

**ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY REPORT
FOR
THE PROPOSED ASBESTOS DISPOSAL SITE (LANDFILL) ON PLOT L.R. NO. 1250B IN
MINJILA AREA WITHIN GARSEN SUB-COUNY, TANA RIVER COUNTY.**

co-ordinates Lattitude: -2.3234397 & longitude: 40.0956301



PROPONENT:

**LIBERTY SOLUTIONS LIMITED,
P.O.BOX 40388-80100,
MOMBASA KENYA.**

PRESENTED TO:

**NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY (NEMA)
P.O. BOX 67839-00200
NAIROBI**

ENVIRONMENTAL CONSULTANTS

LEAD EXPERT

***ONESMUS GIKONYO WANGARI
P.O. BOX 15225-00400
NAIROBI
NEMA REG. NO. 6759
0720-115-079***

JUNE 2023

This report has been prepared in accordance with the requirements of the Environmental Impact (Assessment and Audit) Regulations, 2003, pursuant to The Environmental Management and Coordination Act, (EMCA) CAP 387

ACKNOWLEDGEMENT

NEMA experts & the other consultants are grateful to the proponent M/s. Liberty Solutions Limited for according us the privilege of undertaking this ESIA study report. We are also grateful to the residents of Minjila for according us the much needed support as we conducted this study in respect to the proposed Asbestos disposal site (landfill). We are also very grateful to the community neighboring the site of the proposed project for forwarding their views both written and oral during the public participation process.

Further, I extend my sincere appreciation to all the NEMA experts who worked hard throughout the entire process of preparing this ESIA Study report and sacrificing a lot in ensuring that it is completed professionally. Not to be forgotten are the other members of our assessment team who played a critical backup role for their unreserved commitment and dedication throughout the entire ESIA process. Thank you and May God abundantly bless you all.

CERTIFICATION

This Environmental Impact Assessment Study Report was prepared following a study by Approved NEMA experts, a sociologist and a hydro-geologist. This was done following a request by The Proponent in accordance with the second schedule of the Act (EMCA CAP 387) which specifies projects or activities that must be subjected to Environmental Impact Assessment (EIA) and Environmental Audit (EA) and also in compliance with Environmental Impact Assessment and Audit Regulations 2003. It was done within the report limitations and resources available.

I hereby certify that the information and particulars given in this report are correct and true to the best of my knowledge as at the time the ESIA was undertaken.

PROJECT BRIEF:

Title : Environmental Impact Assessment Study Report Proposed Asbestos Disposal Site (Land Fill) on plot l.r. no. 1250b in minjila area within garsen sub-couny, tana river county.

Nature of Development : Establishment of Hazardous Waste disposal Site/ Waste management.

Status of The Site : The Land is currently occupied by shrubs and scattered parches of trees.

Neighbourhood characters. : The site is in remote location and does not have settlement around.

PROPONENT AND EXPERT DETAILS

Proponent: **LIBERTY SOLUTIONS LIMITED,**
P.O BOX 40388-80100,
Mombasa.

Name: _____ (Proponent Representative Name) _____ (Date)

Signed: _____ (On Behalf of (Stamp)/Position) _____ (Signature)

Lead expert: **ONESMUS GIKONYO W,**
NEMA REG .NO 6759,
P.O Box 15225-00400,
Nairobi.

Signed: _____ (Lead expert) _____ (Date)

DECLARATION	i
DOCUMENT AUTHENTICATION.....	i
EXECUTIVE SUMMARY	iv
Summary of key proposal	v
<i>Summary Of Potential Environmental Impacts And Mitigation Measures</i>	viii
1.0 INTRODUCTION	1
1.1 DESCRIPTION OF THE PROJECT	1
1.1.1 General Disposal procedures for asbestos	2
What is required when disposing of asbestos?.....	2
How is asbestos waste stored on site prior to removal?.....	2
Asbestos waste should	2
1.1.2 Project Concept.....	3
1.1.3 Objectives	3
1.2 Brief about asbestoses	3
1.2.1 Government efforts to reduce exposure level	4
1.2.1 Asbestos as a contaminant	4
1.2.2 The Need and Desirability of Asbestos Disposal Project.....	5
1.2.3 The need for a Licence.....	6
Asbestos sheets removal	6
<i>Bagging</i>	7
<i>Handling and Transportation</i>	7
<i>Disposal</i>	7
1.2.3 a Key points to note include:.....	8
The Project Cost.....	8
1.3 Site Description	8
Location and Land use	8
1.4 Site Construction	11
1.4.3 Available utilities	11
1.5 Project Justification	11
Alternatives	11
Alternative Technology	11
Alternative land.....	11
1.6 Process and Procedural Context.....	12
1.7 Methodology	12
2. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK	14
2.1 LEGAL FRAMEWORK	14
2.1.0 The Constitution of Kenya, 2010	14
2.1.2. The Environmental Management and Co-ordination Act, 1999	15
2.1.3. EMCA Regulations	15
2.1.3.1 <i>EIA/EA Regulations (Legal Notice No. 101 of 2003)</i>	15
2.1.3.2 <i>Environmental Management and Coordination Act, 1999 section 91 (1-7)</i>	15
2.1.3.3 <i>Environmental Management and Coordination (Waste Management) Regulations, 2006.</i>	16
2.2 Water Quality Regulations (Legal Notice No. 120 of 2006)	16
2.3 <i>Waste Management Regulations (Legal Notice No.121 of 2006)</i>	17
2.4 Noise Regulations (Legal Notice No. 61 of 2009).....	17
2.5 The Water Act No. of 2012.....	17
2.6 <i>Electricity Power Act No. 11 of 1997</i>	18
2.7 <i>Occupational Health and Safety Act No. 15 of 2007</i>	18
2.7.1 The Occupational Safety and Health Act, No. 15 of 2007	18
2.8 The Public Health Act- Laws of Kenya, Chapter 242	19

2.8.1	Public Health Act Cap 242 Sections 11-13.....	19
2.10	Occupiers Liability Act Cap 34.....	20
2.12	<i>The Factories and Other Places of Work (Hazardous Substances) Rules, 2007.....</i>	20
2.12.1	<i>The Factories (Building, Operations and Work of Engineering Construction) Rules, Legal Notice No. 40 of 1984</i>	20
2.12.12	The Tana River County Environment (Control and Regulations) of 2016.....	20
2.13	INSTITUTIONAL FRAMEWORK	21
2.13.2	County Government.....	21
3	DESCRIPTION OF ENVIRONMENT	22
3.1.	Introduction	22
3.1	Location	22
3.2	Population	22
3.4	Infrastructure.....	22
3.5	Geography and Climate	23
3.6	Waste Management.....	23
3.7.	<i>Water sources.....</i>	23
	<i>The residents source water from the local pipes and taps. There are hardly any borehole in the area nor the rivers or streams.....</i>	23
	Site physical Location.....	23
3.8	Natural environment	23
3.9	Landscape and Topography	23
3.10	Climate.....	24
3.10.1	Rainfall.....	24
3.10.2	Temperature	24
3.11	Geomorphology	24
3.11.1	Soils.....	24
3.11.2	Socio-economic.....	24
4	COMMUNITY AND STAKEHOLDER PARTICIPATION.....	25
	Some of the members present were as follows	26
4.	IDENTIFICATION AND PREDICTION OF IMPACTS.....	27
4.0	ENVIRONMENTAL MANAGEMENT PLAN.....	41
6.	PROJECT DECOMMISSIONING.....	48
7.	CONCLUSIONS AND RECOMMENDATIONS	49
9.0	NON-TECHNICAL SUMMARY	50
10.0	REFERENCES	51
	APPENDICES;.....	52
	Appendix 1: Hydrological Report.....	52
	Appendix 2: PIN copy.....	52
	Appendix 3: Land Ownership Documents.....	52
	Appendix 4: Questionnaires/ Public Barasa minutes	52
	Appendix 5: Certificate of registration copy.....	52
	Appendix 6: Approval Of TOR	52
	Appendix 7: acknowledgment of initial project report	52
	Appendix 8: registration of lead Expert	52

