

**ENVIRONMENTAL AND SOCIAL IMPACT
ASSESSMENT STUDY REPORT
FOR THE PROPOSED ASBESTOS DISPOSAL
(LANDFILL) SITE AT KALUMANI ON PLOT NO. LR.
5010 IN MNYENZENI AREA, IN KILIFI COUNTY.**



**PROJECT PROPONENT:
FADEMA COMPANY LIMITED.
P.O.BOX 26701 - 00504
NAIROBI KENYA,**

GPRS: LATITUDE -3.736452, LONGITUDE 39.412196.

EIA TEAM LEADER:

**GLOBAL EHS CONSULTING
LEAD EIA/AUDIT EXPERT REG. NO. 1916
P.O Box 42588-80100
MOMBASA**

December@2021

CERTIFICATION

Certification by EIA Expert

I certify that this Environmental Impact Assessment study report has been done under our supervision and that all due diligence has been taken in assessment criteria, methodology and report writing and that it conforms to the requirements of the Environmental Management and Coordination Act, 1999 and Legal Notice No. 101 of June 2003 (Environmental Impact Assessment and Audit Regulations).

EIA Expert;

Edgar Ambaza Malenge (1916)

Venlensa Atieno Odhiambo (9989)

Signature: _____ Signature: _____

Date: _____

Certification by Proponent

I, confirm that the content of this EIA project report is true to the best of my knowledge and it has been submitted to NEMA with my approval as the proponent.

Signature: _____ Date: _____

PROPONENT ADDRESS:

Fadema Company Limited

P.O BOX 26701 - 00504

Nairobi, Kenya.

EXECUTIVE SUMMARY

Environmental Impact Assessment study report is a planning tool now generally accepted as an integral component of sound decision-making. The purpose of Environmental Impact Assessment is to give the environment its due place in the decision-making process by clearly evaluating the environmental consequences of the proposed activity before action is taken. Early identification and characterization of critical environmental impacts allows the public and the government to form a view about the environmental acceptability of a proposed developmental project and what conditions should apply to mitigate or reduce those risks and impacts. Following concern arising from the presence of asbestos wastes generated in various asbestos containing materials, building and construction sectors, the company commissioned a study to assess and identify the appropriate site where these materials can be disposed off safely. The study was to identify the impacts of such disposal within the premises and to make recommendations thereon. The study has made a series of recommendations regarding handling and disposal among others. As legislative requirements provide for the preparation of an Environmental Impact Assessment for projects that might have adverse effects upon the environment, the proposed project is being subjected to the statutory EIA process.

Fadema Company Limited, a Kenyan registered company with Memorandum of Association incorporated in Kenya to operate various business entities has a vested interest in operation of Asbestos Management, Handling and Disposal project the land is registered in the name of the proponent, Fadema Company Limited management have purchased the piece of land which is estimated to be 5 acres from 58 acres piece of land as per the attached on sale agreement LR No. 5010/Kalumani/Mnyenzi area, Fadema Company Limited proposes to provide a facility that will offer solutions to asbestos disposal from various building that intend to dispose off the asbestos roofing's and any other asbestos containing material's within republic of Kenya. The site is located about 7.5 kilometres away from the main Mombasa – Nairobi highway accessible through the Maji ya Jumvi Check[Point] Junction Road, the site is neighbored by land parcels that are not developed at all, human settlement in this area is scattered without major developments near the proposed site.

Asbestos is a naturally occurring mineral that once was lauded for its versatility, recognized for its heat resistance, tensile strength and insulating properties, and used for everything from fire-proof vests to home and commercial construction. It was woven into fabric, and mixed with cement.

Its properties were so desired that the United States military mandated its use in every branch of service. Asbestos was a perfect blend to make things better – except it was highly toxic, too. Today asbestos is a known cause of mesothelioma cancer, is banned in more than 50 countries and its use has been dramatically restricted in others.

Asbestos is a Group of six different fibrous minerals (amosite, chrysotile, crocidolite, and the fibrous varieties of tremolite, actinolite, and anthophyllite) that occur naturally in the environment. All forms of asbestos are hazardous, and all can cause cancer.

The major components of this project will be erecting of a temporary site office and house, sanitary block with toilets, shower room and changing room, truck washing bay chain link fence/perimeter wall to cover the selected area for disposal of asbestos, temporary storage areas, excavations of pits/cells, provision of safety gears that are appropriate for asbestos disposal, provision of security services at the site at a cost of estimated Ksh.2 million. The proposed disposal site is in a bare field.

In view of its anticipated environmental impacts, an environmental Impact assessment was prepared to enhance project acceptability and identify measures aimed at mitigating the negative impacts. The full EIA followed an earlier scoping exercise that identified the significant impacts. The assessment used site surveys and a checklist among other tools. This report highlights the main features of the project and the procedural context, within which the EIA was prepared, and discusses some of the main issues that need to be addressed to improve the project's area and the surrounding.

The terms of reference for the preparation of the EIA Report are:

- A critical look into project objectives
 - The proposed location of the project site
 - Description of project objectives.
 - A concise description the national environmental legislative and regulatory framework, and any other relevant information related to the project
 - Evaluation of the technology, procedures and processes to be used in the implementation of the project
 - Description, evaluation and analysis of the foreseeable potential environmental effects of the project broadly classified into physical, ecological/biological and socio-economic aspects which can be classified as direct, indirect, cumulative, irreversible, short-term and long-term effects.
 - Evaluation and analysis of alternatives including the proposed project, project alternative, project site, design and technologies
 - An Environmental Management Plan (EMP), proposing the measures for eliminating/minimizing or mitigating adverse impacts on the environment,
 - Propose measures to prevent health and safety hazards and to ensure security in the working environment for the employees, and for the management in case of emergencies.
- This encompasses prevention and management of the foreseeable accidents and hazards during operational phase.



Picture's showing the site



SUMMARY EMP FOR CONSTRUCTION AND OPERATION

IMPACTS	Mitigation measures
Excavations and protection of flora and fauna	<p>Protect as possible indigenous trees and other surrounding vegetation that need not be removed. Minimize site clearance to only areas needed for excavations</p> <p>Undertake continuous excavation of asbestos pits/cells. That is excavation of any subsequent pit shall base on expected asbestos materials</p> <p>Plant trees around the perimeter fence and within some section of the site</p> <p>Cover any asbestos pit that is not full with polythene sheet and soil 1m above the buried asbestos and seal the cell with concrete material as it awaits more asbestos materials to be concluded as full.</p>
Safety & health	<ul style="list-style-type: none"> • Occupational Safety and Health Act, 2007 • Training the workers on the potential health risk caused by exposure to asbestos and how to reduce these risks • The asbestos removal and disposal workers shall be trained on safe asbestos handling techniques. • Notify workers about the upcoming disposal activity and the Safety requirements • Prepare appropriate PPE • PPEs shall be of single use and shall be used once and disposed with asbestos materials • Post appropriate signpost of the site that will inform the workers of key rules to follow • Put in place an appropriate emergency and incident response plan
Waste Generation	<ul style="list-style-type: none"> • Train cleaning and maintenance workers on the need for proper waste management • Minimize waste generation, segregate general and hazardous waste in color coded refuse bins. • Any waste/material contaminated with asbestos shall out rightly be disposed of in asbestos pit
Asbestos management	<ul style="list-style-type: none"> • The onsite and offsite Asbestos disposal site shall be marked clearly as asbestos hazard area in accordance with the National Guidelines on Safe Management and Disposal of Asbestos • The asbestos will be appropriately contained and sealed to minimize exposure • The asbestos prior to removal shall be treated with a wetting agent to minimize asbestos dust • Asbestos shall be handled and disposed by skilled & experienced professionals • If asbestos material is being stored temporarily, the wastes shall be securely enclosed inside closed containments, marked appropriately and secured. • The removed asbestos will not be reused or recycled in anyway • The asbestos materials removed shall be buried onsite/offsite based on the clients preference • Removal including Onsite/offsite disposal of asbestos shall be subjected to environmental impact assessment in accordance with the Environmental (Impact Assessment and Audit) Regulations, 2003.
Management of temporary waste storage sites	<ul style="list-style-type: none"> • Ensure management of temporary waste storage sites is in line with the National Guidelines on Safe Management and Disposal of Asbestos. • Register and monitor waste volumes at the temporary waste storage site • Oversee the physical removal of the waste from the temporary waste storage sites
Traffic and Pedestrian Safety	<ul style="list-style-type: none"> • Signposting, warning signs, barriers and traffic diversions: site should be clearly visible and the workers warned of all potential hazards • Provision of safe passages and crossings for pedestrians be made

	<ul style="list-style-type: none"> • Train staff at the site on safe and convenient passage at the work place. • Ensuring safe and continuous access to office facilities, shops and residences during disposal and cleaning activities, if the facility is in operation during this activity
Air Quality	<ul style="list-style-type: none"> • Establish simple air quality monitoring that ensures the outputs of the monitoring process are maintained and utilized in improving. • Appoint a dust monitoring agent/lab to monitor and analyze dust and air quality • Air monitoring should be done continuously in areas related to asbestos removal works.
Storm water Management	Ensure all storm water from the site is directed towards the established water drains
Hygiene and sanitary provision	<p>Provide washrooms, bathrooms and changing rooms within the facility</p> <p>Provide truck was bay for cleaning asbestos transportation vehicles</p>
Disposal Scheduling and Hours	The disposal and cleaning activities should be limited from 7 am or sunrise (whichever is later) to 5 pm or sunset
Clearance Inspections	Inspections should be done to ensure that temporary storage site and work environment is cleaned to a satisfaction standard.

