ENVIRONMENTAL AND SOCIAL IMPACT STUDY REPORT FOR THE PROPOSED ASBESTOS SANITARY LANDFILL PROJECT ON PLOT L. R. 184 UNDER CERTIFICATE NUMBER 155, MUTHAARA LOCALITY, JUJA SUB-COUNTY, KIAMBU COUNTY

PROJECT PROPONENT:

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DOCUMENT AUTHENTICATION

A. EIA EXPERTS

I Patrick Kituta, Wanjohi Nderitu and Mr. Timothy Kamau of Devlink Resource Consultants and as Environmental Lead Experts to the Proponent, Waste Afrika Limited carried out and prepared the Environmental and Social Impact (EIA) Study Report for the Proposed Asbestos Sanitary Landfill, to be located in Muthaara Locality, Juja Sub-County of Kiambu County.

We hereby certify that this study report was prepared on the information provided by the proponent, consulted stakeholders as well as that collected from other primary and secondary sources and on the best understanding and interpretation of the facts by the environmental assessors. It is issued without any prejudice.

i. **Mr. Patrick Kituta: EIA Lead Expert, NEMA Reg. No. 1275**
ii. **Mr. Wanjohi Nderitu: EIA Expert, NEMA Reg. No. 2646**
iii. **Mr. Timothy Kamau: NRM and Socio-Economic Expert, NEMA Reg. No. 2343**
iv. **Charity Kita (Public Consultation/ Reporting)**

Signature: …… Date: ……

On behalf of ESIA Experts

B. PRELIMINARY PROJECT DETAILS

PROJECT PROPONENT: Waste Afrika Kenya Limited

PROJECT NAME: Asbestos Sanitary Disposal Landfill

CONTACT PERSON: Mrs. A. W. Kaburi

POSITION OF CONTACT PERSON: Operations Manager

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POSTAL ADDRESS: P. O. Box 44636-00100 NAIROBI

COST OF THE PROJECT: KShs 4.6M

LOCATION OF THE PROJECT: Plot L. R. 184 Under Certificate Number 155, Muthaara Locality, Juja Sub-County, Kiambu County

GPS COORDINATES: Latitude: 1.1182°S, Longitude: 37.0836°E (-1.118200, 37.083600)

PIN NUMBER OF THE PROPONENT: P051580932B

WASTE AFRIKA KENYA LIMITED
P. O. Box 44636 00100
NAIROBI

Signature .....Date: .....

For the Project Proponent

EXECUTIVE SUMMARY

Waste Afrika Kenya Limited is a private firm registered under the laws of the republic of Kenya and specializes in Asbestos Handling and Disposal. The firm intends to put up an Asbestos Sanitary Landfill facility on a parcel of land in Muthaara Area, Juja Sub-county in Kiambu County. The proposed site is approximately 1.25Acres (0.505Ha) and is far away from densely populated human settlement, with the area dominated by both active and decommissioned quarry pits. As at the time of this report, the firm had had signed an agreed towards acquiring the parcel of land, a decommissioned quarry pit, from the owners who inherited it from their fathers. A copy of the agreement has been attached to this report. The pit shall be considered full when the material reaches a mark of 1.5m below the ground level. Other amenities to be provided at the site include office facilities, rooms for the storage of Personal Protective Equipment and works equipment, jet wash area, sanitary and bathing facilities, temporary asbestos storage shed, car park, perimeter fence, and a lockable gate. The site will be manned throughout.

The major risk of the project is exposure 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, undertaking staff occupational health surveillance, 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 concrete confinement, washing the vessels on the site, disposing the used disposable PPE on the site among others. The positive impacts will be provision 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 increasing indiscriminate disposal of such.

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Waste Afrika Kenya Limited Management 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 the republic of Kenya. Immediate and neighbouring parcels of land are undeveloped and are used for open cast quarrying. 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 proposed project is classified as high risk thus need for winder public consultation hence why an ESIA is being undertaken. The experts have enumerated several potential positive and negative impacts of the project 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 workers which will be mitigated by proper handling by trained staff and provision of appropriate PPE. There is no potential underground contamination as per the hydro-geological survey and there will be no excavation below the abandoned quarry site ground. These measures are contained in the Environment management Plan (EMP) and include the following: -

- Practising good waste management
- Establish the waste tracking mechanism.
- Erection of concrete compartments.
- Control of asbestos fibre release and exposure effects
- Monitoring air and soil quality
- Medical surveillance
- Safety and health 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 site 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.

Positive impacts include availability of asbestos disposal area which will reduce the exposure of the material to larger public, and that the project will provide avenue for the compliance through safe disposal.

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

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ACRONYMS/ABBREVIATIONS

ACM	Asbestos Containing Materials
AIDS	Acquired Immuno-Deficiency Syndrome
CAP	Crisis Action Plan
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CPP	Consultation and Public Participation
EA	Environment Audit
EAP	Environment Action Plan
EIA	Environment Impact Assessment
EMCA	Environment Management Coordination Act
EMMP	Environment Management and Monitoring Plan
EMP	Environment Management Plan
GoK	Government of Kenya
IAEA	International Atomic Energy Agency
IOMAC	Regional Convention/Agreement on the Organization for Indian Ocean Marine Affairs
NCA	National Construction Authority
NEAP	National Environment Action Plan
NEMA	National Environment Management Authority
NPEP	National Poverty Eradication Plan
OSHA	Occupational Safety and Health Act
PIA	Project Influence Area
PPEs	Personal Protective Equipment
SHE	Safety Health and Environmental
STD	Sexually Transmitted Diseases
UNFCCC	United Nations Framework Convention on Climate Change

1. INTRODUCTION

1.1. Introduction of the Project

Waste management is a perennial problem in Kenya; with the local authorities (county governments) struggling to provide sound management strategies that will ensure there is sustainable disposal of both solid and liquid wastes. There are several laws and regulations guiding the management of wastes in Kenya; these laws have been developed to offer direction and oversight the disposal of wastes and to guarantee a clean environment.

Solid wastes are classified based on their material content (composition); ability to be reused, recycled, their source (point of generation) among other classifications. The material composition of wastes is central to defining the disposal method/ strategy. Some materials such as asbestos are considered hazardous and require specialized disposal methods, thus asbestos and asbestos containing materials (ACM) are classified as hazardous wastes under the Environment Management and Coordination Act (Waste Management Regulations, 2006). The use of asbestos has been banned in Kenya and the National Environment Management Authority (NEMA) has developed guidelines on the disposal of the same. The guidelines (National Guidelines on Safe Management and Disposal of Asbestos (2015) provides for three methods on safe disposal of asbestos and Asbestos Containing Material (ACM) as listed below:

i. Sites designated by the local authorities and licensed by NEMA;
ii. Privately owned disposal facility licensed by NEMA; and
iii. Designated by the waste generator (on-site disposal).

In that line, the proposed project under assessment falls under the "***Privately Owned Disposal Facility Licensed by NEMA***"

1.2. Project Objective

The overall objective of the proposed project is to construct a privately-owned sanitary landfill for purposes of sanitary disposal of end-of-life asbestos and ACM in line with the National Guidelines on Safe Management and Disposal of Asbestos (2015).

1.3. Project Justification

Asbestos is a versatile industrial material with many uses. Asbestos was the material of choice in many industrial uses where heat resistant material was needed in the early and mid-twentieth century. However, it was realized that its industrial benefits were outweighed by the impacts on public health. This is because asbestos is considered to be a carcinogenic material and therefore a predisposing factor to cancers of the respiratory tract and the skin. It is against this background that many countries/ jurisdictions banned the use of

asbestos. The use of asbestos in Kenya was banned in the year 2006 and NEMA later developed guidelines on the management and disposal of the asbestos.

Despite the ban on use of asbestos in Kenya, there has been numerous challenges effecting the ban, largely attributable to lack of disposal facilities, it is against this background that the proponent, (Waste Afrika Kenya Limited) experts in hazardous wastes management would like to construct and operate a privately owned sanitary landfill in the identified decommissioned/ abandoned quarry pit in Muthaara Area, Juja Sub-county in Kiambu County.

1.4. Terms of Reference

The list below highlights the NEMA approved terms of reference for this report. The terms of reference define the objectives and scope of the ESIA as follows:

i. Assess the baseline environmental conditions in the project area, such as biological, physical and socio-economic environment;
ii. Study the potential positive and negative impacts of implementing the proposed project in the society living within the influence of the project including, but not limited to, sound disposal of ACM, job creation, improvement in the livelihood and improvement of land use in the locality.
iii. Assess the potential environmental and social impacts of the project and suggest suitable mitigation measures for the adverse impacts;
iv. Study the project conditions and requirements in terms of location, construction and operation requirements;
v. Study issues arising from the proposed project for example livelihood disruption, public safety and health and rehabilitation of the affected environment.
vi. Prepare an Environmental and Social Management Plan (ESMP) for implementation and monitoring of mitigation measures along with budgetary estimates, institutional and reporting requirements.

1.5. ESIA Methodology

The EIA is based on site visits, literature review, and discussions with the project proponent, hydrogeologists, engineers and consultation with the public (public participation). The project proponent provided all details relevant to the proposed project. While preparing the ESIA report, care has been taken to identify the potential negative impacts and their mitigation measures in terms of:

i. Impacts due to project location;
ii. Impacts from project design and during construction; and
iii. Impacts during the operation of the project.