EXECUTIVE SUMMARY

LIBERTY SOLUTIONS LIMITED , a private company registered under laws of the republic of Kenya and specializes in Asbestos Handling and Disposal. The firm intends to put up a n asbestos disposal site facility on Plot. No. 1250B in Minjila area, Garsen Sub-County in Tana River County. The proposed site is approximately 0.971 Hectares and is far away from the human settlement . As at the time of this report, the proponent had acquired the parcel from the County Government of Tana River through the chief officers Lands & Physical planning. A copy of allotment letter has been attached to this report. The facility to be set up shall occupy only 0.971 Ha of land, where a pit, depending on the quantity of the asbestos to be disposed, shall be shall be dug at a maximum depth of six meters (6m) below the ground. A concrete lining/wall of 130mm shall be constructed all round before the asbestos materials are placed in the pit, covered by 130mm concrete cover, then poor top soil. The pit shall be considered full when the material reaches a mark of 1.5m below the ground level. The pits shall be dug when the materials are received on the site and the volume of excavation shall depend on the mount of the asbestos materials to be disposed. Other amenities to be provided at the site include jet wash area, sanitary facilities, car park, fence, and a lockable gate. The major risk of the project is exposer of the asbestos fibres to both the public and the workers which can be mitigated as proposed in the management plan by providing appropriate safety gear, training the staff on asbestos handling, wetting the asbestos prior to removal to the disposal site, transporting them in a licensed vehicle, disposing the asbestos immediately they arrive at the site, disposal of the material in underground concrete confinement, washing the vessels on the site, disposing the used PPEs on the site, undertaking medical surveillance on the staff among others. The positive impacts will beprovision of the employment but the most significant is the provision of a site for safe disposal of the hazardous substance thus reducing the risk of explore from the public and environment.

Liberty Solutions Limited proposes to provide a facility that will offer solutions on safe disposal of asbestos from various entities that intend to dispose-off the asbestos roofing's within republic of Kenya but more specifically within the coastal region. The site is located in Minjila area, Garsen Constituency in Tana River County. Access to the site from Garsen is through Bura-Garsen-Malindi Road taking a right turn off exit 0.95 kilometers before getting to Minjila Market to join the access road to the site. The site is accessible by an earthen road. Immediate and

neighbouring parcels of land are undeveloped and are used for grazing and making of charcoal. 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. 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 Kenya being one of them and its use has been dramatically restricted in others.

The project is classified as high risk thus need for wider public consultation. The experts has enumerated several potential positive and negative impacts of the projects and listed how the negative impacts can be mitigated. The most important negative impact is the exposure of the asbestos materials to the public and worker which will be mitigated by proper handling and provision of appropriate PPE. Potential underground contamination will be mitigated by giving an allowance of 10m above water table and disposing of the material in underground concrete confinement.

Positive impacts includes availability of asbestos disposal area which will reduce the exposure of the material to larger public, mitigating climate change by removing the asbestos sheets and replacing it with the solar panels which produces clean energy and lastly the project will provide avenue for the compliance through safe disposal.

Summary of key proposal

Characteristics	Description/quantities
Activity description	Proposed establishment of asbestos containing material disposal site, with a total initial capacity of 105000M ³ with possibility to of increasing the capacity.
Location	Plot. No. 1250B, In Minjila area, Garsen location, Tana River County
Land Tenure	Parcel owned by Liberty Solutions Limited
Overview of the site and the surrounding	The site is located in a busy area, used mainly for hunting and charcoal making. Agricultural activities are seldom. The human settlement is far away with the nearest homestead found approximately 3km away. The site has a clay soil type which has low drainage. The hydrological survey indicate the presence of water at a depth of fifty meters below the ground though this may be higher since the survey was done during rainy season. The tree species found in the area are mostly second generation tree as most has been cut for making of charcoal. The site does not have any historical or cultural site of importance. There is no nearest river or stream.
Mojor equipment to be used.	Excavator when human labor is not sufficient

Input

Water	Water jet system to be put down to wash the vehicle transporting the asbestos to the site. The water to be used in effluent wash down facilities.
Energy	Solar for lighting the site at night
Wastes	
Liquid	Waste from storm water as well as from wash-down of vehicles
Atmosphere	Asbestos dust, dust from transport vehicles and dust from materials used in management of asbestos.
Solid	General litters
Noise	From the trucks delivering the asbestos materials and from workers on the site.
Operating hours	The site shall operate between 0800hrs and 1700hrs between Monday to Saturday.

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 when a person is exposed to its fibres. The asbestos are however considered safe when it is intact and not withered.

The major components of this project will be :

- i. erecting of impermeable fence to cover the selected area to be used for disposal of asbestos,
- ii. Excavations of pits & constructing 130mm thick concrete lining of the pit prior to disposal of the asbestos. The area to be excavated shall depend on size of the asbestos that shall be required to be disposed at a particular time.
- iii. The maximum depth of the pit shall be 6m below the ground.
- iv. The proponent shall also provide disposable safety gears that are appropriate for asbestos disposal,
- v. Provision of security services at the site.
- vi. Installation of water reticulation system within the site for cleaning the asbestos transporting vehicles.

The cost estimates of the above will cost approximate **KES 3M** thus the proponent is required to pay a statutory fee of 0.1% of the project budget with a minimum cap of 10,000 Ksh .

The proposed disposal site is in a bare field. The water table is approximately 12 meters from the below the ground level. Based on that, the proponent is advised to limit the depth of the pit

to a maximum of 6m below the ground and ensure a qualified contractor build the lining wall. Attached is the hydrological survey report.

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 ESIA study 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 ESIA 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 ESIA Report are:

- i. A critical look into project objectives
- ii. The proposed location of the project site
- iii. Description of project objectives.
- iv. A concise description the national environmental legislative and regulatory framework, and any other relevant information related to the project
- v. Evaluation of the technology, procedures and processes to be used in the implementation of the project
- vi. 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.
- vii. Evaluation and analysis of alternatives including the proposed project, project alternative, project site, design and technologies
- viii. An Environmental Management Plan (EMP), proposing the measures for eliminating/minimizing or mitigating adverse impacts on the environment,
- ix. 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.

Table 1: Summary Of Potential Environmental Impacts And Mitigation Measures

Summary Of Potential Environmental Impacts And Mitigation Measures

Issue	Potential impact	Proposed mitigation measure.
1.	Screening of waste. Unregulated access to the site and deposition of wastes can lead to inadvertent receipt of unauthorised waste. This may result I the emission of pollutant such as contaminated leachates	<ul style="list-style-type: none"> i. All Asbestos Containing Materials (ACM) will be recoded on the plan with GPS coordinates indicating their origin for future tracking. ii. all operation personnel will be trained in proper management of ACM and emergency response procedure. iii. All deliveries to the site to be registered in NEMA tracking document system. iv. Confirmation of material properties prior to disposal. v. -rejection of materials that are not classified for disposal in the site.
2.	Security and access. Unregulated access and deposition of wastes	<ul style="list-style-type: none"> i. The site will be secured by a 2m high fence and entrance to be locked when not in operation. ii. Signage will be place at the entrance and along the access road to indicate speed limits and risk, OH&S entry obligations and emergency contact details. iii. Full time surveillance to be installed.

3.	Dust Control	Environmental Nuisance caused by dust off the land	<ul style="list-style-type: none"> i. First 25m of access to the entrance to be sealed. ii. Vehicle speeds on the access road will be limited to 10km/h to minimize the possibility of wheel generated dust. iii. A wash down area will be provided for all trucks and vehicles leaving the site. The Unloading area with drainage and treatment of water. iv. Site jet system to be established to allow adequate wetting of operation surfaces.
----	--------------	--	---

		v. After structural rehabilitation is complete, the area will be progressively rehabilitated by planting of local native trees as each level is complete.
4.	noise	Noise will be generated by vehicles movement and material handling of ACM on the .Noise emission have the potential of causing environmental harm or nuisance.
		Boundary noise level to be kept to a max of 45dB during operation hours. Installation of speed limits for vehicle will also reduce noise emission. Operation hours shall be strictly observed.
5.	Traffic	Noise, dust, spillage caused by traffic movement to and from the site can cause environmental nuisance at person residing along the transport route .
		Staff operating the site will monitor any spillage and any accidents involving material accepted at the site. If they learn of the accident, the NEMA office and county government offices shall be informed immediately.
6.	Weeds and pathogens	The spread of invasive weeds and disease via the distabance and movement of soil, maintenance and machinery importation and importation of weed and disease from and to the site.
		Progressive rehabilitation of the site has been included in the plan of the site. In addition to revegetation and weed management plan shall be developed by the proponent .