The company is in the process of ensuring cleaner environmental hygiene. Cleaner Production is an approach to environmental management that aims to improve the environmental performance of products, processes and services by focusing on the causes of environmental problems rather than the symptoms. In this way, it is different to the traditional 'pollution control' approach to environmental management. Where pollution control is an after-the-event, 'react and treat' is the approach used; Cleaner Production reflects a proactive, 'anticipate and prevent' philosophy. Cleaner Production is most commonly applied to production processes by bringing about the conservation of resources, the elimination of toxic raw materials, and the reduction of wastes and emissions.

ABBREVIATIONS

NEAP	National Environment Action Plan
EIA	Environmental Impact Assessment
LTD	Limited
NEMA	National Environment Management Authority
EMCA	Environmental Management and Co-Ordination Act
OEL	Operational Exposure Limit
EMP	Environmental Management Plan

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1.0 INTRODUCTION

This Environmental Impact Assessment (EIA) is to provide information on the potential negative and positive environmental and social impacts of the project. It also aims to make recommendations for the mitigation of the potential negative impacts and enhancement of the positive ones. A field survey of the project site was conducted and potential environmental impacts of project activities were identified, assessed, and documented. The EIA Team carried out consultations with various stakeholders, particularly lead agencies, local authorities and the affected people.

Environmental Impact Assessment is a planning tool now generally accepted as an integral component of sound decision-making. The purpose of Environmental Impact Assessment is to give the environment its due place in the decision-making process by clearly evaluating the environmental consequences of the proposed activity before action is taken. Early identification and characterization of critical environmental impacts allows the public and the government to form a view about the environmental acceptability of a proposed developmental project and what conditions should apply to mitigate or reduce those risks and impacts.

Following concern arising from the presence of roofing asbestos within the county and republic of Kenya. Fadema Company Limited commissioned a study to assess and identify the appropriate site where these materials can be disposed off safely. The study was to identify the impacts of such disposal and to make recommendations thereon. The study has made a series of recommendations regarding handling and disposal among others.

As legislative requirements provide for the preparation of an Environmental Impact Assessment for projects that might have adverse effects upon the environment, the proposed project is being subjected to the statutory EIA process.

DESCRIPTION OF THE PROJECT

The proposed project involves asbestos pits, temporary storage area, site office, sanitary block, truck washing bay, perimeter wall/fence, asbestos removal & offsite disposal services, and associate amenities on Plot LR. No 5010 Land sorounding the piece of the portion bought by Fadema Company is 58 in acraeges which consists of shrubs in Mnyenzeni Village Kalumani area, of Kilifi County. The plot is approximately 5 acres bare land. The Sanitary facility will contain (toilets, shower room and changing room).

The proponent shall specialized in removal, transportation as well as **off-site and on-site disposal** of asbestos materials. This will majorly involve

Item	Activity
1.	<ul style="list-style-type: none"> • The proponent shall advise all its offsite and onsite clients on environmental requirements such as the need for EIA, hydrogeological survey report and risk analysis where applicable. • Hydrogeological analysis (of the proposed on site/offsite landfill) to determine its suitability for asbestos disposal without contaminating the underground water to be included in the EIA report. Done by a qualified hydrologist • The proposed OFFSITE DISPOSAL has been subjected to hydrogeological survey analysis, report appended herein so the offsite disposal will only be subjected to EIA and Risk assessment and they shall have dully executed contract for disposal of asbestos materials with our company. • Risk assessment for removal and disposal of asbestos shall always be done by a qualified environmental Expert.
2.	<p>Removal and transportation to the onsite pit or licensed offsite landfill involves;</p> <ol style="list-style-type: none"> a. Procurement of Personal protective Equipment's (PPEs) and; b. asbestos plastic wrapping liners and pit plastic liners of 500 gauge c. Notification of affected parties on the time and nature of work to be done d. Training of workforce on safe work procedure e. Fully trained technical and casual staff all equipped with recommended PPEs f. Removal tools g. Double wrapping of bundled asbestos roofing sheets with 500 gauged lined plastic sheet h. Securing the temporal holding area for asbestos before actual disposal which should not be more than 30 days if offsite. i. Transportation of asbestos to the on-site disposal pit/licensed offsite landfill using a NEMA licensed vehicle j. Excavation of the pit to a depth recommended in the hydrological report. k. Covering the pit with liner l. Gently lowering the stacked asbestos materials to the prepared pit

	m. Covering the pit with a plastic liner and soil 1m below the ground level n. Securing the pit with chain link and labeling as “asbestos hazard area keep out”
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Note that the proponent shall undertake **onsite** and **offsite** asbestos disposal based on the **PREFERENCE OF THE CLIENT** and in accordance with the existing local bylaws and legal requirements. **The main reference in this context is on the compliance to EMC (Waste Management) Regulations, 2006 and in line with the National Guidelines on Safe Management and Disposal of Asbestos, 2013**

1.1.1 Disposal procedures for asbestos

Asbestos waste must be disposed of at approved NEMA sites. It must not be sold or re-used.

What is required when disposing of asbestos?

Asbestos must be removed from the site to an approved refuse site as soon as practicably possible. Before removal the asbestos waste must be placed in a sealed container and marked clearly to indicate the presence of asbestos.

A licensed asbestos handler must prepare an asbestos removal control plan for any licensed asbestos removal work being undertaken.

The removal control plan must include details of the means of transport and disposal of asbestos waste.

An asbestos removal control plan should describe:

- how the waste is contained (on and off site)
- the quantity (amount and dimensions) of waste
- where the waste will be stored on site before disposal
- how the waste will be transported (on and off site)
- approvals from the local authority
- local authority requirements such as quantity of asbestos and dimensions of containers
- where the waste will be transported to
- Verification of correct disposal such as tip docket.

The asbestos removal plan must be kept on site.

How is asbestos waste stored on site prior to removal?

Before being removed from site, asbestos waste must be stored in closed containers that are impermeable to asbestos dust, such as 500 gauge thick plastic bags or double wrapped in 500 gauge thick polythene sheet

Asbestos waste should:

- be double-bagged in case of one bag rupturing
- be in appropriate polythene bags or wraps
- not be more than half-filled if in the bag
- have excess air in the bag carefully removed before sealing so there is no release of asbestos dust

All stored asbestos waste must be clearly marked to indicate the presence of asbestos.

1.1.2 Project Concept

Environmental Hygiene is the science of anticipation, recognition, evaluation and control of health hazards in the work environment with the objective of protecting the health of workers and citizens of the community. Its role is first, to ensure a healthy work environment through continuous surveillance; second, to protect workers from diseases that can be caused by unhealthy environments; third, to break the vicious cycle of 'unhealthy environment' – occupational disease.

The company however sought the assistance of an environmental consultant to carry out an environmental impact assessment of the asbestos disposal site.

1.1.3 Objectives

The primary objectives of the project are:

- To safely remove and dispose off asbestos materials,
- To ensure that the handling of asbestos containing products or material during the disposal and clean-up is in accordance with regulatory requirements
- To minimize occupational exposures to asbestos fibers and future liabilities
- To protect employees and the community from contact with asbestos fibers during the disposal and subsequent clean up exercise
- To disclose to employees, contractors and the public, asbestos contaminated sites within the premises and pronounce on management of these.
- To advise its potential clients on viable disposal options of asbestos either offsite or onsite and execute the preferred options with professionalism.

1.2 NATURE AND SCOPE

Asbestos is a naturally occurring substance applied in a wide variety of industrial uses because of its desirable properties and because it can be produced at prices competitive with those of available substitutes. There are a set of six naturally occurring [silicate minerals](#) used commercially for their desirable physical properties. They all have in common their eponymous, asbestiform habit: long, (1:20 μ m) thin fibrous [crystals](#). Six minerals are defined as "asbestos" include those belonging to the serpentine class [chrysotile](#) and those belonging to the amphibole class [amosite](#), [crocidolite](#), [tremolite](#), [anthophyllite](#) and [actinolite](#). Asbestos and all commercial forms of asbestos (including chrysotile asbestos) are known to be human [carcinogens](#) based on sufficient evidence of carcinogenicity in humans. Asbestos became increasingly popular among manufacturers and builders in the late 19th century because of its sound absorption, average [tensile strength](#), its [resistance to fire](#), heat, electrical and chemical damage, and affordability. Because of the above-mentioned characteristics, asbestos has been used for a wide range of manufactured goods, mostly in building materials (roofing shingles, ceiling and floor tiles, paper products, and asbestos cement products), friction products (automobile clutch, brake, and transmission parts), heat-resistant fabrics, water pipes, gaskets, and coatings. It has extensively been used as insulation material in the sugar industry and is also present in many houses, built in the 1960's.

