB-COUNTY, MACHAKOS COUNTY.

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1. Are you a resident or just operate your business operations in this area? (How far do you live/operate your business from this plot (proposed site)- *(Je, wewe ni mkaazi wa eneo hili?)*

I am working nearby.

2. Are you aware of the activities carried out by Sanergy limited within this area? *(Je, una ufahamu wowote wa mradi unaoendelezwa na kampuni ya Sanergy?)*

Yes I am aware.

3. What are the major environmental issues that may have effect on you or your premises once the proposed project starts? *(Wahisi ni changamoto zipi utakazokumbana naza opareshani ya mradi huu ukianza?)*

Air Pollution.

FOR ENQUIRIES, CONTACT: 0724 634 944 / 0732 766 984
zebahltd@gmail.com

4. Are there any features or areas of historic/cultural importance; public utilities that need protection? *(Je, kuna sehemu zenye umuhimu wa historia ama mila na tamaduni; mali ya uma ambazo zahitaji kutambulika na uhifadhi?)*

No idea about this.

5. What are your comments/concerns on the proposed project? *(mitigation measures to impacts noted/whether it should proceed or not/what you need done/benefits of the project)*- *(mapendekezo yako kuhusiana na mradi huu)*

I proposed the project to start immediately hoping will benefited from it in terms of job opportunity since there is lack of employment in this area.

Name: Evans Lagat

Area of Residence: Epza .... Contacts: 0711324F899.

Signature: [signature] .... Date: 28/02/2024

FOR ENQUIRIES, CONTACT: 0724 634 944 / 0732 766 984
zebahltd@gmail.com

PUBLIC CONSULTATION FOR THE PROPOSED EXTENSION TO WASTE HANDLING FACILITY

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1. Are you a resident or just operate your business operations in this area? (How far do you live/operate your business from this plot (proposed site)- *(Je, wewe ni mkaazi wa eneo hili?)*

   No

2. Are you aware of the activities carried out by Sanergy limited within this area? *(Je, una ufahamu wowote wa mradi unaoendelezwa na kampuni ya Sanergy?)*

   No

3. What are the major environmental issues that may have effect on you or your premises once the proposed project starts? *(Wahisi ni changamoto zipi utakazokumbana nazo oparesheni ya mradi huu ukianza?)*

   No challenges

FOR ENQUIRIES, CONTACT: 0724 634 944 / 0732 766 984
zebahltd@gmail.com

4. Are there any features or areas of historic/cultural importance; public utilities that need protection? *(Je, kuna sehemu zenye umuhimu wa historia ama mila na tamaduni; mali ya uma ambazo zahitaji kutambulika na uhifadhi?)*

No

5. What are your comments/concerns on the proposed project?*(mitigation measures to impacts noted/whether it should proceed or not/what you need done/benefits of the project)- (mapendekezo yako kuhusiana na mradi huu)*

Improve our Living Standard by Creating Jobs. Project to Start immediately.

Name: Chris Kiplo

Area of Residence: ...... **Contacts:** 0723 4347..

Signature: [signature] **Date:** 28/02/2019

FOR ENQUIRIES, CONTACT: 0724 634 944 / 0732 766 984
zebahltd@gmail.com

PUBLIC CONSULTATION FOR THE PROPOSED EXTENSION TO WASTE HANDLING FACILITY

QUESTIONAIRE TO GATHER NEIGHBOUR'S VIEWS COMMENTS AND CONCERNS FOR ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED EXTENSION OF AN ALREAADY EXISTING WASTE PROCESSING FACILITY LOCATED ON PLOT No. 23961 KINANIE AREA, MAVOKO SUB-COUNTY, MACHAKOS COUNTY.

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1. Are you a resident or just operate your business operations in this area? (How far do you live/operate your business from this plot (proposed site)- *(Je, wewe ni mkaazi wa eneo hili?)*

Ndio

2. Are you aware of the activities carried out by Sanergy limited within this area? *(Je, una ufahamu wowote wa mradi unaoendelezwa na kampuni ya Sanergy?)*

Ndio

3. What are the major environmental issues that may have effect on you or your premises once the proposed project starts? *(Wahisi ni changamoto zipi utakazokumbana nazo opareshen ya mradi huu ukianza?)*

Ukuna Sipokua harufu

FOR ENQUIRIES, CONTACT: 0724 634 944 / 0732 766 984
zebahltd@gmail.com

4. Are there any features, or areas of historic/cultural importance; public utilities that need protection? *(Je, kuna sehemu zenye umuhimu wa historia ama mila na tamaduni; mali ya uma ambazo zahitaji kutambulika na uhifadhi?)*