7.	Fauna and Flora	Destruction of plant species and animal habitat.	<ul style="list-style-type: none"> i. In an effort to preserve the existing biodiversity, naturally occurring plants such as those used primarily for landscaping (ornamental/beautification and fencing) should be harvested during the site clearing phase and relocated to a nursery, to serve as a source of plants for replanting at a later date. ii. Demarcate and delineate areas to be affected by the construction work. iii. Conduct site clearing activities in stages to minimize the area of exposed soil. iv. Control earthworks v. Install drainage structures properly vi. It is important to note that there is no threatened species of flora and fauna
8.	Rehabilitation	Degradation of the site through erosion, reduction in water quality and loss of natural values	<ul style="list-style-type: none"> i. After structural rehabilitation is complete the area will be progressively rehabilitated by planting local native trees as each level is complete. ii. Upon permanent closure of the site, the will be initially covered to a depth of one meter beneath the final land surface.
9.	Water quality	Potential impacts on surface and groundwater through release of asbestos particles and contaminant .	<ul style="list-style-type: none"> i. The asbestos shall be disposed in underground concrete confinement of 130mm thick. ii. The maximum depth of the pit will be 6m. this will be more than 10m above water table, compared to 1m allowance recommended in the asbestos management guideline. iii. Surface water from road, wash down and operational areas shall be directed to sediment traps then sock drains, the filter membrane, to the flash tank and finally to the settling ponds. iv. The proponent shall install water quality monitoring device. v. Asbestos is insoluble in water and alkali and as such can not leach.
10.	Seismic risk	Potential risk from airborne and water contamination form seismic event.	<ul style="list-style-type: none"> i. The concrete underground wall shall be constructed to withstand the seismic events. ii. The area has not experienced seismic events in the recent past.
11.	Fire manageme	Fire may have significant impact on air quality,	<ul style="list-style-type: none"> i. The proponent shall install fire fighting devices at strategic areas. ii. There proponent shall have fire management plan for the area. iii. The staff shall be trained on fire fighting skill.

	nt	surrounding land use, flora and fauna.	iv.	Contact of Tana River County fire department shall be conspicuously displayed in strategic areas.
12.	Health	Health risks to members of the public and workers.	i.	Inform all the relevant stakeholder and government officials prior to commencement of any work.
			ii.	All employees will wear protective clothing during the exercise.
			iii.	Provision of respirators to all persons entering the asbestos sites.
			iv.	Fence off the site to avoid unauthorized access.
			v.	Warning & Safety signage will be placed at the strategic areas within the disposal site.
			vi.	All personnel involved with the asbestos disposal process will be subjected to medical surveillance.
			vii.	The area currently used for stockpiling of excavated material shall be lined with impermeable material.
			viii.	All machinery involved in an asbestos disposal process will be jet-washed prior to leaving site.
			ix.	Asbestos air sampling will be conducted on the sites for clean-up
			x.	When there is a visible dust or winds in excess of 20 knots, any asbestos disposal and cleaning process will be stopped.
			xi.	Thorough, complete and up to date records should be kept of at the site.
			xii.	Ensure all asbestos is collected and loaded into a transportation vehicle licensed by NEMA
			xiii.	The transporting vessel shall be labelled <HAZARDOUS WASTE<
13.	Hazardous substances	Potential hazardous substance can be harmful to the public	i.	The proponent to follow laid down procedure for handling hazardous substances as per the waste management regulation of 2006
14.	Heritage	Loss of heritage sites that are important to local community	i.	There is no cultural site in this site.

ABBREVIATIONS

ACM	Asbestos Containing Material
NEAP	National Environment Action Plan
EIA	Environmental Impact Assessment
CGK	County Government of Tana River
NEMA	National Environment Management Authority
EMCA	Environmental Management and Co-ordination Act
OEL	Operational Exposure Limit
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
TOR	Terms of Reference
EMP	Environmental Management Plan

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 ESIA Team carried out consultations with various stakeholders, particularly the neighbours, local administration and the county government.

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 improper disposal of roofing asbestos within the county and republic of Kenya, Liberty Solutions Limited , decided to establish a proper and safe asbestos disposal site in Garsen Sub County. Prior to establishment of the site, the proponent commissioned a ESIA process to assess the suitability of the site . 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 ESIA process.

1.1 DESCRIPTION OF THE PROJECT

The proponent intends to set up an asbestos disposal site. The site shall be used to disposal asbestos from potential clients at a fee. The site shall be fenced off to limit any access to unauthorized persons. The site, having been identified as ideal, shall only be commissioned once the license has been granted.

This site is not for a one-off disposal but rather a site that can accommodate approximately 3000 tons of the asbestos material.

Once a client approaches Liberty Solutions Limited on the need to dispose off its asbestos, the firm shall calculate the space that might be required. Thereafter, Liberty Solutions will excavate the space for that specific disposal upto 6m below the ground. After excavation, the firm shall construct concrete wall on the excavated pit to ensure that the asbestos leachate doesnot go into the underground water. After lining the pit with concrete , the asbestos material shall be placed on the constructed pit to upto one metre below ground level, then covered. The pit shall be marked with visible marks indicating what has been disposed, the source and the words ‘danger’.

1.1.1 General 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 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 to be 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 county governments
- where the waste will be transported to
- Verification of correct disposal such as tip dockets.

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 200 micron thick plastic bags, or 200 micron thick polythene sheet

Asbestos waste should:

- be double-bagged in case of one bag rupturing
- be in bags no bigger than 1200 mm x 900 mm

- not be more than half-filled
- 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 firm however sought the assistance of an environmental consultant to carry out an environmental impact assessment of the disposal site of asbestos from various premises especially within Mombasa, Tana River, Kwale and any other source of asbestos within the republic of Kenya.

1.1.3 Objectives

The primary objectives of the project are:

- i. To safely dispose-off asbestos material,
- ii. To ensure that the handling of asbestos containing products or material during the disposal and clean-up is in accordance with regulatory requirements
- iii. To minimise occupational exposures to asbestos fibres and future liabilities
- iv. To protect employees and the community from contact with asbestos fibres during the disposal and subsequent clean up exercise

1.2 Brief about asbestoses

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, (1:20µm) 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 had 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.

1.2.1 Government efforts to reduce exposure level.

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 effective method of completely removing these risks is to remove asbestos from the marketplace by eliminating the asbestos products and 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 μm wide and can be as slim as 0.01 μm . Human hair ranges in size from 17 to 181 μm 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.

The inhalation of asbestos fibres is known to cause mesothelioma, lung cancer and asbestosis.

Malignant mesothelioma is a cancer of the outer covering of the lung (the pleura) or the abdominal cavity (the peritoneum). It is usually fatal. Mesothelioma is caused by the inhalation of needle-like asbestos fibres deep into the lungs where they can damage mesothelial cells, potentially resulting in cancer. The latency period is generally between 35 and 40 years, but it may be longer, and the disease is very difficult to detect prior to the onset of illness. Mesothelioma was once rare, but its incidence is increasing throughout the industrial world as a result of past exposures to asbestos. Australia has the highest incidence rate in the world.

Lung cancer has been shown to be caused by all types of asbestos. The average latency period of the disease, from the first exposure to asbestos, ranges from 20 to 30 years. Lung cancer symptoms are rarely felt until the disease has developed to an advanced stage.