It has become increasingly evident that exposure to asbestos, throughout the life cycle of the asbestos products; that is, the mining, milling, manufacturing, processing, use, and disposal of the asbestos product, can significantly increase an individual's risk of contracting diseases, including cancers. Such diseases frequently end in death, and when they do not, activity is reduced as respiratory function is restricted. Initially, the findings on the hazards of asbestos were confined to occupationally exposed individuals, but more recent evidence points to the likelihood that even low exposures of the non-occupationally exposed are potentially hazardous.

In response to such information, the Kenyan Government has taken steps to reduce human exposure to asbestos. Although asbestos use is declining in the country, it is still used in a variety of applications and asbestos dust is still being released into the environment.

The only method of completely removing these risks is to remove asbestos from the marketplace by eliminating the asbestos products, by eliminating the asbestos fiber used to produce these products, or both. Thus, one advantage of a combined ban and phase-down approach is that selected products can be eliminated quickly with a ban, and all others can be eliminated over time through the fiber phase-down rule.

1.2.1 Asbestos as a contaminant

Most respirable asbestos fibers are invisible to the unaided [human eye](#) because their size is about 3–20 μ m wide and can be as slim as 0.01 μ m. [Human hair](#) ranges in size from 17 to 181 μ m in breadth. Fibers ultimately form because when these minerals originally cooled and crystallized, they formed by the [polymeric](#) molecules lining up parallel with each other and forming oriented [crystal lattices](#). These crystals thus have three [cleavage planes](#), and in

this case, there are two cleavage planes which are much weaker than the third. When sufficient force is applied, they tend to break along their weakest directions, resulting in a linear fragmentation pattern and hence a fibrous form. This fracture process can keep occurring and one larger asbestos fiber can ultimately become the source of hundreds of much thinner and smaller fibers.

As asbestos fibers get smaller and lighter, they more easily become airborne and human respiratory exposures can result. Fibers will eventually settle but may be re-suspended by air currents or other movement. When fibers or asbestos structures from asbestos containing materials (ACM) become airborne, the process is called primary release. Primary release mechanisms include [abrasion](#), [impaction](#), fallout, air [erosion](#), vibration, and fire damage. Secondary release occurs when settled asbestos fibers and structures are resuspended as a result of human activities. In unoccupied buildings or during unoccupied periods, fiber release typically occurs by fallout or is induced by vibration or air erosion.

1.2.2 The Need and Desirability of Asbestos Disposal Project

The presence of asbestos poses a long term environmental and human health risk to people, and therefore the need and urgency to dispose off and clean up the various premises and facilities in order to eliminate any further environmental risks. The asbestos materials and substances will be contained in one area which will be easily manageable rather than having different area or pieces of land with disposal points of asbestos, it will be much valuable for authority to consider issuing out the license for this facility since it will offer long term solutions for asbestos disposal menace within the republic.

1.2.3 The need for a Licence

The facility was subjected to full study after evaluating the impacts associated with this kind of project in length, it is important for the authority to issue this project with EIA license as a monitoring tool both during construction and operational.

1.2.4 Asbestos sheets removal

Waste containing asbestos in the form of dust or fibers is listed as hazardous according to the **fourth** and **fifth schedules** of regulations on waste management, **legal notice no. 121 of 2006**. As per the Environment Management and Coordination Act, 1999, the National Environment Management Authority (NEMA) has the responsibility of enforcing agency for all types of wastes, including hazardous wastes. According to the General provisions, section 23 of the Waste management Regulations, 'No person shall engage in any activity likely to generate any hazardous waste without a valid Environmental Impact Assessment licence issued by Authority under the provisions of the Act'

This EIA identifies, describes, and evaluates the potential environmental impacts that could result from the implementation of the proposed action. Resource areas most relevant to the proposed action are the focus of

analysis. These include “Infrastructure and Utilities - Potential effects on sanitary sewer, potable water, solid waste management, drainage, transportation, and electricity. Potential effects on existing environmental and management practices for hazardous materials and wastes will also be assessed.

The proposed disposal site involved represents little ecological interest, being bare land. Air quality and health and safety issues are, however, considered more significant taking into account the national legislation on the issues. With adequate mitigation measures, environmental protection policies would be largely satisfied. The on-site and off-site impacts are also considered to be significant enough to warrant investigation.

Warning and safety signage will be placed at the areas within the temporary site and the disposal site. Skilled staff/workers as well as a site supervisor will be required, and all will use the required Personal Protection Equipment (PPE). Unauthorised personnel will not be allowed near the work areas. All personnel involved with the asbestos disposal and remediation process will be subjected to medical surveillance as per the Occupational Health and Safety Act, 2007.

The asbestos workers coming in direct contact with asbestos waste will need to shower (using clean water) to remove any asbestos fibers from their PPE – decontamination suits on a daily basis. A fully functional decontamination unit or trailer will be utilized at each site. The decontamination unit, placed about 30 metres of the sites will consist of three chambers and will have a fully operational hot and cold running water system, adjustable at the shower tap, and a functional water filtration unit that will filter the water waste down to 5 microns prior to being tapped for disposal. Workers should wear a clean outer protective suit as they exit from the work area to the decontamination area.

The site that had asbestos pile will then be cleaned up. Prior to commencement of the disposal and clean-up, the asbestos sheets and the contaminated site shall be sprayed with water to suppress the release of fibers. Stock piled asbestos waste shall be continuously sprayed with a mist of water during the disposal and cleaning process so as to effectively reduce and control the release of the fibers. Damp asbestos will be manually lifted by the use of shovels, forks or by hand and placed into 500 micro-plastic bags (Double bagged and labelled). The cleaning process will involve removing the soil overlain by the asbestos roofing wastes. The areas where any soil has been removed during the cleaning process will be backfilled with clean soil and covered.

Bagging

All asbestos to be disposed of at the proposed disposal site will be contained by layers that separate it from the environment. The layers will include two impermeable, high density plastic liners, alternating with thick layers of soil between and on top to cushion the material against puncture as well as geotextile sheets that further seal the disposal “cell.”

These procedures to seal the waste from contact with the environment make it extremely unlikely that any water could come into contact with the material. Medical experts recommend that asbestos simply be buried in an ordinary

landfill since asbestos is not soluble in water and one must guard only against inhalation. The asbestos disposal activity at the site thus exceeds the requirements of the Environmental legislation.

Handling and Transportation

The handling and transportation of asbestos material shall be in accordance to waste regulations. All machinery involved in an asbestos disposal and clean-up process shall be jet-washed for asbestos contamination before leaving the sites.

Disposal

The removal of asbestos material from the temporary site to the disposal site will involve the asbestos workers excavating the asbestos material to remove it and the contaminated soil, and then placing it into airtight containers. Or wrapping and gently lifting the temporary stored asbestos materials into a NEMA licensed truck and transport to the NEMA Licensed landfill or licensed onsite disposal.

There are two options for disposing of asbestos:

- Asbestos waste is double-wrapped in 500 gauge thick plastic bags or sheeting, sealed with tape and labelled double wrapped and transported to a licensed asbestos landfill site .
- Label all bags with an appropriate warning such as:

CAUTION

ASBESTOS DO NOT DAMAGE OR OPEN BAG

DO NOT INHALE DUST

The disposal site will **be dug to a depth recommended in the hydrogeological survey report and it will be considered full once it's one meter below** the ground level. The wrapped/contained asbestos will then be gently put in the dug site and buried with soil layers.

Asbestos waste must be disposed of at a licensed asbestos landfill. The site is usually operated by a NEMA licensed asbestos handler in this case the proponent site should obtain a license to own/operate an asbestos Landfill and a NEMA license to own an asbestos containing materials waste transportation vehicle; However potential proponents shall be given options to dispose onsite or offsite depending on their preference and cost implications. Our Company is ready to offer the services as preferred subject to compliance with NEMA requirements on offsite and onsite disposal.

- Asbestos waste is a regulated hazardous waste;
- Asbestos is a hazardous material that can have health effects to yourself and others if asbestos fibers become airborne;

- It is illegal to dispose of asbestos waste in domestic garbage bins;
- It is illegal to re-use, recycle or illegally dump asbestos products;
- It is illegal to store, sell or give away asbestos.

All employees will wear protective clothing. Each asbestos worker will be provided with

- An approved and unused disposable overall
- Clean boots
- Clean PVC gloves
- High filter Dust masks

Restrictions will be placed on the site where asbestos is buried. Land uses that involve digging of foundations that may expose asbestos to the surface will be prohibited.

Before completion, certifications will be done on the site surfaces to ensure that they are clear of asbestos.

1.3 The Project Cost

The project cost of Ksh. two million five hundred is anticipated for, the main components of this programme is to provide for a, temporary storage area, asbestos pits, sanitary facility(washrooms, changing room, and birth room) entry gate, labor and provision of PPE's for the personnel and twenty four hour security surveillance. However the cost of PPEs and other disposable equipment's will depend on disposals done.

1.4 SITE DESCRIPTION

1.4.1 Location and Land use

The proposed site is located L.R No. 5010 in Kalumani area of Kilifi County. It is a bare piece of land approximately 5 hectares. The land is registered under title number surveyed Land in Mnyenzi Village Kalumani area, of Kilifi County.

The surrounding area of the proposed disposal site has no residential areas, no farms nor is any shopping Centre.