For the purpose of the assessment and preparation of the Study Report, the following approaches and methodologies were employed:

i. Desktop studies which involved review and analysis of literature for acquisition of secondary data;
ii. Environmental screening, in which the project was identified as among those requiring ESIA under schedule two (2) of EMCA, 2015; the proposed project is classified as a Medium Risk Project.
iii. Environmental scoping that provided the key environmental issues to be investigated in relation to implementation of the proposed project;
iv. Physical inspection of the site and surrounding areas;
v. Consultation involving key stakeholders for collection of primary data (Consultation and Public Participation-CPP);
vi. Identification of potential impacts and preparing an ESMP;
vii. Confirmation and sharing of findings with the project proponent; and
viii. Reporting

1.6. Consultation and Public Participation

Consultation and Public Participation was done within the Project Influence Area (PIA). This promotes open governance whereby everybody is granted equal opportunity to voice their opinion/ views with regard to the proposed project: the opinions/ views given assist in planning of the proposed project. This promotes awareness and provides an opportunity for better planning of the proposed project whereby opinions from various stakeholders are considered.

Kenya has developed EIA/ESIA Regulations, which must be adhered to by proponents of all development projects. These regulations have been clearly spelt out in the EMCA, 1999-Amended 2015 and the EIA and Environmental Audit (EA) Regulations of 2003. These documents provide guidance on environmental and social issues/factors that must be considered during an ESIA and preparation of the assessment report. The assessment found out the proposed project is located in a locality whereby mining (quarrying) is the predominant activity.

2. PROJECT DESCRIPTION

2.1. Introduction

This section highlights details of the proposed project; the projects specs and baseline information of the project location and the PIA. The section also examines the compatibility of the proposed project with the local land uses.

2.2. Project Location

The proposed project will be located at Muthaara Area, Juja Sub-county in Kiambu County. Quarrying is the predominant activity in the project area, hence the area is characterised by abandoned and active quarry pits. The project site can be accessed through three routes:

- Route 1 runs from Thika Road branching off at Ndarugu Lorry Park
- Route 2 runs from Witeithie Bus Stop
- Route 3 runs from Thika Town off Thika-Mwingi Highway.

Site GPS Coordinates: Latitude: 1.1182°S, Longitude: 37.0836°E (-1.118200, 37.083600)

Figure 1: Site Location and Direction (Source: Google Earth 2019-)

2.3. Project Details

The proposed project will entail construction of a sanitary landfill in a decommissioned/ abandoned quarry pit for purposes of sanitary disposal of asbestos and ACM. The quarry pit is approximately 50ft deep, 80ft wide and 200ft in length. The total project area is 1.25Acres (0.505Ha). , River Ndarugu, water course is approximately 200m away. The proponent proposes to construct the sanitary landfill in line with the National Guidelines on Safe Management and Disposal of Asbestos (2015).

Figure 2: A Google Earth Map image showing the proposed project site in relation to Ndarugu River Channel

2.3.1. Project Design

The design will entail:

i. Lining the pit (to engineer's specification guided by asbestos disposal guidelines);
ii. Building compartments where the asbestos will be disposed/buried;
iii. Providing for access road at the side of the landfill.
iv. Construction of Site offices, Ablution/sanitary block (To PHO's standards/ recommendations), Perimeter fence/wall, Site Stores, Security/ guard house, office facilities, storage rooms for Personal Protective Equipment and works equipment, jet wash area, sanitary and bathing facilities, temporary asbestos storage shed, car park, perimeter fence a lockable gate and any other requisite/ auxiliary structure.

2.3.2. Disposal Methodology

The proponent is committed to disposing asbestos and ACM in line with the National Guidelines on Safe Management and Disposal of Asbestos (2015). The proponent has the requisite human resources to implement the guidelines upon commissioning of the landfill not forgetting that all personnel to be involved in running the project will be subject to occupational health surveillance, training in handling of asbestos as well as management of an asbestos disposal site.

2.3.3. Project Summary Sheet

The table below summarizes the proposed project design details/ parameters

Table 1: Project Summary Sheet

Item	Particulars	
Name of the proponent	Waste Afrika Kenya Limited	
Name of Project	Proposed Asbestos Sanitary Landfill	
Specific location	Muthaara; Juja Sub-County, Kiambu County	
Site Coordinates	Latitude: 1.1182°S, Longitude: 37.0836°E (-1.118200, 37.083600)	
Project Objective	To construct a privately owned Sanitary landfill for asbestos and ACM disposal	
Project Scope	To construct a sanitary landfill for asbestos and ACM disposal. The landfill will entail all the necessary auxiliary structures such as offices, perimeter fence, ablution block, and site stores	
Land/ Plot Details	Plot Number 184 under share certificate number 155	
Plot Area:	1.25acre (0.505ha)	
Project Budget	a) Civil and other works	
	b) Overheads including design, supervision and administration	(30% material costs)
Approximate Total cost of Construction:	**KShs. 4.6 million**	

2.3.4. Project Input

Table 2: Project Input

PROJECT INPUTS			
Site Office	Constructing of temporary site office	Iron sheets, timber, nails	Manual equipment
Site Hoarding	Securing the site with perimeter fence	Building Blocks, sand, cement, steel, timber, diesel and lubricants, razor wire	Manual Tools, excavator
Site Preparation	Site clearing/stripping (removing of quarry wastes & vegetation)	Diesel and lubricants	Tractors, loaders, Shovels,
Pit Lining	-Erecting liner on the base and on all the walls of the landfill pit -(lining to engineer's specification)	-Building blocks, Steel bars, Sand, cement, ballast	Manual Equipment, Concrete mixer and vibrators
Pit Cover	-Covering of disposed wastes	Cover to Engineers standard -Soil for top cover	Manual Equipment, Concrete mixer & vibrators
Walkway	-Constructing 2 meter wide walkway in the middle of the pit (Secured with guard rails).	Guard rails	Manual equipment and tools and Welding machines
Office, Sanitation facilities, stores	-Construction of Office, sanitation facility and stores	-Steel bars, Sand, cement, ballast, timber, Pipes, taps, electrical wires	Manual equipment,
Landscaping	-Rehabilitating the project site, levelling, planting of vegetation (trees, flowers)	tree and flower seedlings, Top soil, pavements blocks	Manual equipment and tools, welding machines, concrete mixers, vibrators.

2.3.5. Project Output

The following will be the main outputs resulting from implementation of the proposed project:

a) Waste Output

i. Site clearance wastes;
ii. Domestic waste/ Waste associated with workers;
iii. Metallic wastes;
iv. Containers (plastic/papers);
v. Wooden wastes; and
vi. Concrete wastes among others

b) Other Outputs Include

i. Noise emissions from construction machinery, motor vehicles, among others; and

ii. Air emissions from machinery (Carbon Dioxide (CO_2), Carbon Monoxide (CO), Nitrogen Oxide (NO_x), Nitrogen Dioxide (NO_2), PPM etc.)

2.3.6. Project Objectives

The primary objectives of the project are:

i. To safely dispose-off asbestos and ACM,

ii. To ensure that the handling of asbestos and ACM 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

2.4. Envisaged Project Activities

The proponent intends to set up an asbestos disposal site. The site shall be used as a sanitary landfill for safe disposal of asbestos from potential clients at a fee. The site shall be fenced off to limit any access to unauthorized persons and animals. The site, having been identified as ideal, shall only be commissioned once a license has been granted by NEMA.

This site is not for a one off disposal but rather a site that can accommodate large amounts of asbestos and ACM. Once a client approaches Waste Afrika Kenya Limited Management on the need to dispose off its asbestos/ACM, the firm shall go and collect as per the provisions of environmental regulations and after carrying out an ESIA. The firm shall prepare the disposal area as needed where the asbestos shall be placed up to one metre below ground level, then covered. The office shall keep records indicating what has been disposed and the source. The site shall have visible marks and the words 'asbestos danger keeps off'.

2.4.1. General Disposal Procedures for Asbestos

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

a) *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 sealed polythene sheets 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 burying upon wrapping with polythene papers/plastic material.

The asbestos removal plan must be kept on site.

b) *How is asbestos waste stored on site prior to removal?*

Before being removed from site, asbestos waste must be wrapped in polythene sheets that are impermeable to asbestos dust, such as thick plastic bags or 500 micron thick polythene sheet

c) Asbestos waste should:

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

2.4.2. 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 sources of asbestos within the republic of Kenya.

2.5. Project Site and Land Ownership

The project land is in the process of being owned by Waste Afrika Kenya Limited; the proponent is in possession of legal documents for the land.

2.6. Cultural and Historic Sites

There are no cultural or historically important sites within the project influence area and therefore the proposed project is bound to have no adverse impacts on the cultural aspects of the neighbouring community.

2.7. Local Land Uses

The predominant land use in the project influence area is open quarry mining, hence the area I characterised by both active and decommissioned/abandoned. The decommissioned/abandoned quarry pits are a both a safety and security concern because there are no efforts made to rehabilitate them. The proposed project will serve to decommission the subject quarry pit thereby making the environment safe, hence the proposed project is therefore compatible with the land uses.

2.8. Baseline Information

Baseline information is very important because it establishes the current biophysical conditions and it is against these conditions that performance of environmental strategies will be evaluated. Baseline information is intended to establish the present state of the environment, taking into account changes resulting from natural events and from other human activities (Glasson, 1994; Canning et al., 2003). The expected social and economic gains from the proposed project must be weighed in light of possible negative impacts on the environment and tenable measures that have been proposed to mitigate against such impacts. The baseline information for this project was gathered from both secondary sources and the field visits described earlier in this report.

2.8.1. Soils

Striping of the top soil has already been done on the project site. The project influence area is generally rocky with minimal top soil the reason informing quarrying activities. There is little evidence of good agricultural land in the project site.