Hakuna

5. What are your comments/concerns on the proposed project? *(mitigation measures to impacts noted/whether it should proceed or not/what you need done/benefits of the project)- (mapendekezo yako kuhusiana na mradi huu)*

Mradi huu [illegible] [illegible] [illegible] kwa [illegible] ~~[illegible]~~ [illegible] [illegible] kwa sababu wengi wao watapata ~~[illegible]~~ kazi

Name: Simon [illegible]

Area of Residence: Kwa [illegible] **Contacts:** [illegible]

Signature: [signature] **Date:** [illegible] 2019

PUBLIC CONSULTATION FOR THE PROPOSED EXTENSION TO WASTE HANDLING FACILITY

QUESTIONAIRE TO GATHER NEIGHBOUR'S VIEWS COMMENTS AND CONCERNS FOR ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED EXTENSION OF AN ALREAADY EXISTING WASTE PROCESSING FACILITY LOCATED ON PLOT No. 23961 KINANIE AREA, MAVOKO SUB-COUNTY, MACHAKOS COUNTY.

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1. Are you a resident or just operate your business operations in this area? (How far do you live/operate your business from this plot (proposed site)- (*Je, wewe ni mkaazi wa eneo hili?*)

yes

2. Are you aware of the activities carried out by Sanergy limited within this area? (*Je, una ufahamu wowote wa mradi unaoendelezwa na kampuni ya Sanergy?*)

yes

3. What are the major environmental issues that may have effect on you or your premises once the proposed project starts? (*Wahisi ni changamoto zipi utakazokumbana nazo oparesheni ya mradi huu ukianza?*)

Hakuna Mbaya, inzi na magonja mengi

FOR ENQUIRIES, CONTACT: 0724 634 944 / 0732 766 984
zebahltd@gmail.com

4. Are there any features or areas of historic/cultural importance; public utilities that need protection? *(Je, kuna sehemu zenye umuhimu wa historia ama mila na tamaduni; mali ya uma ambazo zahitaji kutambulika na uhifadhi?)*

No

5. What are your comments/concerns on the proposed project? *(mitigation measures to impacts noted/whether it should proceed or not/what you need done/benefits of the project)- (mapendekezo yako kuhusiana na mradi huu)*

Kuma kidu to stop smell and housing
To benefit to employ people

Name: Dorcus M. Musinga

Area of Residence: Kwa Mbao Contacts: 0701185992

Signature: [signature] Date: 28.2.2019

PUBLIC CONSULTATION FOR THE PROPOSED EXTENSION TO WASTE HANDLING FACILITY

QUESTIONAIRE TO GATHER NEIGHBOUR'S VIEWS COMMENTS AND CONCERNS FOR ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED EXTENSION OF AN ALREAADY EXISTING WASTE PROCESSING FACILITY LOCATED ON PLOT No. 23961 KINANIE AREA, MAVOKO SUB-COUNTY, MACHAKOS COUNTY.

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1. **Are you a resident or just operate your business operations in this area? (How far do you live/operate your business from this plot (proposed site)- *(Je, wewe ni mkaazi wa eneo hili?*)**

I Ndio

2. **Are you aware of the activities carried out by Sanergy limited within this area? *(Je, una ufahamu wowote wa mradi unaoendelezwa na kampuni ya Sanergy?*)**

Ndio

3. **What are the major environmental issues that may have effect on you or your premises once the proposed project starts? (*Wahisi ni changamoto zipi utakazokumbana nazo opareshení ya mradi huu ukianza?*)**

Noise Smell

FOR ENQUIRIES, CONTACT: 0724 634 944 / 0732 766 984
zebahltd@gmail.com

4. **Are there any features or areas of historic/cultural importance; public utilities that need protection?** *(Je, kuna sehemu zenye umuhimu wa historia ama mila na tamaduni; mali ya uma ambazo zahitaji kutambulika na uhifadhi?)*.

Not applicable

5. **What are your comments/concerns on the proposed project?*(mitigation measures to impacts noted/whether it should proceed or not/what you need done/benefits of the project)*- *(mapendekezo yako kuhusiana na mradi huu)***

The project will create job opportunities to the people within the area.