The remaining surrounding piece of land is 58 acres bushy and undeveloped.

The land for the proposed project belongs to Fadema Co Limited as per the attached sale agreement. The proposed disposal site is about seven kilometres from the Maji Ya Jumvi Town.

1.4.2 Site Construction

The proposed disposal site is currently a bare land that is an isolated area with no residential neighborhoods around it.

1.4.3 Available utilities

Communication is achieved by land line, mobile telephones and radio which are available. The area is served by good road network, the proposed disposal site; paths for ease of movement and transportation are available.

1.5 PROJECT JUSTIFICATION AND ALTERNATIVES

Asbestos waste is defined as Hazardous Waste. It is an exposure to asbestos fibers that presents the health risk to people. Many studies have described a link between occupational exposure to various types of asbestos and lung cancer and associated diseases. Asbestos has therefore been designated as a known human carcinogen and hazardous substance. This carcinogenic activity is directly linked to the air pathway and ingestion of the fibers when swallowed. The presence of asbestos within the premises poses a long term environmental and human health risk to people who operate on the site, and therefore the need and urgency to undertake the disposal and clean-up and eliminate any further environmental risks at contaminated areas within the premises is imperative.

The proposed land use / development will outweigh the negative impacts of it. By removing the asbestos contaminated soil, further human health risk to the premises employees and nearby communities will be eliminated.

The assessment of technology alternatives is limited due to asbestos being a hazardous substance. The preferred option for handling asbestos is to remove and dispose the asbestos in a land fill.

1.6 PROCESS AND PROCEDURAL CONTEXT

After many years of economic growth, there has been concern for the state of environment in Kenya. This is due to degradation that has occurred in many areas which if not addressed now may jeopardize the future development. In 1994, the Government adopted an environmental action plan (NEAP) thereby committing itself to sustainable development. Such commitment has been expressed further by the government's active participation at international meetings and programmes.

The Government's aims are, specifically, to:

- Increase efforts to mitigate the adverse effects of environmental degradation;
- monitor environmental performance of industries, commercial concerns and the agricultural sector; take strong and pro-active action on emerging environmental issues facing the nation;
- build partnerships with community Groups, non-governmental organizations, business and industries; and
- Facilitate public awareness and provide educational opportunities for people to learn about conservation and sustainable human development.

The enactment of the Environment Management and Coordination Act (EMCA) in 1999 was another milestone in the country's effort towards sustainable development. In line with provisions contained in Section 58 of the Act, EIAs are therefore being increasingly introduced into the national decision-making process and are basically aimed at alerting the decision-makers on the consequences of the proposed development on the environment.

1.7 METHODOLOGY

The assessment was conducted by use of the following methods:-

- Literature review, public and government sources
- Site reconnaissance
- Interviews with site personnel
- Use of an observation schedule
- Use of a checklist

Some questions whose answers had to be sought included:

- Are there potential physical or health hazards associated with the proposed activities to the premises workers?
- Will there be significant disturbance of existing communities?
- Are there potential impacts on the socio-economic interests?
- Are there any employment opportunities to be created by the proposed activity?
- Will the proposed project require major development to existing physical infrastructure, including transport and power generation?
- What would be the increased demand upon the existing provision of social services?

The site was visited so as to collect ground information by both observation and interviews to ascertain the collected information and to fill gaps where omissions or assumptions had been made. Observation was guided by a prepared schedule and involved 'walk - through' checks of the site grounds and the surroundings.

The Impact Assessment followed a scoping stage that enabled the identification of certain issues. Interested parties were contacted for their views on the project. After ascertaining that all details were available, this report was prepared.

2.0 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

Enacted in the year 1999, the Environmental Management & Coordination Act (EMCA) has put forth guidelines aimed at protecting Kenya's natural resources from pollution by industries and other anthropogenic activities.

2.1 The Environmental Management and Co-Ordination Act of 1999.

The Act provides for the establishment of an appropriate legal and institutional framework for the management of the environment and for matters connected therewith. The Act is based on the recognition that improved legal and administrative co-ordination of the diverse sectoral initiatives is necessary in order to improve the national capacity for the management of the environment. It accepts the fundamental principle that the environment constitutes the foundation of our national economic, social, cultural and spiritual advancement. The Environmental Management and Co-ordination Act, 1999 establishes the legal and institutional framework for the co-ordination of the diverse sectoral initiatives for environmental management. The Act itself is a framework statute whose provisions can only be implemented through the promulgation of enabling regulations.

Environmental Impact Assessment

The National Environment Management Authority (NEMA) is mandated by the Environmental Management and coordination Act (EMCA) no 8 of 1999 to administer the EIA.

Project which require EIA

- a) The Revised second schedule of the Act (EMCA of 1999) specifies projects or activities, which must be subjected to environmental impact assessment (EIA). These too must be subject to environmental audit after one year of operation.
- b) The proposed project falls under the Category of **High Risk Project** _as listed in the amended second schedule of the EMCA, CAP 387 and in line Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019. In this case the project is subject to Environmental Impact Assessment Sturdy.

The following is a summary of legislature relevant to this study extracted from the Act.

Section 58 (1)

Notwithstanding any approval, permit or licence granted under this Act or any other law in force in Kenya, any person, being a proponent of a project, shall, before financing, commencing, proceeding with, carrying out, executing or conducting or causing to be financed, commenced, proceeded with, carried out, executed or conducted by another person any undertaking specified in the Second Schedule to this Act, submit a project report to the Authority, in the prescribed form, giving the prescribed information and which shall be accompanied by the prescribed fee.

Section 58 (2)

The proponent of a project shall undertake or cause to be undertaken at his own expense an environmental impact assessment study and prepare a report thereof where the Authority, being satisfied, after studying the project report

submitted under subsection (1), that the intended project may or is likely to have or will have a significant impact on the environment, so directs.

Offences

Section 138

Any person who-

Fails to submit a project report contrary to the requirements of section 58 of this Act; Fails to prepare an environmental impact assessment report in accordance with the requirements of this Act or regulations made thereunder; Fraudulently makes false statements in an environmental impact assessment report submitted under this Act or regulations made thereunder; Commits an offence and is liable for conviction and imprisonment for a term not exceeding **twenty four months** or to a fine of not more than **two million shillings** or to both such imprisonment and fine.

Section 139

Any person who: -

Fails to keep records required to be kept under this Act; fraudulently alters any records required to be kept under this Act; fraudulently makes false statements in any records required to be kept under this Act; commits an offence and is liable upon conviction to a fine of not more than **five hundred thousand shillings** or to imprisonment for a term of not more than **eighteen months** or to both such fine and imprisonment.

Section 72 (1)

Any person, who upon the coming into force of this Act (14/1/2000), discharges or applies any poison, toxic, noxious or obstructing matter, radioactive waste or other pollutants or permits any person to dump or discharge such matter into the aquatic environment in contravention of water pollution control standards established under this Part shall be guilty of an offence and liable to imprisonment for a term not exceeding two years or to a fine not exceeding one million shillings or to both such imprisonment and fine.

Section 72 (2)

A person found guilty under subsection (1) shall, in addition to any sentence or fine imposed on him: pay the cost of the removal of any poison, toxic, noxious or obstructing matter, radioactive waste or other pollutants, including the cost of restoration of the damaged environment, which may be incurred by a Government agency or organ in that respect; pay third parties reparation, cost of restoration, restitution or compensation as may be determined by a court of law on application by such third parties.

Other relevant sections include:

- Section 59, - Publication of Environmental Impact Assessment
- Section 60, - Comments of EIA report by Lead Agencies
- Section 61, - Technical Advisory Committee on EIA
- Section 62, - Further EIA

Section 63,	- Environmental Impact Licence
Section 64,	- Submission of fresh EIA report after EIA Licence issued
Section 65,	- Transfer of EIA Licence
Section 66,	- Protection in respect of an EIA Licence
Section 67,	- Revocation, suspension or cancellation of EIA Licence
Section 68,	- Environmental Audit
Section 69,	- Environmental Monitoring
Section 78-85,	- Air quality standards and emission licensing
Section 86	- Standards for waste
Section 87	- Prohibition against dangerous handling and Disposal of wastes
Section 90	- Court order to cease operation
Section 91-93	- hazardous wastes

Other relevant pieces of legislation related to this report include:

- The Public Health Act Cap 242
- Land Control Act, 2002
- Occupational Health and Safety Act, 2007
- The Food, Drugs and Chemical Substances Act Cap 254
- The Physical Planning Act, Cap 286
- The Land Planning Act Cap 303
- The Water Act, 2002
- Environmental Management and Co-ordination(Waste Management) regulation, Legal Notice No.121 of 2006
- Legal Notice No. 61 of 2009 on Noise Pollution Control.

Kenya is also a signatory to a number of different international conventions on the environment some of which include the above mentioned.

The proponent will be strictly guided by the **National Guidelines for safe Management and disposal of Asbestos , 2013.**

3.0 DESCRIPTION OF ENVIRONMENT

3.1. Geology, Hydrology and Climate

3.1 Introduction

Kilifi County is located in the South part of the Coastal region of Kenya. The County lies between latitudes 3° 80' and 4° 10' S and longitudes 39° 60' and 39° 80' E, with a total land mass of 229.9 km² and inshore waters covering 65 km². The County also enjoys proximity to an expansive water mass as it borders the Exclusive Ecological Zone of the Indian Ocean to the East. Administratively, the County is divided into sub-counties and County assembly wards. These are further sub-divided into locations and sub-locations.