2.8.2. Geology

The project area is underlain by mainly volcanic and volcano-sedimentary rocks of Recent to Pleistocene age. The intense tectonic activity associated with the formation of the Great Rift Valley, led to a series of widespread eruptions and lava flows, which occurred from Upper, Middle and Lower Pleistocene to Quaternary times. The thick volcanic sheet is underlain at great depths (probably more than 700m) by metamorphic rocks of the Basement complex (gneisses and schists) of the Mozambican System. The Tertiary volcanic period lasted approximately 13 million years, and was characterized by cyclic activity: eruptive episodes, marked by the ejection of lava flows, pyroclastic bombs, and ashes, were punctuated by periods of erosion and landmass denudation. During these times of relative quiescence, Old Land Surfaces were formed, which are, today, important water bearing layers within the volcanic succession (Project Hydrogeology Survey Report, 2019).

Figure 3: Geological Profile of the project site

2.8.3. Flora and Fauna

There is poor biodiversity in the project site because there are poor soils that can support vegetation cover that in return support animal life. A few seasonal plant species adapted to growing in poor rocky soils were identified in the project site.

Figure 4: Flora in the project Site

2.8.4. Water Resources

River Ndarugu lies approximately 200M east of the project site; hydrogeological survey undertaken for the project site has identified that the proposed project will not affect the water resources in the river owing to the impermeable layer of rock on the floor of the pit and the configuration of the aquifers in the project site. The project hydrogeologist has summed up the findings on the project site by recording that "At the proposed site, there is an impervious layer of compact tuffs and the aquifers are not likely to be affected and even if asbestos were to be exposed to the ground the fibres would be removed through the process of attenuation*". (For more information, see attached copy of the hydrogeological report)*

3. REVIEW OF POLICY AND LEGAL FRAMEWORK

3.1. General Overview

Kenya has a policy, legal and administrative framework for guiding it in environmental management. Under the framework, NEMA is responsible for ensuring that ESIAs are carried out for new projects and EAs/ESAs on existing facilities as per the provisions of EMCA, CAP 387 (Amended 2015). ESAs are carried out in order to identify positive and negative impacts associated with ongoing projects with a view to taking advantage of the positive impacts and developing mitigation measures for the negative ones. The guidelines on EAs are contained in Sections 58 to 67 of EMCA of 1999.

ESIA is a tool for environmental conservation and has been identified as a key requirement for new projects to ensure sustainable operations with respect to environmental resources and socio-economic activities in the neighbourhood of the proposed projects. The government has established regulations to facilitate the process on ESIAs and ESAs. The regulations are contained in the Kenya Gazette Supplement No. 56, legislative supplement No. 31, Legal Notice No. 101 of 2003.

In order to ensure that the activities undertaken during implementation of the proposed project conform to existing policies and laws, a number of key statutes and principles geared towards ensuring proper environmental and natural resources management were examined. This enabled the identification of specific provisions of various relevant laws that need to be adhered to. These included the following:

- Environmental Management Principles and Guidelines
    - ✓ Sustainability
    - ✓ Principle of Intergenerational Equity
    - ✓ Principle of Prevention
    - ✓ Precautionary Principle
    - ✓ Polluter Pays Principle
    - ✓ Principle of Public Participation
    - ✓ The Cultural and Social Principle
    - ✓ Principle of International Co-Operation

- Policy Framework
    - ✓ Environmental Policy Framework
    - ✓ National Sustainable Waste Management Policy (draft)
    - ✓ The National Sustainable Waste Management Bill, 2019
    - ✓ The National Poverty Eradication Plan (NPEP), 1999

- ✓ And others

- Legal Framework
  - ✓ Environmental Management and Coordination Act No. 8 of CAP 387 (Amended 2015).
  - ✓ Physical Planning Act, Revised Edition 2012
  - ✓ Environmental Impact Assessment and Audit Regulations of 2003.
  - ✓ Local Authority Act (Cap 265), Revised Edition 2012
  - ✓ EMCA (Waste Management) Regulations, 2006 Legal Notice No.12
  - ✓ EMCA, Air Quality Regulations, (2009)
  - ✓ Occupiers Liability Act Cap 34, Revised Edition 2012
  - ✓ The Public Health Act, Cap 242, Revised Edition 2012.
  - ✓ Occupational Safety and Health Act (OSHA) 2007.
  - ✓ Noise and Excessive Vibrations Pollution Control Regulations 2009.
  - ✓ Water Act of 2016
  - ✓ And others

- The Constitution of Kenya, 2010
- International Conventions and Treaties
  - ✓ Millennium Development Goals (MDG's)
  - ✓ United Nations Framework Convention on Climate Change (UNFCCC)
  - ✓ Kyoto Protocol

- Safeguard Policies for World Bank
  - ✓ Environmental Assessment Operational Policy OP/BP 4.01
  - ✓ Indigenous people OP/BP 4.10
  - ✓ World Bank Group Environmental, Safety and health guidelines

3.2. Environmental Management Principles and Guidelines

The project proponent and the contractor are expected under law and best practice to consider and exercise all the principles and tenets of environmental management. These principles are as discussed below:

3.2.1. Sustainability

The principle of sustainability requires that natural resources should be utilized in a way and at a rate that does not lead to the long-term decline of natural resources, thereby maintaining its potential to meet the needs and aspirations of present and future generations. It strives for equity in the allocation of the benefits of development and decries short-term resource exploitation which does not consider the long-term costs of such exploitation.

In the course of implementing the proposed project, the project proponent/manager is strongly advised to use resources sustainably and source materials from suppliers that have been identified as employing/ practicing sustainable resources use.

3.2.2. Principle of Intergenerational Equity

The principle of sustainability should be examined together with that of intergenerational equity, which focuses on future generations as a rightful beneficiary of environmental protection. Essentially, the principle of intergenerational equity advocates fairness, so that present generations do not leave future generations worse off by the choices they make today regarding development. Operations and activities undertaken at all the stages of the proposed project ought to be designed to embrace the rationale of intergeneration equity in resources use both natural and man-made resources. Besides, intra-generation equity should be observed whereby various resources users in the current generation should not have their resources use ability compromised by the proposed project.

3.2.3. Principle of Prevention

The principle of prevention states that protection of the environment is best achieved by preventing environmental harm in the first place rather than relying on remedies or compensation for such harm after it has occurred. The reasoning behind this principle is that prevention is less costly than allowing environmental damage to occur and then taking mitigation measures. The project proponent is duty bound under EMCA CAP 387 to undertake all the preventive and viable measures to protect the environment in the course of implementing the project, upon commissioning the project through to decommissioning of the project.

3.2.4. Precautionary Principle

The precautionary principle recognizes the limitations of science, as it is not always able to accurately predict the likely environmental impacts of resource utilization. It calls for precaution in the making of environmental decisions where there is scientific uncertainty. Accordingly, it is closely related to the principle of prevention and can be viewed as the application of the principle of prevention where the scientific understanding of a specific environmental threat is not complete.

The precautionary principle thus requires that all reasonable measures must be taken to prevent the possible deleterious environmental consequences of development activities. Further, it demands that scientific uncertainty should not be used as a reason for not taking cost effective measures to prevent environmental harm. The project proponent should undertake all the necessary precautionary measures in the course of implementing the proposed project.

3.2.5. Polluter Pays Principle

The polluter pays principle requires that polluters of natural resources should bear the full environmental and social costs of their activities. It seeks to internalize environmental externalities by ensuring that the full environmental and social costs of resource utilization are reflected in the ultimate market price for the products of such utilization. Since environmentally harmful products will tend to cost more, this principle promotes efficient and sustainable resource allocation as consumers are likely to prefer the cheaper less polluting substitutes of such products. This principle dictates that when undertaking a project or running institution, if damage is caused to private properties or even public utilities such as roads or public goods such as water bodies, measures to compensate the affected should be instituted immediately.

3.2.6. Principle of Public Participation

The principle of public participation seeks to ensure environmental democracy and requires that the public, especially local communities should participate in the environment and development decisions that affect their lives. It requires that the public should have appropriate access to information concerning the environment that is held by public authorities and should be given an opportunity to participate in decision-making processes. This principle calls for public participation in the development of policies, plans and processes for the management of the environment. Public participation ensures that:

- ✓ The process is open and transparent;
- ✓ Provides valuable sources of information on key impacts, potential mitigation measures and possible alternatives;
- ✓ Ensures that a project meets the community's needs;
- ✓ Ensures that a project is legitimate and it is a way of ensuring that conflicts can be addressed before NEMA makes a decision;
- ✓ Assists in informed decision making;
- ✓ Promotes better implementation of projects once NEMA has made a decision; and
- ✓ Enlightens the community on the opportunities and benefits that could arise from a project;

To adhere to this principle, a public meeting ought to be organized at the or near the project site.

3.2.7. The Cultural and Social Principle

The Cultural and Social Principle is traditionally applied by many communities in Kenya for the management of the environment or natural resources in so far as the same are relevant and are not repugnant to justice and morality or inconsistent with any written law. Since time immemorial many communities have lived sustainably in various ecosystems in Kenya. It against this setup that existed where resources utilization though devoid of

sophisticated/ complicated technologies guaranteed health environment that the current development should borrow leave from. It is therefore important for the proponent to factor in local/ traditional environment management systems in the course of implementing the project.

3.2.8. Principle of International Co-Operation

The Principle of International Co-operation applies in the management of environmental resources shared by two or more states. Environmental impacts do not respect national or international boundaries and as such are trans-boundary. This principle ensures that international relations and understanding are upheld and therefore management of environmental concerns arising from a project/ action across two jurisdictions can be managed. However, the proposed project does not have far reaching cross boundary impacts.