Asbestosis is a form of lung disease (pneumoconiosis) directly caused by inhaling asbestos fibres, causing a scarring (fibrosis) of the lung tissue which decreases the ability of the lungs to transfer oxygen to the blood. The latency period of asbestosis is generally between 15 and 25

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

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 regulation 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 ESIA 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, 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 employed, 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 fibres from their PPE – decontamination suits on a daily basis. A fully functional decontamination unit will be utilised at the site. The decontamination unit, placed about 30 metres from 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 drummed 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 fibres. 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 fibres. Damp asbestos will be manually lifted by the use of shovels, forks or by hand and placed into 200 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 concrete that separate it from the environment. 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.

There options for disposing of asbestos:

1. Disposal for asbestos shall be done on a underground concrete confinement. The confinement shall have a depth of approximately 6m below ground.

1.2.3 a Key points to note include:-

- Asbestos waste can only be disposed off at a landfill site that can lawfully receive asbestos waste.
- Asbestos waste is a regulated waste;
- Asbestos is a hazardous material that can have health effects to yourself and others if asbestos fibres 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
- Dust masks

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

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

The Project Cost

The project cost of Kenya shillings two million five hundred thousand only is anticipated for, the main components of this programme is to provide for a fence, entry gate, labour, water installation and provision of PPE's for the personnel and twenty four hour security surveillance.

1.3 Site Description

Location and Land use

The proposed site is located in Minjila area of Garsen Sub County, Tana River County. It is a bare piece of land approximately 0.971 Ha. The surrounding area of the proposed disposal site has no residential areas, no farms nor any shopping Centre within. The nearest shopping center is Minjila shopping center which is approximately 3KM away.

The land for the proposed project belongs to *Liberty Solutions Limited* as per the attached allotment letter. The proposed disposal site is in Garsen Constituency in Tana River County. Access to the site from Garsen is through Bura-Garsen-Malindi Road taking a right turn off exit 0.95 kilometers before getting to Minjila Market to join the access road to the site. Once on this road drive 1.94 kilometers to the project site as directed by the attached sketch map.

There is no visible river or water body within the proposed site. The approximate depth of the water table from ground is approximately 12 metres. attached, is a hydrological report.



Figure 1: Photos showing public consultation on in the process.



Figure 2: Photo showing neighbourhood..

1.4 Site Construction

The proposed disposal site is currently a bare land that is an isolated area with no near buildings so no residential neighbourhood around. The area is very sparsely populated.

1.4.3 Available utilities

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

1.5 Project Justification

Asbestos waste is defined as Hazardous Waste. The exposure to asbestos fibres 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. The carcinogenic activity is directly linked to the air pathway and ingestion of the fibres when swallowed.

The presence of asbestos within the premises poses a long term environmental and human health risk to people who operate on the within that site. There are several persons and factories within coast region who intend to remove the asbestos but does not have land for disposal of the same. This project therefore intend to provide solution of individual companies that intend to remove the asbestos and safely dispose them off in a licensed site. This will eliminate the asbestos in the human environment thus eliminating the risk associated with the asbestos

Alternatives

Alternative Technology

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. The asbestos materials shall be disposed off in underground concrete confinement. The confinement shall have a maximum depth of 6m below the ground level.

Alternative land

The disposal site is required to be away from human settlement. This site is far from human settlement. The nearest homestead is approximately 2km. furthermore, the proponent did not have a suitable location other than this land. The resident consulted did not have any objection to the project.

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 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. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

It is a legal requirement for any new development and existing projects to undergo EIA and EA respectively following the enactment by parliament of the Environmental Management and Co-ordination Act No. 8 of 1999 and gazetement of Legal Notice No. 101 of 2003 by the Minister of Environment. Under this legal provision development projects are required to undergo EIA process whose report is later submitted to NEMA for approval and awarding of a license after demonstrating that the possible negative environmental impacts of a given project will be effectively mitigated. For the proposed residential cum commercial development, the key legislative and regulatory requirements relate to proper management of the environment as well as health and safety aspects. The legislative and legal frameworks would therefore seek to address the issues that include among others;

- ✓ Occupational Health and Safety during construction phase
- ✓ Use of environmental resources to implement the proposal
- ✓ Waste generation and disposal
- ✓ Air pollution
- ✓ Noise pollution
- ✓ Traffic increase
- ✓ Public health

2.1 LEGAL FRAMEWORK

The following legislative provisions and regulations are considered key to management of the environmental, health and safety aspects related to the proposed development.

2.1.0 The Constitution of Kenya, 2010

The Constitution of Kenya 2010 is the supreme law of the land. Any other law that is inconsistent with the constitution is null and void to the extent of its inconsistency. Further any action by an individual or a State organ that contravenes the Constitution is null and void.

Chapter V of the Constitution deals with Land and Environment. Specifically Part 2 elaborates on the following components regarding the protection of the environment.

1. Obligations in respect of the environment
2. Enforcement of environmental rights
3. Agreements relating to natural resources
4. Legislation relating to the environment

Relevance to the proposed project

- ✓ *The proponent has a right to carry out the project within legal limits*
- ✓ *The proponent must ensure that the development is carried out in an ecologically, economically and socially sustainable manner*
- ✓ *The proponent is entitled to a fair administrative decision making process from NEMA and other state organs.*
- ✓ *The proponent must ensure that all the applicable provisions of the Constitution are observed at all times.*

2.1.2. The Environmental Management and Co-ordination Act, CAP 387

The purpose of this Act aims at improving the legal and administrative co-ordination of the ***diverse Sectorised initiatives*** in the field of environment so as to enhance the national capacity for its effective ***management***. To ***administer*** the ***Act***, two major institutions have been established. They include the National Environmental Council (NEC) and the National Environmental Management Authority (NEMA). It has several Regulations that are discussed in the proceeding sections.

2.1.3. EMCA Regulations

2.1.3.1 EIA/EA Regulations (Legal Notice No. 101 of 2003)

The EIA/EA Regulations are meant to operate under Sec. 58 of EMCA. It makes it illegal for anyone to undertake developments without an EIA license.

Relevance to the proposed project

- ✓ *Acquisition of EIA license to commence project development.*
- ✓ *Provide procedures and modalities on the preparation of the EIA/EA reports/ studies*

2.1.3.2 Environmental Management and Coordination Act, CAP 387 section 91 (1-7)

The EMCA, 1999 requires the Authority to categorize hazardous wastes on the recommendation of Standards Enforcement and Review Committee (SERC) and to issue guidelines and regulations for the management of each category of hazardous wastes. The categorization has been done under the EMC (Waste Management) Regulations, 2006, as well as the guidelines that provide for safe management of asbestos and its wastes.

2.1.3.3 Environmental Management and Coordination (Waste Management) Regulations, 2006.

Asbestos has been classified as hazardous waste under the Waste Management Regulations, 2006

- 1) Every person who generates toxic or hazardous waste shall treat or cause to be treated such hazardous waste using the classes of incinerators prescribed in the third Schedule to these regulations or any other appropriate technology approved by the Authority.
- 2) Any leachate or other by-products of such treated waste shall be disposed of or treated in accordance with the conditions laid down in the license or in accordance with guidelines issued by the Authority in consultation with the relevant lead agency.
- 3) In issuing a licence for the disposal of waste, the Authority shall clearly indicate the disposal operation permitted and identified for the particular waste

Relevance to the proposal

The proponent shall only begin once a license to operate a waste disposal site has been issued.

2.2 Water Quality Regulations (Legal Notice No. 120 of 2006)

Water quality regulations were gazetted as a legislative supplement mainly to address the challenges of pollution of water sources and conservation. The regulation provides guides for water use and conservation as well as effluent standards for discharge.

Relevance to the proposed project

- ✓ *The asbestos to be disposed off in underground concrete confinement at a depth of 6m below the ground level.*
- ✓ *Since the asbestos remains will be disposed onto the ground then a hydro geophysical survey shall be done to ensure there is no underground contamination of water.*
- ✓ *Monitoring activities will follow the guide values provided in the asbestos guidelines.*

2.3 Waste Management Regulations (Legal Notice No.121 of 2006)

In pursuit of the provisions of EMCA 1999, the Minister for Environment in 2006 gazetted the waste management regulations focusing on management of solid, industrial and hazardous wastes, pesticides, toxic and radioactive substances.