3.2 Population dynamics

The total population of the county in 2009 was 939,370 persons of which 484,204 and 455,166 were male and female respectively. It was projected to be 1,041,928 in 2012 and will rise to 1,238,348 persons by 2017.

Population distribution and settlement patterns in the County are influenced by proximity to vital social and physical infrastructure networks such as roads, housing, water and electricity. Other factors that influence settlement patterns include accessibility to employment opportunities, and security.

3.3 Demographic Characteristics

Foreigners have toured this region with many settling here while others leave after staying for many years. These people have come both from up country Kenya and other parts of Africa while others from other parts of the world. Kwale district located at the centre of Coast region has experienced many demographic changes including development of many races, practices of many religious faiths, predominantly Christianity, Islam and Hinduism. The project site is located off the island at Galu has been dominated with inter racial activities as it is one of the areas where people in the middle and upper class lives. The area is dominated with flats and other housing designs.

3.4 Housing Structures

Generally the coastal people especially the Mijikenda build their houses with earthen soil and roof/thatch with Coconut branches (leaves). This is however being overtaken by new housing structures that have sprouted in the recent decades. Most of the houses in Kwale County are of the local, Swahili type especially in Old Town although larger buildings are found in other areas of the County.

3.5 Landscape and Topography

Kilifi County lies within the coastal lowland which rises gradually from the sea level in the east to about 132 m above sea level in the mainland. The terrain is characterized by three distinct physiographic features, which includes the

coastal plain, which is found along the shoreline, covering parts of the South Coast, the Island, parts of mazeras, Rabai and the North Coast. The plain consists of an expansive flat land with raised beach terraces covered mainly by Coral limestone and back reef sand deposits that not only provide firm foundation for construction but also provide building materials.

The second category is the hilly areas mainly found within the western part of the County that is underlain by shells and rises gently from 45m to 132m above sea level. This is characterized by poorly drained clay soils which restrict settlement and infrastructural development.

The third category is the Indian Ocean and the shoreline covered with geologically sedimentary rocks of Jurassic to recent age. The topography has evolved as a result of the lowering of the sea level over time leading to severe erosion by the storm water draining into the sea. In addition, the Subsequent rise in sea level led to the submergence of the valleys and the creation of Kwale Island surrounded by deep natural creeks, ports and harbours such as Kilindini, Tudor, Makupa, and old port creeks. Other notable physiographic features includes, the fringing coral reefs, cliffs and tidal flats, sandy beaches, the coastal plain and a hilly severely dissected and eroded terrain. These features have greatly influenced the economic development of the County in a number of ways. For instance, the sea supports maritime trade while the fringing coral reefs, creeks and tidal flats with extensive mangrove forests are breeding grounds for fish. The fringing coral reefs in North Coast are an important marine conservation area hosting the Kwale Marine National Park and Reserve.

3.6 Climate

The County lies within the coastal strip in the hot tropical region where the climate is influenced by monsoon winds.

3.6.1 Rainfall

The rainfall pattern is characterized by two distinct long and short seasons corresponding to changes in the monsoon winds. The long rains occur in April - June with an average of average 1,040 mm and correspond to the South Eastern Monsoon winds. The short rains start towards the end of October lasting until December and correspond to the comparatively dry North Eastern Monsoons, averaging 240mm. The annual average rainfall for the county is 640mm.

3.6.2 Temperature

The annual mean temperature in the county is 27.9°C with a minimum of 22.7°C and a maximum of 33.1°C. The hottest month is February with a maximum average of 33.1°C while the lowest temperature is in July with a minimum average of 22.7°C. Average humidity at noon is about 65 per cent.

3.7 Geomorphology

Kenya has a coastline of over 600 km, but the Kenyan coastal region is generally low-lying and characterized by the extensive coral reef, which lies a few meters above present sea level. The principal soil type in the region is a narrow strip of coastal sands.

3.7.1 Soils

The exploratory Soil Map of Kenya (Sombroek et al, 1982), describes, the soil distribution pattern and soil characteristic of Coastal area and its environs. The soils here range from very deep well drained to very shallow extremely rocky, sandy clay, with top soil of loam to sandy loam. These soils are known to contain low relative fertility.

3.8 Physical Infrastructure

It's considered vital because the standard of living of the people in the County and the performance of the major sectors are greatly influenced by the existence, access, distribution and utilization of the physical infrastructure. Adequate and efficient physical infrastructure has a direct bearing on the production of goods and services in the County. It facilitates and promotes investment, thus creating more jobs, raises income for the people and through taxation increase the County government.

3.8.1 Roads

There is a total of 127 km classified roads and 221.46 km unclassified roads. The County is well served with electricity with virtually all economic and high potential areas having access to power network.

3.8.2 Communication Network

The County has a well-developed communication network with a total network of 31,481 telephone lines and six telephone exchanges; the County is connected to the rest of the country and the outside world. In general, there is a General Post Office (GPO) located within the County with branches in other sub county.

3.8.2 Water Facilities

The County is able to provide 60 percent of the water requirements. It receives water from Shimba Hills in Taita-Taveta, Marere and Tiwi boundaries in Kwale and Sabaki/ Baricho in Malindi. In addition, water is abstracted from boreholes and wells belonging to individuals and mosques. The County Government manages solid waste collection and disposal. However the proposed project proponent intends to employ their own private waste collector registered by NEMA.

3.9 Socio-economic Infrastructure

3.9.1 Employment level

Kilifi County like many other Counties in the coast region has been hit by the problem of unemployment. This has been exacerbated by the rising population growth. Employment is generally generated in manufacturing, building and construction, trade restaurants and hotels, transport and communication finance, insurance, real estate and business services, and community, social and personal services of these major activities account for over 40% of the total labour force engaged in wage employment. However, there is still potential of growth in the manufacturing, transport and communication sectors in the district, though more employment opportunities will be generated in the informal sector.

4.0. IDENTIFICATION AND PREDICTION OF IMPACTS

In line with the EIA Regulations, the following methodology was used in assessing impacts related to the proposed asbestos disposal and subsequent clean-up of the temporary storage site. All impacts are assessed according to the following criteria:

- » The **nature**, a description of what causes the effect, what will be affected and how it will be affected.
- » The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of activity), regional, national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high).
- » The **duration**, wherein it is indicated whether:
 - The lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
 - The lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
 - Medium-term (5–15 years) – assigned a score of 3;
 - Long term (> 15 years) - assigned a score of 4; or;
 - Permanent - assigned a score of 5.
- » The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
 - 0 is small and will have no effect on the environment;
 - is minor and will not result in an impact on processes;
 - is low and will cause a slight impact on processes;
 - 6 is moderate and will result in processes continuing but in a modified way;
 - 8 is high (processes are altered to the extent that they temporarily cease); and
 - 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- » The **probability** of occurrence, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:
 - Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
 - Assigned a score of 2 is improbable (some possibility, but low likelihood);

- Assigned a score of 3 is probable (distinct possibility);
- Assigned a score of 4 is highly probable (most likely); and
- Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).

» The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.

» The **status**, which is described as either positive, negative or neutral.

» The degree to which the impact can be reversed.

» The degree to which the impact may cause irreplaceable loss of resources.

» The degree to which the impact can be mitigated.

The significance is determined by combining the criteria in the following formula:

$S = (E + D + M) P$; where

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The significance weightings for each potential impact are as follows:

» < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to carry out the project in the area),

» 30-60 points: Medium (i.e. where the impact could influence the decision to carry out the project in the area unless it is effectively mitigated),

» > 60 points: High (i.e. where the impact must have an influence on the decision process to carry out the project in the area).

(A) Impacts that may result from the planning, design, construction, operational, decommissioning, and closure phases as well as proposed management of identified impacts and proposed mitigation measures

This environmental assessment has considered the impact of the asbestos disposal and cleanup on the receiving environment. It is not a retrospective impact assessment of what asbestos contamination has occurred on the site.

The disposal and clean up of asbestos contaminated land will be a once-off activity and therefore planning, design, construction and operational phases are not applicable to the asbestos disposal and site clean-up at the premises.

The potential impacts from the asbestos disposal and cleanup (direct, indirect and / cumulative) are detailed below.

An assessment of the “no-go alternative” (i.e. the option for not undertaking the asbestos disposal and clean-up) is included in this assessment; however the no-go option is not preferred.

- **The No-Go Option**

Asbestos is heat resistant and mostly impervious to chemical treatment. It has no odor and is not soluble in water. When asbestos fibers are airborne then it poses the main health risk to people operating at the premises or in the surrounding areas (either by inhalation or ingestion of the fibers).

It is possible for Clumps of asbestos to be mixed within soil within the premises (soil that has been handled many times) to a point where the asbestos has separated literally into millions of small fibers that are invisible to the naked eye. The assessment process has identified the potential for asbestos to be present in the soil which may be released into the atmosphere from materials that may be present on the site, including material buried at insufficient depths, as well as wind erosion, weathering and/or disturbance, for example by heavy vehicle movement or construction work. There is therefore the need to obtain a waste license which would be applicable in the event that remediation of this site is required in the future.