3.3. Policy Framework

3.3.1. Environmental Policy Framework (2013)

The Kenya Government's Environmental Policy of 2013 is geared towards sound environmental management for sustainable development. This is envisaged in the principle of prudent use, which requires that the present day usage should not "compromise the needs of the future generations". This is applicable in the proposed project because resources will be drawn for use in the proposed project. The policy emphasis is on environmental protection in order to ensure sufficient supplies for the present and future generations. The policy envisages the use of the "polluter pays principle", where one is expected to make good any damage made to the environment. The Kenya Government's Environmental Policy aims at integrating environmental aspects into national development plans. The broad objectives of the National Environmental Policy include:

- ✓ Optimal use of natural land and water resources in improving the quality of human environment;
- ✓ Sustainable use of natural resources to meet the needs of the present generations while preserving their ability to meet the needs of future generations;
- ✓ Integration of environmental conservation and economic activities into the process of sustainable development; and
- ✓ Meet national goals and international obligations by conserving bio-diversity, arresting desertification, mitigating effects of disasters, protecting the ozone layer & maintaining an ecological balance on earth.

ESIA critically examines the effects of proposed project on the environment and identifies potential negative and positive impacts of any development activity or project, how it affects people, their property and the environment. ESIA also identifies measures to mitigate the negative impacts, while maximizing on the positive ones. It seeks to minimize adverse impacts on the environment and reduces risks. If a proper EIA is carried out, then the safety of the environment can be properly managed at all stages of a project-operation, monitoring and

evaluation as well as decommissioning. Impact assessment is required at the planning stage of a project or development activity. This helps the decision makers to factor in environment safeguards in project designs thereby avoiding possible negative impacts of the proposed project. EAs are undertaken annually after the commissioning of the project. EAs are to be undertaken regularly on projects including this one, to ensure that they operate within the set environmental principles.

The Environmental (Impact Assessment/Audit) Regulations, 2003 were issued in accordance with the provisions of EMCA of 2015. The Regulations must be administered, taking into cognizance provisions of EMCA, 2015 and other relevant national laws. The project proponent will need to observe the provisions of the various statutes that are aimed at maintaining a clean and healthy environment.

3.3.2. National Water Policy, 2000

The National Policy of Water which was promulgated in April 1999 as Sessional Paper No. 1 of 1999 calls for decentralization of operational activities from the central government to other sectors, including local authorities, the private sector and increased involvement of communities in order to improve efficiency in service delivery. It also tackles issues pertaining to water supply and sanitation facilities development, institutional framework and financing of the sector. According to the policy, in order to enable sustainable water supply and sanitation services, there is need to apply alternative management options that are participatory through enhanced involvement of others in the provision of these services but particularly the private sector. It is therefore important for the proponent to factor in sanitation facilities in the proposed project to avoid contamination of water resources.

The overall objective of the National Water Policy is to lay the foundation for the rational and efficient framework for meeting the water needs for national economic development, poverty alleviation, environmental protection and social well-being of the people through sustainable water resource development and management.

3.3.3. Land Policy of 2009

The Sessional Paper No. 3 of 2009 on National Land Policy was formulated to address the critical issues of land administration, access to land, land use planning and environmental degradation. It also addresses restitution of historical injustices, conflicts, unplanned proliferation of informal urban settlements and information management. It recognizes the need for security of tenure for all Kenyans. The overall objective of the National Land Policy is to secure rights over land and provide for sustainable growth, investment and the reduction of poverty in line with the Government's overall development objectives. Among others, the Policy provides the framework for the maintenance of a system of land administration and management that will provide efficient

and effective utilization of land and land-based resources.

The Policy designates all land in Kenya as public, community and private land. Most significantly, the Policy establishes a mechanism for securing the tenure of public land by placing all public land under the National Land Commission to hold and manage the land in trust for the people of Kenya. The Policy has provisions aimed at protecting forest reserves and water catchment areas through establishment of mechanisms for repossession of any public land acquired illegally or irregularly and establishment of an appropriate system for registering public institutional land. Through the Policy, the Government will ensure that all land is put into productive use on a sustainable basis by facilitating the implementation of key principles on land use, productivity targets and guidelines as well as conservation.

3.3.4. The National Poverty Eradication Plan, 1999

The NPEP had the objective of reducing the incidence of poverty in both rural and urban areas by 50 percent by the year 2015; as well as strengthening the capabilities of the poor and vulnerable groups to earn income. The proposed project will provide employment opportunities during implementation to casual workers and thereafter will offer employment to various service providers like property managers/ agents, water suppliers and eventually a reward to the proponent. This will go a long way in poverty alleviation.

3.3.5. The NEMA National Guidelines on Asbestos Handling and Disposal

NEMA under the direction of a special task force published guidelines for the safe disposal of asbestos in Kenya. This was necessitated by the need to safeguard human health from adverse impacts related to asbestos handling and disposal. Development of these guidelines fell under the Environmental Management and Co-ordination Act (EMCA, 1999) Waste Management Regulations of 2006. The guidelines spell out the role of NEMA in guiding Kenyans on safe handling, packaging, transportation and final disposal of asbestos. Basic facts on asbestos, its use, and impacts on human health and the environment are spelt out in this document. In developing these guidelines, local and international practical experiences (roofing in tea factories, hospitals, houses) and situations were considered. It is these guidelines, which were extensively consulted in preparing this particular ESIA Study Report *(for more information, see attached copy of the guidelines*)

3.4. Legal Framework

3.4.1. Environment Management and Coordination (Amendment) Act (2015)

EMCA is an Act of parliament to provide for the establishment of an appropriate legal and institutional framework for the management of the environment and for related matters. NEMA is a body established under the Act, and has the legal authority to exercise general supervision and co-ordination over all matters relating

to the environment, and is the principal arm of the government charged with the implementation of all policies relating to the environment.

Part II of EMCA states that every person is entitled to a clean and healthy environment and has the duty to safeguard the same. It is worth noting that the entitlement to a clean and healthy environment carries a collective duty. Hence, there is not only the entitlement to a clean and healthy environment, but also the duty to ensure that the environment is not degraded in order to facilitate one's own as well as other persons' enjoyment of the environment. All ESIAs reports are submitted to NEMA for review and necessary advice thereafter. The law is based upon the principle that everybody is entitled to a healthy and clean environment.

Discretionary approvals required: The Act requires that projects acquire approval before their commencement. NEMA approves and issues an environmental license after an Environmental Impact Assessment or a Study Report depending on whether the project assessment and report satisfies it. This is also in compliance with the requirements of EMCA Part VI section 58 (1) and (2) which states that:

> *"Notwithstanding any approval, permit or license granted under this Act or any other law in force in Kenya, any person, being a proponent of a project, shall, before financing, commencing, proceeding with, carrying out, executing or conducting or causing to be financed, commenced, proceeded with, carried out, executed or conducted by another person any undertaking specified in the Second Schedule to this Act, submit a Study Report to the authority in the prescribed form, giving the prescribed information and which shall be accompanied by the prescribed fee" The proponent of the project shall undertake or cause to be undertaken at his own expense an EIA/ESIA and prepare a report thereof where the Authority, being satisfied, after studying the report submitted under Subsection (1), that the intended project may or is likely to or will have a significant impact on the environment, so directs".*

3.4.2. EIA and EA Guidelines (2003)

The EIA and EA guidelines require that EIAs and EAs be conducted in accordance with the issues and general guidelines spelt out in the second and third schedules of the regulations. These include coverage of the issues on schedule 2 (ecological, social, landscape, land use and water considerations) and general guidelines on schedule 3 (impacts and their sources, project details, national legislation, mitigation measures, a management plan and environmental auditing schedules and procedures.

3.4.3. The Water Act, 2016

This is an Act of Parliament to provide for the regulation, management and development of water resources, water and sewerage services; and for other connected purposes. Section 21 (1) states that Water Regulatory Authority shall ensure that there is in place a national monitoring and geo referenced information system on water resources. Part 2 states that the Authority may require any person, within a reasonable time or on a regular basis, to provide it with specified information, documents, samples or materials in relation to the system

referred to in subsection (1). Section 36 of the Act stipulates that a permit is required for any of the following purposes:

a. any use of water from a water resource, except as provided by section 37;
b. the drainage of any swamp or other land;
c. the discharge of a pollutant into any water resource; and
d. any other purpose, to be carried out in or in relation to a water resource, which is prescribed by Regulations made under this Act to be a purpose for which a permit is required.

3.4.4. Water Resource Management Rules (2007)

In addition to the Water Act 2016, the main document outlining the regulations is the Water Resource Management Rules (2007). The rules set out the procedures for obtaining water use permits and conditions placed on permit holders.

3.4.5. Water Quality Regulations (2006)

The Water Quality Regulations (2006) are contained in the Kenya Gazette Supplement No. 68, Legal Notice No. 120. Of relevance to the proposed project and for the purpose of this Study Report is Part II Sections 4-5 as well as Part V Section24. Part II Section IV states that “Every person shall refrain from any act which directly or indirectly causes, or may cause immediate or subsequent water pollution”. Part IV Section 24 states that “No person shall discharge or apply any poison, toxic, noxious or obstructing matter, radioactive wastes, or other pollutants or permit any person to dump any such matter into water meant for fisheries, wildlife, recreational purposes or any other uses”.

3.4.6. Public Health Act Cap 242 (2012)

This Act provides the impetus for a healthy environment and gives regulations to waste management, pollution and human health. Public Health Act protects human health, prevent and guard against introduction of infectious diseases into Kenya from outside, to promote public health and the prevention, limitation or suppression of infectious, communicable or preventable diseases within Kenya, to advice and direct local authorities in regard to matters affecting the public health to promote or carry out researches and investigations in connection with the prevention or treatment of human diseases. This Act provides the impetus for a healthy environment and gives regulations to waste management, pollution and human health.

3.4.7. The Land Planning Act Cap 303 (1968)

The Land Planning Act Cap 303 of 1968 of the Laws of Kenya makes provision for planning the use and development of land. Sec 6 (1) of the subsidiary legislation provides that "a local authority may, after

consultation with, and with the agreement of the Minister, prepare and submit to the Minister for his approval an area plan, as the case may be, for that part of the area under its jurisdiction to which these regulations apply."