Relevance to the proposed project

- ✓ *Ensure there exists proper contractual agreement with licensed solid waste handlers,*
- ✓ *Ensure hazardous wastes are disposed off in the manner prescribed.*
- ✓ *The proponent to ensure that all asbestos waste are to be transported in a licensed truck only.*

2.4 Noise Regulations (Legal Notice No. 61 of 2009)

These Regulations were gazetted to manage noise pollution to levels that do not cause a disturbance/nuisance to the public. The proposed construction activities will however have a potential for the production of noise above the acceptable limits. Generally, construction sites generate noise that is above 85 dB (A).

Relevance to the proposed project

- ✓ *Ensure compliance with the set noise level limits for the site especially during construction and occupational phases.*
- ✓ *The proponent should ensure that employees are not exposed to noise levels above 85 dB (A) and in such cases provide suitable personnel protection equipment (ear protective devices).*

2.5 The Water Act No. of 2012

The Water Bill was gazetted in 2016 as the Water Act, and went into effect in 2017 when effective implementation of its provisions commenced. In furtherance to the Water Act 2016, the Ministry of Water and Irrigation and Water resources Management Authority (WRMA) in collaboration with other stakeholders has prepared a set of Regulations which have now been gazetted to give guidelines on water permit acquisition and adherence to conditions attached and also enforcement of the user fee charges.

Relevance to the proposed project

- ✓ *The proponent should ensure that water usage in all phases of the project cycle is in line with the provisions of this Act and obtain a permit from WRMA if a borehole will be considered as a source of water to supply the facility. The proponent should also ensure that the activities of the site does not cause any leachate that may cause water pollution.*

2.6 Electricity Power Act No. 11 of 1997

The Electric Power Act No. 11 enacted in 1997 deals with generation, transmission, distribution, supply and use of electrical energy as well as the legal basis for establishing the systems associated with these purposes.

Relevance to the proposed project:

- ✓ *Electricity power installation and usage should be done in a manner that seeks to protect the health and safety of the occupiers, the local and other potentially affected communities as well as the environment*
- ✓ *Proponent should adhere to provisions of this Act in all phases of the project.*

2.7 Occupational Health and Safety Act No. 15 of 2007

Of particular importance to the proposed project is the requirement that all work places must be registered with the Department of Occupational Safety and Health Services. Further, there is a requirement that a Safety and Health Committee must be put in place and those employees and members of this committee must be inducted and trained on the provisions of the Act accordingly. The Act imposes various obligations on both employers and employees.

Strict provisions are made in respect of equipment containing self acting machines, hoists and lifts and the requirement for supervision and training of inexperienced workers. Further an abstract of the premise safety and health policy should be exhibited at a conspicuous location within the property.

Relevance to the proposed project

- ✓ *Strict provisions will be made for the requirement of supervision and training of inexperienced workers during commissioning period*
- ✓ *It also involves the prevention of accidents at the workplace and provision of personal protective equipment (PPE) to all workers and ensuring their use.*

2.7.1 The Occupational Safety and Health Act, No. 15 of 2007

The purpose of the **Occupational Safety and Health Act (OSHA)** is to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces and to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. Though not explicitly provided, the act and the rules made there under have various sections on hazardous materials that apply to Asbestos.

The OSHA stipulates that an employer shall not require or permit his employee to engage in the manual handling or transportation of a load which by reason of its nature is likely to cause the employee to suffer bodily injury without his/her consent. It also states that any person supplying, distributing, conveying or holding in chemicals or other toxic substances shall ensure that they are packaged, conveyed, handled and distributed in a safe manner so as not to cause any ill effect to any person or the immediate environment.

2.8 The Public Health Act- Laws of Kenya, Chapter 242

The Act prohibits activities that may be injurious to health. It then becomes the responsibility of the county government to maintain clean and sanitary conditions.

Relevance to the proposed project

- ✓ *Applicable during the entire project cycle in ensuring proper and hygienic methods are used*
- ✓ *Maintain the completed building according to standards*
- ✓ *Ensure access to safe drinking water*
- ✓ *Put measures to prevent activities that would be a nuisance to the public.*

2.8.1 Public Health Act Cap 242 Sections 11-13 –

An act of parliament to make provision for securing and maintaining health. Section 13 states that it shall be the duty of every health authority to take all lawful, necessary and under its circumstances reasonably practicable measures for preventing the occurrence or dealing with any outbreak, or prevalence of any infections, communicable or preventable diseases or conditions to safeguard and promote the public health and to exercise the powers and perform the duties in respect of the public health conferred or imposed on it by this act or by any other law.

The Public Health Act Cap 247, Section 3 gives provisions for use of poisonous substances.

It refers to regulations for protection of persons against risk of poisoning, imposing restrictions or conditions on the importation, sale, disposal, storage, transportation or use of poisonous substances. This Act also requires persons concerned with importation, sale, disposal storage, transportation or use of poisonous substances to be registered and licensed and provides measures for detecting and investigating cases in which poisoning has occurred.

The Public Health Act Sec 126 A, empowers county government to make laws for all or any of the following matters with regards to buildings for controlling the construction of buildings and

the materials to be used in the construction of buildings; Preventing the occupation of a new or altered building until a certificate of the fitness thereof for occupation or habitation has been issued by such local authority. To compel owners to repair order to demolish unsafe, dangerous or dilapidated buildings.

2.10 Occupiers Liability Act Cap 34

This is an Act of parliament to amend the law as to liability of occupiers and others for injury or damage resulting to persons or goods lawfully on land or property from dangers due to the state of the property or to things done or omitted to be done there.

Relevance to the proposed project

- ✓ *Ensure safety of workers during construction and possible decommissioning phases and residents upon occupation phase of the development.*

2.12 The Factories and Other Places of Work (Hazardous Substances) Rules, 2007

Asbestos has been listed as a hazardous substance and its threshold limit values given, therefore these rules apply to all workplaces where asbestos is present.

2.12.1 The Factories (Building, Operations and Work of Engineering Construction) Rules, Legal Notice No. 40 of 1984

The Factories (Building, Operations and Work of Engineering Construction) Rules, Legal Notice No 40 of 1984, rules 20 and 21 prohibit any inhalation of dust and fumes. In any building operation or work of engineering construction where dust or fumes likely to be injurious to the health of persons employed are given off, all reasonably practicable measures shall be taken to prevent the inhalation of dust or fumes by the person employed by ensuring adequate ventilation or providing suitable respirators at the place where the operation or work is carried on.

2.12.12 The Tana River County Environment (Control and Regulations) of 2016

The Act which was enacted to give effects to various provision of the constitution of Kenya 2010, has section dealing with Air pollution, Noise pollution and Public nuisance. It prohibits acts or omission that are likely to cause air pollution , noise pollution and public nuisance.

Relevance to this project

the proponent shall ensure that all activities on the site does not cause air pollution considering that asbestos dust are potential air that not only harmful to environment, but also public health.

2.13 INSTITUTIONAL FRAMEWORK

2.13.1 National Environment Management Authority

The Authority is established to exercise general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of Government in the implementation of all policies relating to the environment. Its mandate includes implementation of Legal Notice no. 121 on Environmental Management and Coordination (Waste Management) Regulations, 2006 which stipulates the disposal of Hazardous waste such as asbestos.

2.13.2 County Government.

The county government is charged with the responsibility of providing guidance, supervisory and monitoring services of county functions in matters of infrastructure development and service delivery including solid waste management .

2.13.3 Directorate of Occupational Safety and Health Services

The department is mandated to implement all rules pertaining to the protection and prevention of workers from occupational hazards and ensure safe working environment. The Directorate implements the OSHA, 2007 and various rules made there under.

3 DESCRIPTION OF ENVIRONMENT

3.1. Introduction

This section provides detailed information of the site where the project is undertaken. It broadly examines the physiographic factors, social and economic forces both visible and invisible as they operate and the stimuli the new project is likely to inject. All major parameters are assessed to establish their capacities and abilities. Baseline information provides a basis to ascertain the implication of the development process and determine the mitigation measures to be undertaken or suitable to ameliorate the identified impacts.