Asbestos concentrations as low as 0.001% (weight basis) in loose, coarse textured soil may give rise to measurable levels of airborne asbestos, if disturbed. In an attempt to provide some sense of risk, the following must be borne in mind: A single asbestos bundle the size of a human hair through a microscope has the appearance of a large untwisted, steel cable i.e. made up of hundreds of smaller strands (fibers, in the case of asbestos). Asbestos fibers tend to fracture longitudinally (along their length) and if airborne, could release thousands of fibers into the air. These small diameter fibers (not visible to the human eye) and fiber-containing particles may remain suspended in the air for a long time and can be carried long distances by wind or water before settling.

Should Asbestos remain on the temporary site, and that soil containing asbestos fibers be disturbed and asbestos fibers released into the atmosphere, the main health risks that the asbestos potentially pose to Fadema Company Limited Ltd employees and people located directly next to the sites include:

- Asbestosis: Exposure to airborne asbestos fibers can cause pulmonary fibrosis. The lungs build up fibrotic scar tissue around asbestos fibers which causes difficulty in breathing, decrease blood flow to lungs which results in poor oxygen exchange, enlarged heart, a persistent dry cough and ultimately death.
- Lung Cancer: A disease characterized by uncontrolled cell growth in tissues of the lung. If left untreated, this growth can spread beyond the lung in a process called metastasis into nearby tissue and, eventually, into other parts of the body.
- Mesothelioma: This is a rare form of cancer that affects thin membranes which surround the lungs and other internal organs.
- Cancer of pleura and peritoneum.
- Cancer of bronchus.
- Cancer of intestines.
- Warts or corns: Dermal contact with asbestos can result in the formation of warts or corns.

Asbestos fibers are chemically inert. They do not evaporate, dissolve, burn or biodegrade in the environment. However, single fibers and clumps of fibers may be released in the air as dust as a result of wind erosion and other

types of activities that generate dust. Once inhaled, fibers may be deposited and retained in the airways and lung tissue. Because asbestos fibers remain in the body, each exposure to asbestos increases the likelihood of developing an asbestos related disease. Many of these diseases caused by asbestos (asbestosis, mesothelioma, lung cancer) take between 15 and 40 years to be diagnosed.

The human respiratory system is therefore assumed to accumulate fibers linearly with concentration. For this reason alone, the cumulative nature of asbestos in the lungs, be it in small doses over long periods of time or a single large dose over a few hours or days, the health risks posed to potentially exposed premises employees and contractors, should not be underestimated. The illnesses listed above are dependent on the degree and frequency of exposure by an individual. In addition, there is a long time period between initial exposure and the development of asbestos-related disease.

The option for not implementing the asbestos clean-up is not preferred from a legal and human-health perspective. A summary table of the impact (baseline conditions) that may continue to occur at the premises and its environs should the asbestos disposal and clean-up not take place is provided below.

Nature: Negative effects of airborne asbestos fibers on human health (Fadema Company Limited Ltd employees who access the areas containing asbestos fibers) prior implementation of mitigation measures.	
Extent	Local (1)
Duration	Permanent (5)
Magnitude	High (8)
Probability	Improbable (2)
Significance	Low (28)
Status (positive or negative)	negative
Reversibility	Not reversible
Irreplaceable loss of resources?	Yes (may result is illness and mortality of people)
Can impacts be mitigated?	Yes
Mitigation:	
(1) Undertake the asbestos disposal and clean-up to remove visible asbestos waste and contaminated soil as soon as any asbestos is removed to the burial site	
Cumulative impacts:	
Cumulative health impacts may result on the premises employees and people who operate at the premises if asbestos is not removed	

- **Potential Impact on health of asbestos workers and Premises employees during the disposal and Clean-Up**

Asbestos containing dust is a complex mixture of fibrous structures. Not only do single fibers vary in dimensions but also such fibers may be found combined with other fibers in the form of bundles, clusters, or matrices. These are known as asbestos structures that can be inhaled. The relationship between soil and air levels of asbestos fibers is therefore considered complex. The potential for asbestos fibers to become airborne depends on the type of work activities as well as natural activities such as wind, i.e. the potential for mechanical disruption of the soil by human and/or natural activities. The removal/disposal of asbestos and asbestos containing materials, including soil, is anticipated to be **high risk** work. Suitable precautionary measures must be implemented during asbestos sheet removal or even the disturbance of asbestos contaminated soil in order to minimize the potential for the release of the fibers into the air.

Mitigation measures are essential to avoid exposure of the asbestos workers, employees who operate at the temporary site and the final disposal site and members of the public who may use the sites or reside in close proximity of the sites, when the asbestos is being lifted by an excavator or manually using shovels and forks. In the absence of mitigation measures, and if people (mainly employees conducting the disposal and clean-up) inhale or ingest asbestos fibers while the asbestos clean-up is underway, the following negative human health effects may occur in the long term (note that it takes years before these effects could materialize and would be related to the level of exposure):

- » Asbestosis (note that asbestosis is incurable).
- » Lung Cancer (can be treated but however can also result in death).
- » Mesothelioma (can be treated but however can also result in death)
- » Cancer of bronchus, Cancer of intestines (can be treated but however can also result in death)
- » Warts or corns (Dermal) (can be treated)

A potential public health risk exists within 100 metres of the areas of the asbestos disposal and clean-up, unless the recommended mitigation measures are implemented. The impact table below summarizes the potential impact on human health during the disposal and clean-up with and with-out mitigation / precautionary measures.

Nature: Direct impact on human health during the disposal and clean-up due to the release of airborne asbestos fibers		
	Without mitigation	With mitigation
Extent	local (1)	local (1)
Duration	permanent (5)	Short – duration (2)
Magnitude	moderate (8)	Moderate (6)
Probability	definite (5)	Improbable (2)
Significance	high(70)	low (18)

Status (positive or negative)	negative	negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes (may result in illness and/ mortality of people)	No
Can impacts be mitigated?	Yes	

Mitigation:

- All employees will wear protective clothing during the exercise. Each asbestos worker will be provided and equipped with:
 - o An approved unused disposable overall
 - o Clean gum boots
 - o Clean PVC gloves
- Demarcate the areas of removal of contaminated soil. A respirator zone is an area where the concentration of regulated asbestos fibers in the air is, or is likely to be greater than the OEL for asbestos. No persons should be allowed to enter the area without wearing respiratory protective equipment and protective clothing. Respirator zones must be clearly demarcated and identified to prevent accidental and chance, albeit brief, entry. Even if a person passes through the area or there is little work being conducted in that area, a respirator must be worn.
- Ground markings are examples of demarcation where the area is not defined by walls. In addition, all access routes should be demarcated and identified by symbolic warning signs that are clearly visible.
- Wire fencing will be used for high risk areas.
- Warning & Safety signage will be placed at the areas within the premises for clean-up on the site.
- No member of the public to be allowed near of the works area.
- All personnel involved with the asbestos disposal process will be subjected to medical surveillance.
- Asbestos contaminated areas shall be sprayed with water prior to commencement of cleaning activities in order to suppress the release of fibers.
- Clearing of asbestos at any site shall be completed entirely before moving onto a new working site.
- Temporary storage of waste: the area currently used for stockpiling of excavated material shall be lined with impermeable material.
- All machinery involved in an asbestos disposal process will be jet-washed prior to leaving site.
- Asbestos air sampling will be conducted on the sites for clean-up
- The employer must not allow anybody to work in or to enter an environment in which they may be

exposed to asbestos that will exceed the exposure limit for asbestos.

- When there is a visible dust or winds in excess of 20 knots, any asbestos disposal and cleaning process will be stopped.
- Thorough, complete and up to date records should be kept of:
 - o Medical surveillance of asbestos workers for a minimum period of 40 years;
 - o Maintenance of control measures for a period of 3 years;
 - o Asbestos inventory for minimum period of 40 years;
 - o Training given to employee in terms of Asbestos Regulations for as long as the employee remains employed at the workplace in which he or she is being exposed to asbestos dust; and
 - o Assessments and air monitoring at the sites that were cleaned

16. Transportation

- Ensure all asbestos is collected and loaded into a transportation vehicle licensed by NEMA
- The transporting vessel (truck will be lined with polythene).
- The transporting vessel shall be labelled <HAZARDOUS WASTE<
- The waste shall be transported to the disposal site in an enclosed vehicle.
- The tenderer shall have a documented HSE policy and ensure that all persons involved in asbestos handling are appropriately inducted/trained in emergency procedures e.g. how to handle asbestos waste, services to be contacted during such spillages.

Cumulative impacts:

Cumulative health impacts may result on the premises employees and people who operate at the premises if the asbestos is not removed, or if spillage/breakage occurs while removing the asbestos.

- **Safety risk to asbestos workers while working at the Sites**

While working at the temporary and disposal sites, the asbestos workers will face daily safety risks. These include:

- » Uneven walkways
- » Dust
- » The handling and transportation of dangerous substances

These hazards have the potential to cause injury or death to the workers/contractors who will be undertaking the asbestos-clean-up and disposal. In this regard, Fadema Company Limited Limited. has a Safety, Health and Environmental policy that will apply to the asbestos disposal and clean-up workers to avoid and minimize injuries or fatalities on their premises (see attached Health Safety and Environment policy).