3.4.8. Physical Planning Act Cap 286 (2010)

This Act provides for the preparation and implementation of physical development plans for connected purposes. It establishes the responsibility for the physical planning at various levels of Government in order to remove uncertainty regarding the responsibility for regional planning. It provides for a hierarchy of plans in which guidelines are laid down for the future physical development of areas referred to in a specific plan. The ostensible intention is that the three-tier order plans, the national development plan, regional development plan, and the local physical development plan should concentrate on broad policy issues. The Act also promotes public participation in the preparation of plans and requires that in preparation of plans, proper consideration be given to the potential for economic development, socio-economic development needs of the population, the existing planning and future transport needs, the physical factors which may influence orderly development in general and urbanization in particular, and the possible influence of future development upon natural environment. The innovation in the Act is the requirement for EIA and EA. Any change of use of the actual development without authority constitutes an offence.

3.4.9. Land Control Act Cap 406 (2010)

This law provides for the control of transactions in agricultural land, especially the machinery of the Land Control Boards/Land Commission. However, it is of environmental interest that one of the points to consider in granting or refusal of consent by the Board is what impact the transaction is likely to have on the maintenance or improvement of standards of good husbandry within the specific agricultural area. Trust land is land held and administered by various local government authorities as trustees under the constitution of Kenya and the Trust Land Act (Cap. 288). National reserves and local sanctuaries as well as county council forest reserves, fall on trust land. Individuals may acquire leasehold interest for a specific number of years in trust land can (in theory) be posed by the local authorities should the need arise. Local authorities should retain regulatory powers over trust land.

Private land is land owned by private individuals under the Registered Land Act (Cap .300). On registration as the landowner, an individual acquires absolute ownership on a freehold basis. The use of private land may, however, be limited by provisions made in other legislation, such an Agriculture Act (Cap. 318).

3.4.10. County Government Act, 2012

The functions of County Governments in Kenya are enshrined in the Constitution. Article 6(1) divides the

territory of Kenya into the counties specified in the First Schedule. The governments at the national and county levels are distinct and inter-dependent. Yet, they conduct their mutual relations based on consultation and cooperation (Article 6:2). Devolution of power is also one of the national values and principles of governance under Article 10.

The functions of County Governments in Kenya under the Constitution are essential for devolution. Counties may perform other functions assigned through an Act of Parliament. The County Governments Act expounds on the functions of County Governments in Kenya. Section 5 of the County Governments Act tries to expound on Article 1(4) of the Constitution.

Section 5 of the County Governments Act (2012) classifies the functions of County Governments in Kenya. Article 186 makes clarifications on functions and powers of county governments. It shows where county functions are situated (Fourth Schedule) and explains about concurrent functions. It also designates any other function not assigned to the counties by the Constitution, or any other written law, as a national government function.

A concurrent function here means a function or power that the Constitution, or any other national legislation, confers on more than one level of government. It becomes a function or power within the concurrent jurisdiction of each of those levels of government. However, such functions are not properly defined, e.g. housing, planning, transport and disaster management. The Fourth Schedule of the Constitution contains the division of functions between the national and the county governments in Kenya. These functions are as follows.

- Agriculture, including crop and animal husbandry, livestock sale yards, county abattoirs (slaughterhouses), plant and animal disease control, and fisheries.
- County health services, including, in particular – county health facilities and pharmacies, ambulance services, promotion of primary health care, licensing and control of undertakings that sell food to the public, veterinary services (excluding regulation of the profession which is a national government function), cemeteries, funeral parlours and crematoria, and refuse removal, refuse dumps and solid waste disposal.
- Control of air pollution, noise pollution, other public nuisances, and outdoor advertising.
- Cultural activities, public entertainment and public amenities, including – betting, casinos and other forms of gambling, racing, liquor licensing, cinemas, video shows and hiring, libraries, museums, sports and cultural activities and facilities, and county parks, beaches and recreation facilities.
- County transport, including – County roads (Class D, E and Unclassified Roads), street lighting, traffic and parking, public road transport, and ferries and harbours (excluding the regulation of international and national shipping and matters related thereto).

- Animal control and welfare, including – licensing of dogs, and facilities for the accommodation, care, and burial of animals.
- Trade development and regulation, including – markets, trade licences (excluding regulation of professions), fair trading practices, local tourism, and cooperative societies.
- County planning and development, including – statistics, land survey and mapping, boundaries and fencing, housing, and electricity and gas reticulation and energy regulation.
- Education – only pre-primary education (ECD), village polytechnics, home craft centres and childcare facilities.
- Implementation of specific national government policies on natural resources and environmental conservation, including soil and water conservation, and forestry.
- County public works and services, including – storm water management systems in built-up areas, and water and sanitation services.
- Firefighting services and disaster management.
- Control of drugs and pornography.
- Ensuring and coordinating the participation of communities and locations in governance at the local level and assisting communities and locations to develop the administrative capacity for the effective exercise of the functions and powers and participation in governance at the local level.

Thus, the Fourth Schedule assigns fourteen functions to the county governments in Kenya to perform as listed above. Hence, the Proposed Sanitary Landfill project is under the County Government, thus the need of its approvals.

3.5. Laws Governing Environmental Health

The health of the environment is a broad issue that should apply to any activity occasioning environmental degradation. However, what we have in Kenya is construed rather narrowly to apply only to environmental problems, which affect the human body, but not including diseases. For brief analytical purposes, it is handled in the following subsections:

- ✓ Public Health
- ✓ The Working Environment
- ✓ Radiation Control
- ✓ The Management of Hazardous Wastes
- ✓ General Waste Management Regulations
- ✓ Liquid Waste Management
- ✓ Noise Pollution

3.5.1. Public Health

Under this section the review is confined to the provision of the Public Health Act (Cap 242 of 2012), the Traffic Act (Cap 403 of 2013), the County Government Act (2012), the Penal Code (Cap 63 of 1948) and the Factories Act (Cap. 514 of 1977, now the Occupational Safety and health Act-OSHA, 2007). Within the Public Health Act, the sections on housing and prevention of mosquitoes are directly pertinent. On sanitation, the Act borrows from the common law doctrine of nuisance, which makes it an offence for any landowner or occupier to allow nuisance or any other condition liable to be injurious or dangerous to health to prevail on his land. A medical health officer, once satisfied of the danger, may issue an order requiring the owner or occupier of the land to remove the nuisance. Fighting malaria is also a critical environmental task dealt under the Act. Part XII makes it an offence to leave on one's land or premises, any collection of water, sewage, rubbish, well, pool, gutter, channel cesspit, latrine, urinal or dump pit where mosquitoes may breed. Such a situation constitutes a nuisance. Any person who fails to clear such a nuisance is guilty of an offence under the Act.

Environmental health requirements are also provided for under the general powers and duties of the local authorities in the County Government Act (2012). Municipal Councils are required to provide and maintain sanitary services, sewage and drainage facilities, take measures for the control, destruction of rats, vermin, insects and pests, control or prohibit industries, factories and businesses which emit smoke, fumes, chemicals, gases, dust, smell, noise vibrations, discomfort or annoyance to the neighborhood, and to prohibit or control work or trade of disinfect ion or fumigation by cyanide or other means. The Penal Code (Cap 65 of 1948, Revised Edition of 2009) carries the offence of common nuisance identical to that in the Public Health Act. The offence under the Penal Code is a misdemeanor punishable by imprisonment for one year. This however is distinct from that in the Public Health Act which may require the offender to abate the offence. Air pollution is dealt with by the Traffic Act (Cap 403 of 2013) and the Factories (Amendment) Act of 1990. The Factories Act specifically prohibits factories from emitting any dust, fumes or impurities into the atmosphere without undergoing appropriate treatment to prevent air pollution or other ill effects to life and property. The amendment further prohibits the use of any stationary internal combustion engine, discharging exhaust gas into the atmosphere without treatment. The Traffic Act prohibits air pollution through Section 51 which requires that motor vehicle use proper fuels. The Rules promulgated under the Act provide that every vehicle be so constructed, painted and used so as not to emit any smoke, or visible vapor. Air pollution as a manifestation of nuisance is also prohibited under the Mining Act (Cap 306 of 2012). Section 26 requires that a holder of prospecting or mining license who causes a nuisance or damage to a landowner or lawful occupier to pay reasonable compensation for such nuisance or damage.

3.5.2. Radiation Control

Since 1982, Kenya decided to join in the global movement for the use of nuclear energy for peaceful purposes, a movement lead by the International Atomic Energy Agency (IAEA). Most of such uses are in the fields of medicine, agriculture, energy and environmental monitoring. The dangers of injury to the public prompted the adoption of the Radiation Protection Act (Cap 243 of 1984) Revised Edition of 2012, to provide according to its citation, protection of the public and radiation workers from the dangers arising from the use of devices or materials capable of producing ionizing radiation and for connected purpose. The Act prohibits the unauthorized manufacture, production, possession or use, sale, disposal, lease, loan or dealership, import, export of any irradiating device or radioactive material. All authorized buyers, sellers, users, of such device must be properly licensed.

3.5.3. Management of Hazardous Waste

In the foregoing section, we saw that radiation protection focuses largely on protection of human beings against injury by such wastes or radiations. The Public Health Act is also concerned with the protection of human health. Section 75 of the Constitution whose purpose is protection from the deprivation of property, empowers the government to acquire property "in circumstances where it is necessary to do so because that property is in a dangerous state or injurious to the health of human beings or animals or plants." This is the closest reference to the protection of the environment and its resources.