3.1 Location

The project is located in Tana River County, Garsen Constituency (sub County), Minjila area/Village. The GPS reading for the site is **2° 19.484'S, 40° 5.684'E**,

3.2 Population

The major ethnic groups are the Somalis out of the Somalis the Wardey are the largest clan, The minority groups are the Pokomo (many of whom are farmers), the Orma people The county is generally dry and prone to drought. Rainfall is erratic, with rainy seasons in March–May and October–December. Conflicts have occurred between farmers and other people over access to water. Flooding is also a regular problem, caused by heavy rainfall in upstream areas of the Tana River.

3.3 Economic Activities

Major economic activity within the sub location of the project is charcoal making. Others include livestock rearing, small scale farming and trading.

3.4 Infrastructure

The site has one major road, the main road access to the site from Garsen is through Bura-Garsen-Malindi Road which is currently tarmacked. The area does not have sewer system as people uses pit latrine for human waste disposal. The water is sourced from boreholes although there is water pipeline. Communication is mostly by mobile

3.5 Geography and Climate.

Garsen is classified as one of arid and semi arid regions in Kenya. It usually experience severe droughts. The area has a tropical climate. In winter, there is much less rainfall than in summer. This climate is considered to be Aw according to the Köppen-Geiger climate classification. The

average annual temperature is 27.0 °C in Garsen. In a year, the average rainfall is 727 mm

3.6 Waste Management

The area is classified as rural area and the waste production is negligible. The waste produced in are usually used as manure or buried.

3.7. Water sources

The residents source water from the local pipes and taps. There are hardly any borehole in the area nor the rivers or streams.

Site physical Location

The project location is in Garsen Constituency in Tana River County. Access to the site from Garsen is through Bura-Garsen-Malindi Road taking a right turn off exit 0.95 kilometers before getting to Minjila Market to join the access road to the site. Once on this road drive 1.94 kilometers to the project site. The area resembles normal ranches of the coastal region.

3.8 Natural environment

Biological diversity

The proposed site was observed to have a significant variety of second generation plant species based on the nature of the activities that take place in the neighbourhood since charcoal burning has eliminated most of the tree. The area resembles a classic ranch in the coast region. There are other animals such as squirrel, roddents , various birds species that roam the area.

3.9 Landscape and Topography

Garsen is in Tana River County which lies within the coastal lowland which rises gradually from the sea level in the east to about 246 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 coast. The plain consists of an expansive flat land.

3.10 *Climate*

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

3.10.1 **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.

3.10.2 **Temperature**

The annual mean temperature in the county is 27.9⁰C with a minimum of 22.7⁰C and a maximum of 33.1⁰C. The hottest month is February with a maximum average of 33.1⁰C while the lowest temperature is in July with a minimum average of 22.7⁰C. Average humidity at noon is about 65 per cent.

3.11 *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.

3.11.1 **Soils**

The exploratory Soil Map of Kenya (Sombroek et al, 1982), describes, the soil distribution pattern and soil characteristic of Garsen 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.

3.11.2 *Socio-economic*

The area where the project will be located relies mostly on charcoal making. Formal employment is very low . apart from charcoal making, subsistence farming is very common.

The area does not have any cultural heritage site.

4 COMMUNITY AND STAKEHOLDER PUBLIC PARTICIPATION

4.1. Overview

Public participation and consultation will form a vital component in the EIA process for gathering, understanding and establishing the project target populations' perceptions, expectations, level of involvement and views on its impacts during design, implementation, operation and decommissioning. Furthermore, through public participation and consultation, it is possible to enhance project performance, acceptability, and sustainability. The aim is to disseminate information to interested and affected parties (stakeholders), solicit their views and consult on sensitive issues. Stakeholder engagement is purposely meant to create public information disclosure.

4.2. Stakeholder Engagement & Disclosure Methodology

Stakeholder engagement and Disclosure shall be achieved in form of the following but not limited to:

- Key informant interviews,
- Public meetings and questionnaire administration
- Focus Group Discussions
- Media

a) Public Consultation Meeting

The proponent through the EIA consultants conducted a public meeting with the affected parties and communities explaining the project and its effects, and received their oral and written comments on key issues of the proposed development. All issues discussed were recorded and incorporated in the meeting minutes. Minutes of the public consultation and a list of the participants were also attached. Questionnaires were administered among the participants and forms part of the appendices of the EIA study report.

Public consultation notices were communicated to different stakeholders as provided for in the EMCA Cap 387 and displayed or posted on public and strategic locations including deputy County Commissioner (Minjila) and Minjila Chief's office notice board, as well as public places in the vicinity of the proposed project site amongst other places. The public notice were also shared to stakeholders via emails and WhatsApp.

b) Media

The proponent will publicize the project and its anticipated effects and benefits through announcement of the notice in both official and local languages in a radio with a nation-wide coverage for at least once a week for two consecutive weeks. Subsequently, the proponent will publish a notice on the proposed project for two successive weeks in a newspaper that has a nation-wide circulation as well as the Kenya Gazette.

Other methods will include;

- Posting posters in strategic public places in the vicinity of the site of the proposed project informing the affected parties and communities of the proposed project

The project proponent and contractors will also be interviewed in order to get technical information about the proposed project. Public consultations will be done with the following aims:

- To inform the public about the proposed project and provide them with balanced and objective information to assist them in understanding the proposed project, project alternatives, opportunities, anticipated impacts (both positive and negative) and mitigation measures;

- To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered;
- To obtain public feedback in terms of their views, concerns and opinions on analysis, impacts and alternatives of the proposed project; and
- To facilitate involvement and participation of affected persons throughout the project life cycle.

4.3. Stakeholders Mapping

Informed by the scoping exercise conducted in November 2022, the public and stakeholder consultations will be conducted at different levels including County, Sub-county, ward and local levels. The following institutions, groups and individuals have been identified as stakeholders in the proposed project and will be consulted widely among others stakeholders. The stakeholders have been divided into 4 broad groups. They include:-

Categories of Key Stakeholders	
<p>Affected Communities</p> <p>1) Minjila community</p>	<p>Government Agencies</p> <p>a) Tana River City Water and Sewerage Company</p> <p>b) National Construction Authority (NCA)</p> <p>c) Tana River County Government (Dept. of Environment, Energy, Water and Sanitation)</p>
<p>Political Leaders & Government Officials</p> <p>1. Minjila Location Chief/Assistant Chief/Village Elders</p> <p>2. Tana River County Commissioner</p> <p>3. Deputy County Commissioner – Garsen Sub-county</p>	<p>Commercial/Non-Commercial Organisations</p> <p>a) Business Persons within the vicinity</p> <p>b) Registered CBOs in the area</p> <p>c) NGOs</p> <p>d) Opinion leaders from Minjila area</p> <p>e) Private Residential Homes Neighbouring the Proposed Development area.</p> <p>Other Key Stakeholders</p> <ul style="list-style-type: none"> • Project Planners

The proponent is obliged to ensure that all concerned public and private stakeholders in the project area have adequate input during the ESIA study. The EIA Experts will therefore undertake comprehensive consultation with the local community to ensure that all their views and opinions are taken into consideration during the project life cycle.

4.4. Output

The output of the study will be a complete Environmental Impact Assessment Study Report and will include project inputs, activities, impacts on both the natural and human environments, national environmental guidelines and standards, international conventions, mitigation measures and environmental management and monitoring plans.