Nature: Safety risks to asbestos workers while working at the concerned sites

	Without mitigation	With mitigation
Extent	local (1)	local (1)
Duration	Short (5)	Short – duration (2)
Magnitude	High (8)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	medium (33)	low (18)
Status	negative	negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes (may result is illness and/ mortality of workers)	No
Can impacts be mitigated?	Yes	
<p>Mitigation:</p> <ul style="list-style-type: none"> » Fadema Company Limited Ltd Safety, Health and Environmental (SHE) policy will apply to the asbestos workers. » All employees will wear protective clothing during the disposal and clean-up of the area. Each asbestos worker will be provided and equipped with: <ul style="list-style-type: none"> o An approved unused disposable overall o gum boots o PVC gloves o dust mask » In addition, high visibility vests must be worn at all times. » The asbestos project team who will access the area must be in possession of a valid premises access card. » If more than 20 employees are involved, the employer must have a Health and Safety representative (1 per 50 employees). » The asbestos site manager shall establish a health and safety committee. The committee shall comprise of the following personnel: <ul style="list-style-type: none"> o Site manager o SHE representative o Premises representative » There must be a health and safety plan that is kept onsite which must contain appropriate safety measures. » Employees must be trained on the contents of the health and safety plan 		

- » The premises first aiders must be available to the asbestos workers
- » A first aid kit must be kept onsite.

Cumulative impacts:

The safety risk will be faced whenever the asbestos workers are at the site - an occupational hazard.

4. Impact on soil during asbestos clean-up

During the clean-up activities, the contaminated soil will be removed and disposed of at the disposal site– this will result in a loss of soil, which will be replaced with either clean soil or stone at relevant areas where asbestos remediation is required. The loss of soil can be completely reversed by the addition of clean soil. However, remediation of the contaminated soils may lead to open excavated areas. The extent of soil removal coupled with the already impacted nature of the area does not warrant the implementation of mitigation measures. To cover these areas with soil would entail removal of soil from some other (probably not impacted) area and may therefore constitute loss of valuable soil resources. Soil erosion is a minimum in the area owing to the nature of the soils and the extent of the area development. Areas that require a substantial amount of excavation, and pose a safety hazard as a result, can be backfilled with stones or soil.

Nature: Loss of soil due to removal during remediation of asbestos contaminated soil		
	Without mitigation	With mitigation
Extent	local (1)	local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Small (0)	Small (0)
Probability	Improbable (2)	Improbable (2)
Significance	Low (12)	low (12)
Status	positive	positive
Reversibility	Yes	Not applicable
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » If necessary, backfill areas which have undergone a substantial amount of excavation with stones or soil.		
Cumulative impacts:		
None		

Residual Impacts: None

5 Generation of waste (general and hazardous waste) during the clean-up

Apart from the asbestos waste and asbestos contaminated soil, other waste may be generated by the asbestos clean-up activities, including the following:

» Hazardous waste:

- Asbestos contaminated PPE that will be discarded will become hazardous waste, and if disposed incorrectly on the site or surrounding areas may pose health risk to people who come into contact with the waste.
- Wastewater will be generated from the decontamination facility where asbestos workers will shower (on a daily basis, until the clean-up is complete). This water will not go into the municipal system and will be collected in receptacles - drums) and will be treated as hazardous waste, and disposed to a hazardous landfill.

» General waste:

- food wrappers
- eating utensils
- paper
- plastic
- used equipment

General waste can be disposed to a general landfill by the asbestos workers to avoid cross contamination with general waste from the daily operations at the active landfills. If general waste is dumped in the surrounding area, it may impact the environment and people around there, by creating a breeding ground for pests and disease. If hazardous waste is incorrectly disposed of into the surrounding environment (onto uncontaminated soil, which then can result in the release of asbestos fibers into the air), this will create an exposure route for asbestos related disease and could pose health risks to people in the vicinity of the waste. With proper general and hazardous waste disposal, the impacts of the general and hazardous waste that is generated by the disposal and clean-up can be avoided.

Nature: Generation of waste (general and hazardous waste) during the clean-up		
	Without mitigation	With mitigation
Extent	local (1)	local (1)
Duration	Short (2)	Short (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Improbable (2)

Significance	Medium (36)	low (14)
Status	negative	negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
<p>» The asbestos contaminated soil, materials and other hazardous waste (such as used PPE and wastewater) from the asbestos clean-up will be disposed to a hazardous landfill by the asbestos workers or contractor-if need arises.</p> <p>» General waste will be handled by a NEMA licensed waste handler.</p> <p>» Littering on the site (general waste) is prohibited.</p> <p>» Waste receptacles for general waste should occur in designated areas.</p> <p>» General waste should be collected on a daily basis.</p> <p>» Ablution facilities must be provided for the asbestos disposal and clean-up workers. These should be located in a designated area.</p> <p>» Should any spillage of the asbestos waste occur, it must be cleaned-up immediately and the affected areas appropriately remediated.</p>		
Cumulative impacts:		
None		

6. Creation of job opportunities during the disposal and clean-up process

The exercise will result in a number of short-term employment opportunities. The number of staff required will be informed by the scope of work. Therefore short term job creation will be a minor positive socio-economic impact.

Nature: Creation of job opportunities during the asbestos clean-up		
	Without mitigation	With mitigation
Extent	local (1)	local (1)
Duration	Short (2)	Short (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	Medium (36)	Low (28)
Status	positive	positive
Reversibility	Not Applicable	Not Applicable
Irreplaceable loss of resources?	Not Applicable	Not Applicable

Can impacts be mitigated?	Yes	
Mitigation:		
» If semi-skilled and specialist asbestos workers are available in the nearest communities, they should be utilized for the asbestos disposal and clean-up		
Cumulative impacts:		
None		

7. Long –term positive impact on environment due to the Disposal and clean up

The removal of asbestos waste visible on the surface of the premises will reduce the future health risk for any of premises employees or people who operate or reside near the premises. The completion of the disposal process will be seen as having a positive impact on the environment (air and soil) and social (premises employees and nearby residents) elements. This is mainly due to the risk of asbestos occurring in the air being reduced to low risk or eliminated altogether and as a result a low risk or elimination of risk of asbestos-related diseases. Therefore, the long-term impact of removal of asbestos from the premises premise is viewed in a positive light (or as a positive action / impact) in terms of the site’s duty of care towards the environment and their social responsibility to remedy contamination due to the presence of asbestos and to prevent any further negative environmental (soil and air) or social impacts.

Nature: The main potential environmental impacts of asbestos disposal and clean up		
	Without mitigation	With mitigation
Extent	local (1)	local (1)
Duration	Short (2)	Short (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	Medium (36)	Low (28)
Status	positive	positive
Reversibility	Not Applicable	Not Applicable
Irreplaceable loss of resources?	Not Applicable	Not Applicable
Can impacts be mitigated?	Yes	
Enhancement Measures:		
»After the disposal and clean-up the premises management should continue with the declaration of the remedied sites as “covenant sites” and limit future use of these areas.		
» These sites should have clear signage that is maintained on an annual basis.		

» If there is a re-surface of asbestos on the premises area, it should be reported to premises management, to initiate remedial activities

» After the remedial activities, it is recommended that test soil samples and air quality samples of the cleaned areas should be taken at least one year after completion of remedial activities, and the results compiled into a report for submission to NEMA such that they can confirm the success of the remedial activities.

Cumulative impacts:

The potential asbestos clean-up at the premises is seen as a cumulative positive impact on the soil, air and reduction in the health risk to the employees.

8. Impact on water during asbestos disposal and clean up

There is no water resource in the immediate vicinity of the proposed disposal site.

5.0 ENVIRONMENTAL MANAGEMENT PLAN

Management Aspect	Mitigation measures	Time frame	Responsibility	Cost (Kshs)	Remarks
1. General Conditions	<ul style="list-style-type: none"> Notify workers about the upcoming activity Prepare appropriate PPE complying with international good practise Post appropriate signpost of the site that will inform the workers of key rules and regulations to 	During preparation for the proposed activity	Manager	60,000	This will help prepare the workers for the asbestos disposal and cleaning process

	follow				
2. Waste Management	<ul style="list-style-type: none"> • Inform cleaning and disposal workers of their responsibilities in terms of the EMP. • Ensure that all waste removal workers comply with the Waste Mgt Regulations of 2006 and National Guidelines for Safe management, and disposal of Asbestos. • Collect waste paper generated at the work site in scrap paper bins. Notify the waste paper removal worker /contractor when the temporary scrap paper storage area reaches capacity, for removal of the 	During the cleaning and disposal process	Manager	70,000	To ensure a clean and healthy environment

	<p>scrap paper to a recycling facility.</p> <ul style="list-style-type: none"> Place all general / domestic waste in refuse bins. 				
<ul style="list-style-type: none"> Asbestos management 	<ul style="list-style-type: none"> Asbestos disposal site shall be marked clearly as hazardous material in accordance with the Asbestos National Guidelines The asbestos will be appropriately contained and sealed to minimize exposure The asbestos prior to removal should be treated with a wetting agent to minimize asbestos dust Asbestos should be handled and disposed by skilled & 	Preparation and disposal of the asbestos	Manager	250,000	<p>To prevent asbestos dust from becoming airborne;</p> <p>To minimize personal exposure to asbestos fibers</p> <p>To ensure good environmental and health status of the facility</p>