3.5.4. EMCA Waste Management Regulations (2006)

These Regulations apply to all categories of waste as is provided for. According to the regulations, no person should dispose off any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle. Any person whose activities generate waste shall collect, segregate and dispose or cause to be disposed off of such waste in the manner provided for under these Regulations. Any person whose activities generates waste has an obligation to ensure that such waste is transferred to a person who is licensed to transport and dispose of such waste in a designated waste disposal facility. Any person, whose activities generate waste, should segregate such waste by separating hazardous waste from non-hazardous waste and shall dispose of such wastes in such facility as is provided for by the relevant Local Authority. Any person who owns or controls a facility or premises which generates waste should minimize the waste generated by adopting the following cleaner production principles, namely:

- Improvement of production process through:
    i. Conserving raw materials and energy;
    ii. Eliminating the use of toxic raw materials within such time as may be prescribed by NEMA;
    iii. Reducing toxic emissions and wastes;

iv. Monitoring the product cycle from beginning to end by:
    a. Identifying and eliminating potential negative impacts of the product.
    b. Enabling the recovery and re-use of the product where possible.
    c. Reclamation and recycling.
v. Incorporating environmental concerns in the design, process and disposal of a product.

Every trade or industrial undertaking should install at its premises anti-pollution technology for the treatment of waste emanating from such trade or industrial undertaking. No owner or operator of a trade or industrial undertaking should discharge or dispose of any waste in any state into the environment, unless the waste has been treated in a treatment facility and in a manner prescribed by the Authority in consultation with the relevant lead agency. The proposed project implementers and management must observe this law strictly in the management of its solid wastes, waste water and sewage.

a. Standards for Liquid Waste

Table 3: The effluent generated from any facility should conform to the following limits

Parameters	**Permissible Limits**
pH	6.5-9.8.5
Suspended solids	100 mg/l
Oil and grease	Nil
BOD	30 mg/l
COD	50 mg/l
Bio-assay test	90% survival of fish after 96 hours in 100% effluent

3.5.5. EMCA Noise Regulations (2009)

The noise regulations in the country clearly state that any person who contravenes their provisions commits an offence. The provisions are as per the following table.

Table 4: First Schedule of the Regulation Provides for the Following Maximum Permissible Noise Levels

Zone			***Sound Level Limits dB(A)***		***Noise Rating Level (NR)***	
			(Length-14hours)		***(Length-14 hours)***	
			Day	Night	Day	Night
A.	Silent Zone		40	35	30	25
B	Places of worship		40	35	30	25
C.	Residential:	Indoor	45	35	35	25
			50	35	40	25
D.	Mixed residential (with commercial some and Places of entertainment)		55	35	50	25
E.	Commercial		60	35	55	25

Time Frame	
Day	6.01 a.m. – 8.00 p.m. (Length-14 hours)
Night:	8.01 p. m. – 6.00 a.m. (Length-10hours)

3.5.6. EMCA Air Quality Regulations, (2009)

These regulations offer guidance on air quality management Kenya. The contractor should adhere to set standards of air quality in these regulations. Special attention is drawn to the following Schedules:

- Schedule 1: Ambient Air Quality Tolerance Limits
- Schedule 2: Priority Air Pollutants
- Schedule 4: Guideline on Air Pollution Monitoring Parameters from Stationary Sources
- Schedule 5: General Guidelines
- Schedule 7: Acceptable Emission Control Systems
- Schedule 10: Record of Pollution Exposure Results.
- Schedule 11: Methods of Test and Measurement of Air Pollutants
- Schedule 12: Acceptable Mobile Emission Control Technologies.

3.5.7. The Occupational Safety and Health Act, (2007)

This is an Act of Parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. The Act was published in the Kenya Gazette Supplement No. 111 (Acts No.15). It received presidential assent on 22nd October, 2007 and became operational on 26th October, 2007. The key areas addressed by the Act include:

i. General duties including duties of occupiers, self-employed persons and employees;
ii. Enforcement of the Act including powers of an occupational safety and health officer;
iii. Registration of workplaces (hence the proponent needs to register the workplace of this project);
iv. Health General Provisions including cleanliness, ventilation, lighting and sanitary conveniences;
v. Machinery safety including safe handling of transmission machinery, hand held and portable power tools, self-acting machines, hoists and lifts, chains, ropes & lifting tackle, cranes and other lifting machines, steam boilers, air receivers, refrigeration plants and compressed air receiver;
vi. Safety General Provisions including safe storage and handling of dangerous liquids, fire safety, evacuation procedures, precautions with respect to explosives or inflammable dust or gas;
vii. Chemical safety including the use of material safety data sheets, control of air pollution, noise & vibration, handling, transportation &disposal of chemicals& other hazardous substances materials;
viii. Welfare general provisions including supply of drinking water, washing facilities, and first aid kits and Offences, penalties and legal proceedings.

Under Section 6 of this Act, every occupier is obliged to ensure safety, health and welfare of all persons in his

workplace. The occupier shall achieve this objective by preparing and as often as may be appropriate, revising a written statement of his general policy with respect to the safety and health at work of his employees and the organization and arrangements for the time being in force for carrying out that policy (Section 7). He is also required to establish a **safety and health committee** at the workplace in a situation where the number of employees **exceeds twenty** (section 9) and to cause a thorough safety and health audit of his workplace to be carried out at least once in every period of twelve months by a registered safety and health Advisor (Section 11). In addition, any accident, dangerous occurrence, or occupational poisoning which has occurred at the workplace needs to be reported to the occupational safety and health officer of the respective area by an employer or self-employed person (section 21). According to section 44, potential occupiers or users of any premises as work places are required to apply for registration to the Director for all premises intended for use as workplaces. Such places shall be maintained in a clean state during the operation phase (section 47).

To ensure machinery safety, every hoist or lift – section 63 and/or all chains, ropes and lifting tackles – section 64 (1d), shall be thoroughly examined at least once in every period of six months by a person approved by the Director of Occupational Safety and health Services. Similarly, every steam boiler - section 67 (8) and/or steam receiver - section 68 (4) and all their fittings and/or attachments shall be thoroughly examined by an approved person at least once in every period of twelve months whereas every air receiver shall be thoroughly cleaned and examined at least once in every period of twenty-four months or after any extensive repairs - section 69 (5). According to section 71 (3), every refrigeration plant capable of being entered by an employee also needs to be examined, tested and certified at least once in every period of twelve months by an approved person. In relation to fire safety, section 78 (3) requires spillage or leaks of any flammable liquid to be contained or immediately drained off to a suitable container or to a safe place, or otherwise treated to make it safe. Furthermore, a clear and bold notice indicating that smoking is prohibited should be conspicuously displayed in any place in which explosive, highly flammable or highly combustible substances, are manufactured, used, handled or stored- section 78 (5). In addition, necessary precautions for dealing with fire incidents should be implemented including provision of means for extinguishing fire and means for escape, in case of fire, for the persons employed in any workplace or workroom – section 81. As far as disaster preparedness and emergency response program is concerned, section 82 (1) makes it a mandatory requirement for every occupier of a workplace to design evacuation procedures to be used during any emergency situation and to have them tested at regular intervals.

To promote safety and health of employees who are at risk of being exposed to chemical substances, section 84 (3) and 85 (4) requires every employer to maintain at the workplace material safety data sheets and chemical safety data sheets respectively for all chemicals and other hazardous substances in use and ensure

that they are easily available to the employees. The employers' positive contribution towards the welfare of the employees include provision and maintenance of adequate supply of wholesome drinking water - section 91 and a first aid box or cupboard of the prescribed standard – section 95 at suitable point (s) conveniently accessible to all employees. Other precautionary measures include: issuance of a permit to work to any employee, likely to be exposed to hazardous work processes or hazardous working environment, including such work processes as the maintenance and repair of boilers, dock work, confined spaces, and the maintenance of machinery and equipment, electrical energy installations, indicating the necessary precautions to be taken – section 96 (1); provision and maintenance for the use of employees, adequate, effective and suitable protective clothing including suitable gloves, footwear, goggle and head coverings in any workplace where employees are likely to be exposed to wet, injurious or offensive substance – section 101 (1).

Table 5: Provisions under the Occupational Safety and Health Act, 2007

Section	Provisions
Section 55	All plant, machinery and equipment whether fixed or mobile for use either at the workplace or as a workplace, shall only be used for work which they are designed for and be operated by a competent person.
Section 56	■ Every flywheel directly connected to any prime mover and every moving part of any prime mover, except prime mover referred to in subsection (3), ■ shall be securely fenced, whether the flywheel or prime mover is situated in an engine-house or not. ■ Every part of an electric generator, motor and rotary converter, and every flywheel directly connected thereto shall be securely fenced.
Section 63	■ Every hoist or lift shall be of good mechanical construction, sound material and adequate strength, free from patent defect and be properly maintained. ■ Every hoist or lift shall be thoroughly examined at least once in every period of six months or after any modifications or extensive repairs or within a shorter period, by a person approved for the purposes of this section by the Director by certificate in writing, and a report of the result of every such examinations, in the prescribed form and containing the prescribed particulars, shall be signed by the person carrying out examination and shall be entered in or attached to the general register within fourteen days of the examination. ■ There shall be marked conspicuously on every hoist or lift the maximum working load which it can safely carry and no load greater than load shall be carried on any hoist or lift.

a) Safety –General Provisions

Part VIII of the Occupational Safety &Health Act, 2007 describes safety general provisions. Section 74 (1) provides for storage. It states that "all goods, articles &substances stored in a workplace shall be stored or stacked:

- ✓ In such a manner as will ensure their stability and prevent any fall or collapse of the stack;
- ✓ In such manner as not to interfere with the adequate distribution of the natural or artificial light, the natural ventilation systems, the proper operation of machines or other equipment, the unobstructed use of passageways, gangways or traffic lanes, and the efficient functioning of sprinkler systems, the unobstructed access to other fire extinguishing equipments within the workplace; and
- ✓ On firm foundations not liable to overload any floor.