The structure of the ESIA study report is outlined below:

Chapter	Title	Contents
1	Introduction	Introduction to the project: Project background, objectives and justification; purpose of the ESIA and objectives of the report; the EIA team.
2	Project Description	The technology and processes to be used in the implementation of the project; workforce requirements; the materials to be used in the construction and implementation of the project; the products, by-products and waste generated by the project.
3	Legal and Regulatory Framework	A concise description of the National Environmental, Legislative and regulatory framework, and international best practices.
4	Baseline Environmental Parameters of the project area	Description of the potentially affected environment within the framework of the proposed ESIA; assessment of existing (pre-project) impacts and potential (project and residual) impacts.
5	Stakeholder Consultation and Public Participation	Information obtained during consultations with stakeholders and interested parties.
6	Project Alternatives	Alternative technologies, processes available, and reasons for preferring the chosen technology and processes.
7	Identification of Impacts and Mitigation Measures	Environmental effects of the project including the social, economic and cultural effects and the direct, indirect, cumulative irreversible, short-term and long-term effects anticipated. Identification of mitigation measures for all identified impacts and determination of impact significance.
8	Cumulative Impacts	Assessment of past and on-going projects in the project area that may have cumulative impacts on the project
9	Environmental Management & Monitoring Plan	Environmental management plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment, including the time frame and responsibility to implement the measures; provision of an action plan for the prevention and management of foreseeable accidents and hazardous activities in the course of carrying out activities and other development projects; measures to prevent health hazards and to ensure security in the working environment for the employees and for the management of emergencies.
10	Conclusion and Recommendations	Summary of the key recommendations from the ESIA.

During the EIA process, members of the affected community were approached for their views on the proposed project. To achieve this, a meeting was held on 17th November, 2022 so as to inform the surrounding community of the proposed project. The meeting was also meant to enlighten them on asbestos roofing sheets and its dangers and measures the government through has put in place to ensure safe handling and disposal of the hazardous material. Those in attendance welcomed the project but requested that extra caution be taken during its implementation.

Some of the issues raised and comments made by those present include:-

- a) The site to be well fenced and security provided to restrict access as people may invade the land and dig out the buried asbestos.
- b) The pit must be well concreted.
- c) The materials to be well wrapped and lowered into the pits carefully so as to avoid breakages and damaging of wrapping material
- d) Locals to be first priority in consideration for employment
- e) The area administration to be well involved throughout the entire exercise.



Figure 3: Photo showing a section of the group in attendance to the meeting

The meeting was convened by the local assistance chief.

Some of the members present were as follows .

ATTENDANCE LIST FOR A MEETING HELD AT MANJILA SHOPPING CENTRE 17TH OF NOVEMBER, 2022 TO SEEK NEIGHBOURS AND SHAREHOLDERS OPINIONS, VIEWS AND CONCERNS FOR THE PROPOSED ASBESTOS DISPOSAL SITE FROM ALL OVER THE COUNTRY TANA RIVER COUNTY.

	NAMES	PHONE NO.	ID NO.	DESIGNATION	SIGNATURE
1.	Benson P Jillo	0700817061	10451756	SMR	
2.	Antonio M. Champwe	0797934813	36217212		
3.	Castro Mwangi Jillo	011067157	33052551		
4.	Osmar B. ARDEBETEMANI	0718707113	29093749		
5.	Abdibetmani B. Astako	0777480793	5442550		
6.	Mariam S. Ieru	0745127854	5446400		
7.	HUSSEIN M. DALANI	0711613018	2444932		
8.	Henry Kamary	0700008622	28391639		
9.	Platonio Moses	0796174679	39314257		
10.	Omani Juma Juice	0777702645	10310257		
11.	Mohamed H. Wape	0113148406	35153869		
12.	Fahma S. Sambo	0795464252	33062899		
13.	Rukia J. Ni	0798788738	32162664		
14.	Bani G. Duda	0113398860	21536034		
15.	Anwar M. Omani	0702364597	36662567		
16.	Suwah S. Jilo	0713272623	0306974		
17.	Murrahim G. Bakari	0113398860	27456698		
18.	Eha H. Ali	0114527625	35255293		
19.	Maimuna H. Shao	0702364597	12729290		
20.	Bahar A. Dudu	0777050728	5368146		
21.	Eha H. Sambo	0745361266	28456150		
22.	Adachan Duka	0710460032	1188454		
23.	Muhamad Mutari	0771447833	8064947		
24.	Muhamad Abilahi	071772374	8207595		
25.	Ali Abdullahti Ogea	0791859017	33125162		
26.	Rukia Said Budu	071600849	21665496		

- Generally, community members were not against the project but insisted on the following:
- i. all employment opportunities to be given to the locals.
 - ii. The proponent to ensure that no underground water contamination results from the operation of the site.
 - iii. The proponent to act on issues that could not be foreseen at the commissioning stage.
 - iv. PPE to be provided to workers as well as medical check-up after every 12months.

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 site (landfill). 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;
 - 1-2 is minor and will not result in an impact on processes;
 - 3-5 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 on the receiving environment. It is not a retrospective impact assessment of what asbestos contamination has occurred on the site. 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 is included in this assessment; however the no-go option is not preferred.

1. The No-Go Option

This is when the project is not licensed to proceed. This option imply that the various asbestos that in premises may corrode and Debrils enter the soils of the premises that they are. Asbestos shall be present in the soils of the premises.

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 (fibres, in the case of asbestos). Asbestos fibres tend to fracture longitudinally (along their length) and if airborne, could release thousands of fibres into the air. These small diameter fibres (not visible to the human eye) and fibre-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 fibres be disturbed and asbestos fibres released into the atmosphere, the main health risks that the asbestos potentially pose to employees and people located directly next to the sites include:

- Asbestosis: Exposure to airborne asbestos fibres can cause pulmonary fibrosis. The lungs build up fibrotic scar tissue around asbestos fibres 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 fibres are chemically inert. They do not evaporate, dissolve, burn or biodegrade in the environment. However, single fibres and clumps of fibres may be released in the air as dust as a

result of wind erosion and other types of activities that generate dust. Once inhaled, fibres may be deposited and retained in the airways and lung tissue. Because asbestos fibres 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 fibres 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 fibres on human health (premises that has asbestos) employees who access the areas containing asbestos fibres) 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: All facilities with the asbestos to Undertake the asbestos removal and safely dispose them in a licensed site which Liberty Solutions is intending to commission.	

Cumulative impacts:

Cumulative health impacts may result on the premises employees and people who operate at the premises if asbestos is not removed

2. 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 fibres vary in dimensions but also such fibres may be found combined with other fibres 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 fibres is therefore considered complex. The potential for asbestos fibres 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 fibres 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 fibres 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 fibres		
	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 is illness and/ mortality of people)	No
Can impacts be mitigated?	Yes	
<p>Mitigation:</p> <ol style="list-style-type: none"> All employees will wear protective clothing during the exercise. Each asbestos worker will be provided and equipped with: <ul style="list-style-type: none"> 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 fibres 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. 		

5. Warning & Safety signage will be placed at the areas within the disposal site.
6. No member of the public to be allowed near of the works area.
7. All personnel involved with the asbestos disposal process will be subjected to medical surveillance.
8. Asbestos contaminated areas shall be sprayed with water prior to commencement of cleaning activities in order to suppress the release of fibres.
9. Clearing of asbestos at any site shall be completed entirely before moving onto a new working site.
10. Temporary storage of waste: the area currently used for stockpiling of excavated material shall be lined with impermeable material.
11. All machinery involved in an asbestos disposal process will be jet-washed prior to leaving site.
12. Asbestos air sampling will be conducted on the sites for clean-up
13. 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.
14. When there is a visible dust or winds in excess of 20 knots, any asbestos disposal and cleaning process will be stopped.
15. 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
 - I. Ensure all asbestos is collected and loaded into a transportation vehicle licensed by NEMA
 - II. The transporting vessel (truck will be lined with polythene).
 - III. The transporting vessel shall be labelled <HAZARDOUS WASTE<
 - IV. The waste shall be transported to the disposal site in an enclosed vehicle.

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.

3. Safety risk to asbestos workers while working at the Sites

While working at the 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, Liberty Solutions Limited shall formulate 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	
Mitigation:		
» Liberty Solutions Limited 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:

- 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 .