Name: Bernard langat

Area of Residence: KSL Security man **Contacts:** [illegible]

Signature: [signature] **Date:** 26/04/2019

PUBLIC CONSULTATION FOR THE PROPOSED EXTENSION TO WASTE HANDLING FACILITY

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1. Are you a resident or just operate your business operations in this area? (How far do you live/operate your business from this plot (proposed site)- (*Je, wewe ni mkaazi wa eneo hili?*)

Ndio

2. Are you aware of the activities carried out by Sanergy limited within this area? (*Je, una ufahamu wowote wa mradi unaoendelezwa na kampuni ya Sanergy?*)

Ndio

3. What are the major environmental issues that may have effect on you or your premises once the proposed project starts? (*Wahisi ni changamoto zipi utakazokumbana nazo oparesheni ya mradi huu ukianza?*)

Harufu mbaya na maji

FOR ENQUIRIES, CONTACT: 0724 634 944 / 0732 766 984
zebahltd@gmail.com

4. Are there any features or areas of historic/cultural importance; public utilities that need protection? *(Je, kuna sehemu zenye umuhimu wa historia ama mila na tamaduni; mali ya uma ambazo zahitaji kutambulika na uhifadhi?)*

Nila

5. What are your comments/concerns on the proposed project? *(mitigation measures to impacts noted/whether it should proceed or not/what you need done/benefits of the project)- (mapendekezo yako kuhusiana na mradi huu)*

Mradi uendelee vijana wapate kazi n.k.w
Zingine tutafahamika ..

Name: Nancy Muli

Area of Residence: Kwamboo **Contacts:** Sina

Signature: Nancy **Date:** 28/02/19

PUBLIC CONSULTATION FOR THE PROPOSED EXTENSION TO WASTE HANDLING FACILITY

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1. Are you a resident or just operate your business operations in this area? (How far do you live/operate your business from this plot (proposed site)- *(Je, wewe ni mkaazi wa eneo hili?*)

I am a resident.

2. Are you aware of the activities carried out by Sanergy limited within this area? *(Je, una ufahamu wowote wa mradi unaoendelezwa na kampuni ya Sanergy?*)

Yes

3. What are the major environmental issues that may have effect on you or your premises once the proposed project starts? (*Wahisi ni changamoto zipi utakazokumbana noza opareshani ya mradi huu ukianza?*)

No effect apart from smell at times when the wind blows

FOR ENQUIRIES, CONTACT: 0724 634 944 / 0732 766 984
zebahltd@gmail.com

4. Are there any features or areas of historic/cultural importance; public utilities that need protection? *(Je, kuna sehemu zenye umuhimu wa historia ama mila na tamaduni; mali ya uma ambazo zahitaji kutambulika na uhifadhi?)*

N/A

5. What are your comments/concerns on the proposed project?*(mitigation measures to impacts noted/whether it should proceed or not/what you need done/benefits of the project)- (mapendekezo yako kuhusiana na mradi huu)*

The Project Should proceed since it has no effect to human/environment.
- Once the project starts it will creat job opportunities to the jobless.
- Fertilizer will be sold to people/farmers to improve their production.
- Social benefits
- Chicken/Fish farmers will also benefit from the products from Synergy Ltd.

Name: Gladys Muyodi

Area of Residence: Kwambao (Kambi Ya Nyeri) **Contacts:** 0710853364

Signature: [signature] **Date:** 28/2/2019

FOR ENQUIRIES, CONTACT: 0724 634 944 / 0732 766 984
zebahltd@gmail.com

PUBLIC CONSULTATION FOR THE PROPOSED EXTENSION TO WASTE HANDLING FACILITY

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1. Are you a resident or just operate your business operations in this area? (How far do you live/operate your business from this plot (proposed site)- *(Je, wewe ni mkaazi wa eneo hili?)*

Yes

2. Are you aware of the activities carried out by Sanergy limited within this area? *(Je, una ufahamu wowote wa mradi unaoendelezwa na kampuni ya Sanergy?)*

Yes

3. What are the major environmental issues that may have effect on you or your premises once the proposed project starts? *(Wahisi ni changamoto zipi utakazokumbana nazo oparesheni ya mradi huu ukianza?)*

Unbearable Smell

FOR ENQUIRIES, CONTACT: 0724 634 944 / 0732 766 994
zebahltd@gmail.com

4. Are there any features or areas of historic/cultural importance; public utilities that need protection? *(Je, kuna sehemu zenye umuhimu wa historia ama mila na tamaduni; mali ya uma ambazo zahitaji kutambulika na uhifadhi?)*