Section 76 (2) states that "Every employer shall take necessary steps to ensure that workstations, equipment and work tasks are adapted to fit the employee and the employee's ability including protection against mental strain". According to Section 76 (3) 'Every manufacturer, importer and supplier or an agent of a manufacturer, importer and supplier of the machinery and equipment referred to in paragraph (1) shall ensure that the equipment complies with the safety and health standards prescribed under this Act and shall provide adequate and appropriate information including hazard warning signs".

Section 76 (4) further states that "An employer shall not require or permit any of his employees to engage in the manual handling or transportation of a load which by reason of its weight is likely to cause the employee to suffer bodily injury". Other provisions covered under this Safety – general provisions include:

- ✓ Section 77: Safe means of access and safe place of employment;
- ✓ Section 78: Fire Prevention;
- ✓ Section 79: Precautions in places where dangerous fumes are likely to be present;
- ✓ Section 81: Safety provisions in case of fire; and
- ✓ Section 82: Evacuation procedures.

Part IX of the Occupational Safety and Health Act, 2007 also provides for Chemical Safety, Part X provides for Welfare – General Provisions, Part XI Health, Safety and Welfare Special Provisions and Part XII special applications.

3.5.8. Employment Act (2007)

a) General Principal

The Act constitutes minimum terms and conditions of employment of an employee and any agreement to relinquish vary or amend the terms set shall be null and void. The Act stipulates that no person shall use or assist any other person, in using forced labour. Clause 5 of the Act states that its shall be the duty of the Minister, Labour officer, the National Labour Court and the subordinate labour courts to; Promote equality of opportunity in employment in order to eliminate discrimination in employment Promote and guarantee equality of opportunity for a person who, is a migrant worker or a member of the family of the migrant worker lawfully within Kenya. No employer shall discriminate directly or indirectly, against an employee or prospective employee or harass an employee or prospective employee on the following grounds; race, colour, sex, language, religion, political or other opinion, nationality, ethnic or social origin, disability, pregnancy, mental status or HIV status. An employer shall pay his employees equal remuneration for work of equal value.

b) Part IV Rights and Duties of Employment

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

c) Maternity Leave

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

d) Section 37 (Conversion of Casual Employment to Term Contract)

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

3.5.9. Work Injuries Benefits Act (2007)

a) Obligations of Employers

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

b) Registration of Employer

Every employer carrying on business in Kenya shall within the prescribed period and in the prescribed manner register with the Director of Occupational Safety and health Services and any other information as the Director may require. Subsection 4 of section 8 of the Act states that where an employer carries on

business in more than one workplace, or carries on more than one class of business, the Director may require the employer to register separately in respect of each place or class of business.

c) Employer to Keep Record (Section 9)

Section 9 states that an employer shall keep a register or other record of the earnings and other prescribed particulars of all employees and produce the same on demand by the director for inspection. Such records shall be retained for at least six years after the date of last entry. Thus all records in relation to the operation of the facility shall be well kept and maintained.

d) Right to Compensation

An employee who is involved in an accident resulting in the employee's disablement or death is subject to the provisions of this Act, and entitled to the benefits provided for under the Act. Subsection 3 of section 10 of the Act however states that no employee shall be entitled to compensation if an accident, not resulting in serious disablement or death, is caused by the deliberate and willful misconduct of the employee.

Section 12 of the act stipulates if an employee is injured in an occupational accident or contracts an occupational disease while the employee, with the consent of the employer, is engaged in any organized first aid, ambulance or rescue work, or firefighting or other emergency services, the accident or disease is for the purpose of this Act, deemed to have arisen out of an in the course of the employee's employment.

e) Reporting of Accidents

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

f) Lapse of Right to Benefits

A right to benefits in accordance with this Act shall lapse if the accident is not reported to the employer within twelve months after the date of such accident. However, it shall not be barred to compensation if it is proved that the employer had knowledge of the accident from any other source. Section 30 of the Act states that compensation for permanent disablement shall be calculated on the basis of ninety-six months earnings subject to the minimum and maximum amounts determined by the minister after consultation with the board. In case of a fatal accident compensation shall be paid to the dependants of the employee in accordance with the set provisions in the third schedule. The employer shall further be liable to pay reasonable expenses for the funeral of the deceased employee subject to the maximum amount determined by the minister, after

consultation with the National Council for Occupational Safety and health. The First Schedule of the Act gives the minimum degree of disablement for various body parts while the second Schedule gives a list of work description and the associated occupational disease.

3.6. International Conventions and Treaties

A treaty is a binding agreement under International Law concluded by subjects of International Law, namely states and international organizations. Treaties can be called by many names including; International Agreements, Protocols, Covenants, Conventions, Exchanges of Letters, Exchanges of Notes, etc. However, all of these are equally treaties and the rules are the same regardless of what the treaty is called. Treaties can be loosely compared to contracts; both are means of willing parties assuming obligations among themselves, and a party to either that fails to live up to their obligations can be held legally liable for that breach. The central principle of treaty law is expressed in the maxim *pacta sunt servanda*, translated as "pacts must be respected." Kenya has ratified the following international conventions:

3.6.1. United Nations Framework Convention on Climate Change

The Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. The Convention enjoys near universal membership, with 191 countries having ratified. Under the Convention, governments:

- Gather & share information on greenhouse gas emissions, national policies and best practices;
- launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries;
- Cooperate in preparing for adaptation to the impacts of climate change.

The Convention entered into force on 21 March 1994. The landmark United Nations Framework Convention on Climate Change (UNFCCC) was opened for signature at the 1992 United Nations Conference on Environment and Development (UNCED) Conference in Rio de Janeiro (known by its popular title, the Earth Summit). On June 12, 1992, 154 nations signed the UNFCCC that upon ratification committed signatories' governments to a voluntary "non-binding aim" to reduce atmospheric concentrations of greenhouse gases with the goal of "preventing dangerous anthropogenic interference with Earth's climate system." These actions were aimed primarily at industrialized countries, with the intention of stabilizing their emissions of greenhouse gases at 1990 levels by the year 2000; and other responsibilities would be incumbent upon all UNFCCC parties. The parties agreed in general that they would recognize "common but differentiated responsibilities," with greater

responsibility for reducing greenhouse gas emissions in the near term on the part of developed/ industrialized countries, which were listed and identified in Annex I of the UNFCCC and thereafter referred to as "Annex I" countries. Kenya signed the UNFCCC on 12th July 1992, ratified it on 30th August 1994 and started enforcing it on 28th November 1994.

3.6.2. Kyoto Protocol

According to a press release from the United Nations Environment Programme: "The Kyoto Protocol is an agreement under which industrialized countries will reduce their collective emissions of greenhouse gases by 5.2% compared to the year 1990 (but note that, compared to the emissions levels that would be expected by 2010 without the Protocol, this target represents a 29% cut). The goal is to lower overall emissions of six greenhouse gases - carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, HFCs, and PFCs - calculated as an average over the five-year period of 2008-12."(*http://en.wikipedia.org/wiki/kyoto_protocol*) It is an agreement negotiated as an amendment to the UNFCCC, which was adopted at the Earth Summit in Rio de Janeiro in 1992. All parties to the UNFCCC can sign or ratify the Kyoto Protocol, while non-parties to the UNFCCC cannot. The Kyoto Protocol was adopted at the third session of the Conference of Parties (COP) to the UNFCCC in 1997 in Kyoto, Japan. Kenya's accession was presented on 25th February 2005 and the Protocol acceded on 26th May 2005.

Table 6: Other Treaties to Which Kenya Is a Party

Convention/ Agreement/ Treaty/ Protocol	Ratification Date
Convention on Biological Diversity (CBD)	July 26, 1994
United Nations Convention to Combat Desertification	June 24,1997
United Nations Framework Convention on Climate Change (UNFCCC)	Aug 30, 1994
Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar)	June 5, 1990
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Dec. 13, 1978
Protocol on Bio-safety (Cartagena Protocol)	Jan. 24, 2002
Regional Convention/Agreement on the Organization for Indian Ocean Marine Affairs (IOMAC)	Sep. 7, 1999
Convention for the Establishment of the Lake Victoria Fisheries Organization	May 24, 1996
Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region	May 30, 1996

3.7. World Bank Safeguard Policies Triggered by the Project

The WB's environmental and social safeguard policies are a cornerstone of its support to sustainable poverty reduction. The objective of these policies is to prevent and mitigate undue harm to people and their environment in the development process. These policies provide guidelines for Bank and borrower staffs in the identification, preparation, and implementation of programs and projects. The Safeguard policies also provide a platform for the participation of stakeholders in project design and have been an important instrument for building a sense of ownership among local populations. In essence, the safeguards ensure that environmental and social issues

are evaluated in decision making, help reduce and manage the risks associated with a project or program, and provide a mechanism for consultation and disclosure of information. The WB has 10 key operational policies although for the project under study only 2 policies were triggered that is OP/BP 4.01 on Environmental assessments and OP/BP 4.10 on Indigenous People.