» The asbestos site manager shall establish a health and safety committee. The committee shall comprise of the following personnel:

- 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 fibres 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	
<p>Mitigation:</p> <p>» The asbestos contaminated soil, materials and other hazardous waste (such as used PPE and wastewater) from the asbestos 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>		

- » General waste should be collected on a daily basis.
- » Ablution facilities must be provided for the asbestos disposal and clean-up workers. These should be located in a designated area.
- » Should any spillage of the asbestos waste occur, it must be cleaned-up immediately and the affected areas appropriately remediated.

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	
<p>Enhancement Measures:</p> <p>»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.</p> <p>» These sites should have clear signage that is maintained on an annual basis.</p> <p>» If there is a re-surface of asbestos on the premises area, it should be reported to premises management, to initiate remedial activities</p> <p>» 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.</p>		
<p>Cumulative impacts:</p> <p>The potential asbestos clean-up at the premises premises is seen as a cumulative positive impact on the soil, air and reduction in the health risk to the employees.</p>		

8. Impact on water during asbestos disposal and clean up

There is no water resource in the immediate vicinity of the proposed disposal site. However, hydrological survey indicated that the water tables is a about 20m below ground level. As such, the pit to be excavated will dug to a depth of 6m below the ground level.

4.0 ENVIRONMENTAL MANAGEMENT PLAN

Management Aspect	Mitigation measures	Time frame	Responsibility	Cost (Kshs)	Remarks
General Conditions	<ul style="list-style-type: none"> a) Notify workers about the upcoming activity b) Prepare appropriate PPE complying with international good practise c) Post appropriate signpost of the site that will inform the workers of key rules and regulations to follow 	During preparation for the proposed activity	Manager	60,000	This will help prepare the workers for the asbestos disposal and cleaning process
Waste Management	<ul style="list-style-type: none"> a) Inform cleaning and disposal workers of their responsibilities in terms of the EMP. b) Ensure that all waste removal workers comply with the Waste Regulations of 2006. c) Collect waste paper generated at the work site in scrap paper bins. Notify the waste paper removal 	During the cleaning and disposal process	Manager	70,000	To ensure a clean and healthy environment

	<p>worker /contractor when the temporary scrap paper storage area reaches capacity, for removal of the scrap paper to a recycling facility.</p> <p>d) Place all general / domestic waste in refuse bins.</p>				
Asbestos management	<p>(a) Asbestos disposal site shall be marked clearly as hazardous material</p> <p>(b) The asbestos will be appropriately contained and sealed to minimize exposure</p> <p>(c) The asbestos prior to removal should be treated with a wetting agent to minimize asbestos dust</p> <p>(d) Asbestos should be handled and disposed by skilled & experienced professionals</p> <p>(e) If asbestos material is being stored temporarily, the wastes should be</p>	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 fibres</p> <p>To ensure good environmental and health status of the facility</p>

	<p>securely enclosed inside closed containments and marked appropriately. Security measures will be taken against unauthorized removal from the site.</p> <p>(f) The removed asbestos will not be reused</p>				
Traffic and Pedestrian Safety	<p>(a) Signposting, warning signs, barriers and traffic diversions: site should be clearly visible and the workers warned of all potential hazards</p> <p>(b) Provision of safe passages and crossings for pedestrians be made</p> <p>(c) Active management by trained and visible staff at the site, if required for safe and convenient passage for the workers.</p> <p>(d) Ensuring safe and continuous access to office facilities, shops and residences during disposal and</p>	At preparation stages	Manager	80,000	<p>To avoid the spread of asbestos dust</p> <p>To reduce the potential to contaminate, as asbestos fibres can be spread through various mediums including living persons</p> <p>To eliminate risks of exposure to asbestos fibres</p>

	cleaning activities, if the facility is in operation during this activity				
Air Quality	<p>a) Establish air quality monitoring systems and implement operational management plans to ensure that the system is being maintained properly and that the outputs of the monitoring system are providing suitable data on air quality.</p> <p>b) Appoint a dust monitoring system to monitor and analyse dust and air quality</p> <p>c) Air monitoring should be done continuously in areas related to asbestos removal works.</p>	At preparation and disposal stages of the disposal	Manager	200,000	<p>To minimize air pollution</p> <p>To prevent asbestos fibres from being airborne</p>
Storm water	Ensure all storm water from the site is	During disposal	Manager	20,000	To ensure that there is no

Management	directed towards the established water drains	process			ponding on the disposal site or flowing water
Management of temporary waste storage sites	<p>a) Ensure management of temporary waste storage sites is in line set procedures and legal requirements.</p> <p>b) Register and monitor waste volumes at the temporary waste storage site</p> <p>c) Oversee the physical removal of the waste from the temporary waste storage sites</p>	During preparation and disposal stages	Manager	80,000	To ensure that the wastes are removed effectively and in time
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
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

Asbestos exposure	The firm 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 exposure limit.	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 fibres, e.g. cancer
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 fibres
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
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		The prevent risk of inhaling asbestos fibres, which is possible if one does not clearly see the area of work due to darkness

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
Underground water contamination	Construct a concrete lining in the asbestos disposal site	Before disposing the asbestos	manager	30,000 per ton of asbestos to be disposed	This will reduce possibility of underground water contamination.

6. 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 fibres 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. CONCLUSIONS AND RECOMMENDATIONS

As a result of the current potential health risk posed by asbestos, it has made it necessary for the government to ban use of asbestos materials and the government through NEMA has issued notice for removal of asbestos roofing sheets from buildings. Since there exists a challenge in the disposal of the asbestos, Liberty Solutions Limited saw it necessary to go in the line of handling hazardous waste key being asbestos. The firm contracted a NEMA licensed EIA expert to carry out an Environmental assessment for the identified land to be a disposal site for asbestos. From the assessment, the site is suitable for the activity and should be licensed on condition the proponent should adhere to EMP set and international guidelines on handling of asbestos.

It is recommended that the proponent shall comply with all statutory requirements for handling and disposal of Asbestos including ensuring that all vehicles transporting asbestos are NEMA licensed.

8.0. KEY EXPERTS FOR THE STUDY

No	Expert Name	Proposed Role and Designation
1	Onesmus Gikonyo	Lead Environmental Expert Coordination of all project activities
2	Dixon Kiptanui	Hydrogeologist (Undertaking Hydrogeological survey report to determine area water table)
3	Godfrey Njugi Ng'aari	Biophysical and environmental data collection. Data collation and compilation of EIA Report
4	Patrick Njoroge	Data collation and compilation of EIA Report

9.0 NON-TECHNICAL SUMMARY

This Environmental Impact Assessment was conducted to determine the overall environmental impacts that the proposed asbestos material disposal site

exercise is likely to have in the future. *Liberty Solutions 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
- Establish the waste tracking mechanism.
- Disposal of waste in underground concrete confinement.
- The depth of the pit to be at most 6m below the ground.
- Control of asbestos fibre release and exposure effects
- Monitoring air and soil quality
- Medical surveillance
- Health and safety considerations
- Asbestos waste shall not be stockpiled at the landfill for disposal at a later date
- Caution should be exercised to ensure that bags or containers are not broken open before they are covered. If an asbestos container is ruptured, it should be re-packed by trained personnel prior to burial.
- The maximum carrying capacity is approximately 2500tons. Thereafter, it should be decommissioned.
- There shall be no handling of asbestos in windy conditions.
- Detailed location and maps must be recorded and maintained to minimize the risk of exposing asbestos waste during future activities at the landfill
- The proponent shall put up an asbestos emergency response plan.

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, 2006, The environmental Waste management regulation , Government Press, Nairobi, Kenya,

Kenya Gazette, 2007. The Occupational Health and Safety Act , Government Press, Nairobi, Kenya,

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

Tana River County Government , 20016. The Tana River County environment (Regulation andControl Act), Government Press, Nairobi, Kenya.

NEMA, 2013. National Guidelines On Safe Management And Disposal Of Asbestos, NEMA, Nairobi Kenya.

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: Hydrological Report.

Appendix 2: PIN copy

Appendix 3: Land Ownership Documents

Appendix 4: Questionnaires/ Public Barasa minutes

Appendix 5: Certificate of registration copy

Appendix 6: Approval Of TOR

Appendix 7: acknowledgment of initial project report

Appendix 8: registration of lead Expert.