Not aware

5. What are your comments/concerns on the proposed project? *(mitigation measures to impacts noted/whether it should proceed or not/what you need done/benefits of the project)- (mapendekezo yako kuhusiana na mradi huu)*

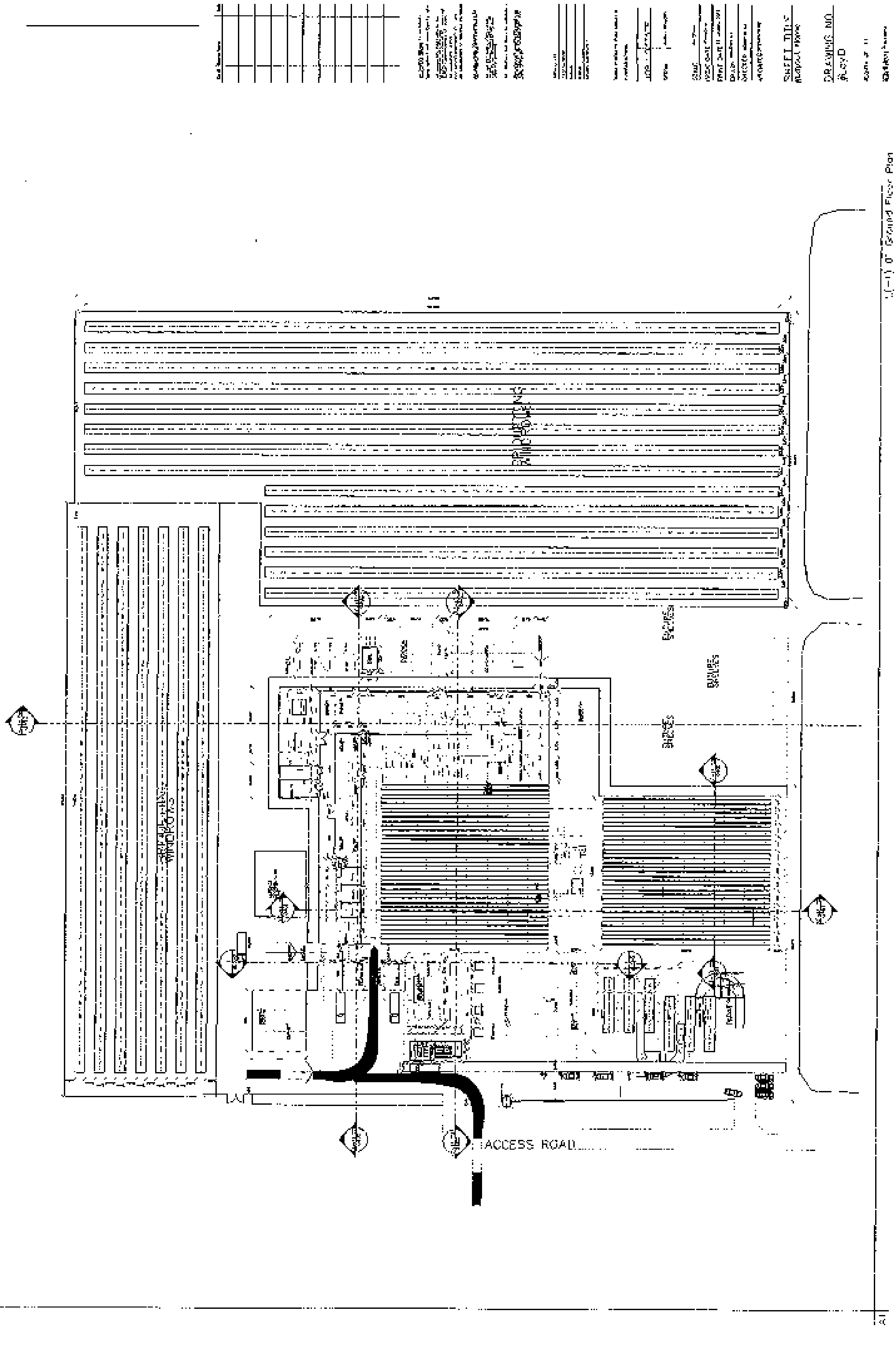
Jobs are given inconsiderately whether it starts or not I don't care indeed it's very risky to surrounding environment and human health

Name: Steve Kyalo

Area of Residence: Kwanthoo Contacts: N/A

Signature: [signature] Date: 28/07/19

FOR ENQUIRIES, CONTACT: 0724 634 944 / 0732 766 984
zebahltd@gmail.com


ACCESS ROAD