	<p>experienced professionals</p> <ul style="list-style-type: none"> If asbestos material is being stored temporarily, the wastes should be securely enclosed inside closed containments and marked appropriately. Security measures will be taken against unauthorized removal from the site. The removed asbestos will not be reused 				
4. Traffic and Pedestrian Safety	<ul style="list-style-type: none"> Signposting, warning signs, barriers and traffic diversions: site should be clearly visible and the workers warned of all potential hazards Provision of safe 	At preparation stages	Manager	80,000	<p>To avoid the spread of asbestos dust</p> <p>To reduce the potential to contaminate, as asbestos fibers can be spread through various mediums including living persons</p> <p>To eliminate risks of</p>

	<p>passages and crossings for pedestrians be made</p> <ul style="list-style-type: none"> • Active management by trained and visible staff at the site, if required for safe and convenient passage for the workers. • Ensuring safe and continuous access to office facilities, shops and residences during disposal and cleaning activities, if the facility is in operation during this activity 				<p>exposure to asbestos fibers</p>
5.Air Quality	<ul style="list-style-type: none"> • Establish air quality monitoring systems and implement operational management plans to ensure that the system 	<p>At preparation and disposal stages of the disposal</p>	<p>Manager</p>	<p>200,000</p>	<p>To minimize air pollution</p> <p>To prevent asbestos fibers from being airborne</p>

	<p>is being maintained properly and that the outputs of the monitoring system are providing suitable data on air quality.</p> <ul style="list-style-type: none"> • Appoint a dust monitoring system to monitor and analyse dust and air quality • Air monitoring should be done continuously in areas related to asbestos removal works. 				
6. Storm water Management	Ensure all storm water from the site is directed towards the established water drains	During disposal process	Manager	20,000	To ensure that there is no ponding on the disposal site or flowing water
7. Management of temporary waste storage sites	<ul style="list-style-type: none"> • Ensure management of temporary waste storage sites is in line set procedures and 	During preparation and disposal stages	Manager	80,000	To ensure that the wastes are removed effectively and in time

	<p>legal requirements.</p> <ul style="list-style-type: none"> • Register and monitor waste volumes at the temporary waste storage site • Oversee the physical removal of the waste from the temporary waste storage sites 				
8. Affected flora and fauna	Preserve as possible indigenous trees and other surrounding vegetation that need not be removed	During preparation and disposal stages	Manager	20,000	To ensure environmental management and proper ecological balance
9. Information and training	Training on the potential health risk caused by exposure to asbestos and how to reduce these risks	Before the disposal process commences	Manager	40,000	To provide awareness on the risks of asbestos
10. Asbestos exposure	The company shall not permit any person to work in an environment in which he or she would be exposed to asbestos in excess of the prescribed occupational	At, during and after the disposal and cleaning process	Manager	80,000 (Air quality monitoring)	To minimise risks of contracting diseases associated with exposure to asbestos fibers, e.g. cancer

	exposure limit.				
11. Medical surveillance	Ensure medical surveillance of an occupational medical practitioner after the disposal exercise	After the disposal exercise	Manager	100,000	To minimize incidents of occurrence of occupational diseases, notably those caused by exposure to asbestos fibers
12. Cleanliness of premises and plant	workplaces are maintained in a clean state and are free of asbestos waste	After the disposal process	Manager	40,000	To eliminate workplace contamination
13. Disposal Scheduling and Hours	The disposal and cleaning activities should be limited from 7 am or sunrise (whichever is later) to 5 pm or sunset	During the disposal and cleaning exercise	Manager		To prevent risk of inhaling asbestos fibers, which is possible if one does not clearly see the area of work due to darkness
14. Clearance Inspections	Inspections should be done to ensure that temporary storage site is cleaned to a satisfaction standard.	After the cleaning work	Manager	50,000	To eliminate risk of future contamination and exposure to asbestos

6.0 PROJECT DECOMMISSIONING

In the event that the proposed disposal site lifetime is limited as a result of any unforeseen factors, then at some point, the asbestos containing site must be decommissioned or redeveloped to keep up with changes in land use and legislation on environmental impact.

An initial site assessment will have to be undertaken before an acquisition is made and a change of site usage is proposed. Environmental assessment is a key part of the due diligence process and ensuring that all surveys and assessments identify potential decommissioning hazards and risks and how to conserve resources and reduce the instances of environmental liability. In extreme situations, the decommissioning process may involve the safe handling and disposal of hazardous asbestos, material and waste and the cleanup of a site that has been contaminated by previous disposal operations.

Exposure to asbestos may be fatal: the fibers can lodge in the lungs, thus causing the onset of a number of types of lung cancer. This may be prevented if suitable protective clothing is worn. The site may carry more risks through the decommissioning process. The cost of the decommissioning process may be high, but the safety implications of contamination are so severe that each step of the process needs to be planned and executed to perfection.

Ultimately, the purpose of decommissioning of the site will be to reclaim the land, making it safe for people and vegetation. The introduction of vegetation to the site is less likely to have any severe impact. Environmental impact assessment will ensure that environmentally responsible decommissioning and redevelopment is a priority and that introduction of right vegetative species offsets any damage that may have been previously caused. The regeneration of this site will aim at protecting the health of the people that work on or are near the site and provide protection for the land for any other future developments with minimal negative impact.

7.0 CONCLUSIONS

As a result of the current potential health risk posed by the presence of the asbestos waste at Fadema Company Limited Limited premises and the long period of time that the asbestos has been present at the temporary site, it is recommended that the license and authorization for the potential asbestos disposal and clean-up at the proposed site within the premises be granted by NEMA, subject to the a specific mitigation measures contained in this report and the EMP, when handling and disposing of asbestos waste. The presence of asbestos at the current site within

the premises grounds poses a long term environmental and human health risk to people who operate on the site, and therefore the need and urgency to undertake the disposal and clean-up in order to eliminate any further environmental risks at contaminated area within the premises is imperative. It is therefore recommended that the asbestos disposal and clean-up be undertaken by the premises management as a matter of urgency to avoid or reduce any future health risks to workers and people that operate at the premises.

8.0 COMMUNITY AND STAKEHOLDER PARTICIPATION

During the EIA process, members of the affected community were approached for their views and valid comments. The proposed development has been accepted by the community due to its perceived importance and the associated direct benefits. Consultations and interviews of the immediate community indicate that the project is an important activity in the area mainly due to its environmental health benefits.

The list of members of the public interviewed is attached on the annex.

Issues Raised

- The project has not affected the normal activities of the concerned area. The project will not affect negatively, the neighbouring land uses
- The project will minimize health risks from asbestos fibers to the surrounding communities
- With the mitigation measures, the project will lead to reduction of air and water contamination by asbestos fibers
- The proposed project has helped raise awareness on risks of asbestos in the surrounding community
- The disposal and proper management measures will lead to a clean, safe and healthy environment

9.0 NON-TECHNICAL SUMMARY

This Environmental Impact Assessment was conducted to determine the overall environmental impacts that the proposed asbestos roofing sheet disposal and subsequent clean up exercise is likely to have in the future. Fadema Company Limited. believes that investing in environmental management is a worthwhile venture and has greater plans for land management for sustainable environmental undertakings during its activities at this site.

After consideration of all the environmental impacts that the proposed activity may cause, including public health risks; impact on soil, air and water; waste management issues; short and long term positive impacts, various mitigation measures are proposed. These measures are contained in the Environment management Plan (EMP) and include the following: -

- Practising good waste management
- Control of asbestos fibre release and exposure effects
- Monitoring air and soil quality
- Medical surveillance
- Health and safety considerations

The proposed activity can be a sustainable development if all the mitigation measures advanced herein are adhered to.

10.0 REFERENCES

Administrative Staff College of India, Hyderabad, 2009, EIA Guidance Manual – Asbestos based industries, India.

ICF Incorporated 1989, Regulatory Impact Analysis of Controls on Asbestos and Asbestos Products, Fairfax Virginia, USA.

Kenya Gazette, No. 8 of 1999, The environmental Management and Co-ordination Act, 1999, Government Press, Nairobi, Kenya, 175pp

UNEP (2011) Decoupling natural resource use and environmental impacts from economic growth, A Report of the Working Group on Decoupling to the International Resource Panel. Fischer-Kowalski, M., Swilling, M., von Weizsäcker, E.U., Ren, Y., Moriguchi, Y., Crane, W., Krausmann, F., Eisenmenger, N., Giljum, S., Hennicke, P., Romero Lankao, P., Siriban Manalang, A., Sewerin, S. UNEP (Industry and Environment), UNIDO, IFA: Environmental Management Systems, Technical Report No. 26 part 2, Paris France 1998

APPENDICES;

Appendix 1: Land Ownership Documents

Appendix 2: Certificate of registration copy

Appendix 3: PIN copy

Appendix 4: Questionnaires/ Public barasa minutes

Appendix 6: Hydrogeological Report