3.7.1. Environmental Assessment Operational Policy OP 4.01

Environmental Assessment is used in the WB to identify, avoid, and mitigate the potential and actual negative environmental impacts associated with Bank lending operations. In WB operations, the purpose of Environmental Assessment is to improve decision making, to ensure that project options under consideration are sound and sustainable, and that potentially affected people have been properly consulted. It helps ensure the environmental and social soundness and sustainability of investment projects as well as support integration of environmental and social aspects of projects in the decision-making process. Having assigned the proposed project environmental category B, its implementation triggered the Environmental Assessment Operational Policy OP 4.01. This means that before implementation, the project should be subjected to an ESIA. The ESIA is meant to ensure that there is due diligence in the application of safeguards during implementation of the proposed project and to plan for mitigating and/or addressing of any potential and actual adverse risks during the operational phase of the sanitary landfill project. As per the ESIA, the Sanitary Landfill has minimal negative impacts to the environment and people, which can be mitigated successfully as **it is categorized under category B under WB Categorization criteria**. But to be noted is that the project proponent is adhering to this OP by subjecting the project to ESIA, disclosure will be done in due course, that review will be done as per the provisions of EMCA (Amendment) 2015 and that the proponent will implement the ESMP as contained in this ESIA report and as advised by NEMA.

3.7.2. OP/BP 4.10 (Indigenous Peoples)

This policy contributes to the Bank's mission of poverty and sustainable development by ensuring that the development process fully respects the dignity, human rights, economies and cultures of indigenous peoples. For all proposed projects, the Bank requires the project proponent to engage in a process of free, prior, and informed consultation. The broad support of the project by the affected Indigenous Peoples projects includes;

(i) Preventive measures to adverse effects to the indigenous cultures and practices
(ii) Avoiding potential and actual adverse effects on the Indigenous Peoples' communities
(iii) When avoidance is not feasible, minimize, mitigate, or compensate for such effects.

Projects should also be designed to ensure that the Indigenous peoples receive social and economic benefits that are culturally appropriate and gender and inter-generationally inclusive. The objective of this policy is to

design and implement projects in a way that fosters full respect for Indigenous Peoples' dignity human rights and cultural uniqueness and so that they receive culturally compatible social and economic benefits and do not suffer adverse effects during the development process. Via consultation of key stakeholders and government agencies, it was established that the project implementation will lead to creation of various job opportunities to the locals while not forgetting that it will lead to improved safety and security in the area as well as make better use of the decommissioned quarry pit.

3.7.3. World Bank's Environmental, Safety and health Guidelines

Under its "General EHS Guidelines (April 30, 2007)", the WB has several guidelines that include the EHS Guidelines - Air Emissions and Ambient Air Quality; EHS Guidelines - Waste Management; EHS Guidelines - Health Care Facilities; EHS Guidelines - Hazardous Materials Management and EHS Guidelines - Construction and Decommissioning. The WB EHS "Air Emissions and Ambient Air Quality" guidelines require projects with "significant" sources of air emissions, and potential for significant impacts to ambient air quality to prevent or minimize impacts by ensuring that emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards (or in their absence, the current WHO Air Quality Guidelines, or other internationally recognized sources). Kenya currently has National Air Quality Standards (2014) applicable to this project. But to be noted is that, the proposed project is a "no significant of air pollution" source since it does not have the capacity to generate high levels of air pollutants if well maintained and properly managed as per the operation procedures given in this report.

The WB EHS "Waste Management" guidelines apply to both non-hazardous and hazardous waste. They advocate for waste management planning where waste should be characterized according to: composition, source, types, and generation rates. This is essential for the proponent in relation to operation of the project since there is a need to segregate the different categories of waste generated probably at the source. These guidelines call for implementation of a waste management hierarchy that comprises prevention, recycling/reuse; treatment and disposal. The guidelines require segregation of conventional waste from hazardous waste streams and if generation of hazardous waste cannot be prevented (note that the project is intended to handle hazardous waste); its management should focus on prevention of harm to health, safety and environment. The Guidelines recommend monitoring to include:

i) Regular visual inspection of all waste (asbestos/ACM) handling, storage, collection and storage areas for evidence of accidental releases & to verify that wastes are properly labelled and stored.
ii) Regular audits of waste segregation and collection practices (if any).
iii) Tracking of waste transportation trends by type and amount.
iv) Keeping manifests or other records that document the amount of waste delivered and its source.

3.8. Institutional and Administrative Framework

There are several organizations involved in water resource and environment management in the country. These organizations include the Ministry of Water and Irrigation, Ministry of Environment and Natural Resources, National Environment and Management Authority, Water Resources Management Authority and the Local Authorities etc. The overall entity involved in environmental management in Kenya is the NEMA which has been founded and mandated under EMCA.

3.8.1. National Environment Management Authority

The objective and purpose for which NEMA was established is to exercise general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of the government in the implementation of all policies relating to the environment. EMCA, CAP 387 (Amended 2015). National Environment Council is the most top organ that is charged with the following:

i. Policy formulation and direction;
ii. Setting national goals and objectives and determining policies and priorities for the protection of the environment;
iii. Promotion of cooperation among public departments, local authorities, the private sector, nongovernmental organizations & such other organizations engaged in environmental protection programs, and;
iv. Performing any such other functions as are assigned by the EMCA CAP 387 (Amended 2015).

Besides, EMCA CAP 387 provides for the establishment and enforcement of environmental quality standards to be set by the technical committee of NEMA known as the Standards and Enforcement Review Committee (SERC).

3.8.2. Directorate of Occupational Safety and Health Services

The directorate has the responsibility of ensuring that occupational safety and health standards are observed in all places of work. The directorate enforces all provisions in the Occupational Safety and health Act, 2007.

3.8.3. County Government

The county governments have critical roles to play to ensure that all development projects within respective jurisdictions are compliant to all the necessary standards for purposes of sustainable development. The proponent has to liaise with county government of Kiambu to ensure that all the necessary compliance requirements are achieved. It is worth noting that the proponent has already approached the department of Public Health for their professional opinion with regards to the proposed project.

3.8.4. The National Construction Authority (NCA)

NCA is charged with issuing licences/ permits for construction sites and offering advisory to the government with regards to building and construction industry in Kenya. NCA is responsible for undertaking research and developing standards in building and construction industry. The proponent has a responsibility of ensuring that the project site is registered with NCA and the contractor is NCA compliant.

3.9. The Constitution of Kenya, 2010

Kenya has been touted as the 'Land of Splendor', with a rich historical background, great diversity of physical features, pleasant climate, diverse people, and magnificent wilderness areas.[1] More recently, it has been

1 Ministry of Environment and Natural Resources, *Kenya: Land of Splendour* 1 (Nairobi: Ministry of Environment and Natural Resources, 2000).

praised as a model for environmental progress in the region following enactment of the new constitution which contains specific measures for environmental management.[2] Any constitution functions to guarantee basic human rights and to provide guiding principles for the country, and by entrenching environmental rights and principles in the constitution, Kenya signals unwavering environmental commitment.

3.9.1. Rationale for Environmental Provisions within the Constitution

The provision for legal and institutional mechanisms is one of the basic conceptual tools for environmental management.[3] Further, considering that the environment supports life, it requires protection that is stable and can only be changed, if necessary, by a special and substantial majority. These Constitutional provisions for environmental management are not new, and already exist in other countries.[4] Environmental provisions were outlined, albeit superficially, in the previous constitution of Kenya. The current constitution's innovation is the presentation, in greater detail, of obligations in respect of specific natural resources, as well as the human aspects of environmental management. Environmental provisions are included in Chapter Four, under 'Rights and Fundamental Freedoms', Chapter Five, under 'Environment and Natural Resources', and Chapter Ten, under 'Judicial Authority and Legal System'. The Fourth Schedule also includes environmental provisions under 'Distribution of functions between National and County Governments' and the Fifth Schedule titled 'Legislation to be enacted by Parliament'.

3.10. Licenses and Permits

The project proponent should demonstrate compliance to the legislations through acquisition of the appropriate licenses and permits. Furthermore, all contractors and consultants who are ever engaged in the planning, operation and maintenance of the project should demonstrate compliance to the necessary pieces of legislation. These includes: NEMA registration certificates and licenses and Registration to National Construction Authority (NCA) among others.

3.11. Compliance with Environmental Management Provisions

An analysis of the various environmental laws in Kenya shows that, at disposal to the project proponent are clear laws providing guidance on the best way to manage the environment and its resources. By not adhering to any cannot be an excuse of causing environmental degradation. Remember, ignorance is no defense in a court of law. Hence, the proponent is advised to acquaint himself with the provisions of all laws that may touch on the project's implementation and operations.

2 J. Walljasper, Looking South for Environmental Progress, available at http://onthecommons.org/looking-southenvironmental-progress
3 C. O. Okidi, *Environmental Rights and Duties in the Context of Management of Natural Resources* (Nairobi: Constitution of Kenya Review Commission, 2003).
4 Ibid

4. KEY STAKEHOLDER CONSULTATION AND PUBLIC PARTICIPATION

4.1. Introduction

This section highlights the outcome from public participation and consultation exercises undertaken within the project influence area. Key Stakeholder and Public participation is geared towards informed decision making by all stakeholders involved in a project thereby promoting sustainability. The Legal Notice No. 101, the Environmental (Impact Assessment and Audit) Regulations, 2003 (as revised in 2016) requires that the views of persons who may be affected by the project be sought during the process of conducting an ESIA. This is achieved through a number of mechanisms, including the administering of questionnaires as well as well as holding public hearings/workshops. Public participation is a key component of an ESIA and is used to integrate citizens into the environmental decision-making process. Traditional decision-making approaches such as closed-door discussions between politicians and experts are no longer appropriate (Barrington et al., 2003). Public participation, if it is to be democratic, must foster trusting relationships through open and honest negotiations between proponents and the public (Barrington et al., 2003).

4.2. Summary of Public Consultations Findings

As per the feedback from key government departments including the Public Health Department of Kiambu County and Water Resources Authority, there is no objection to the project set up and that it is a timely project in the area and in Kenya as a whole. *(For more information, see attached reports and letters from key government agencies and minutes of a stakeholders meeting held in the project area).*

5. ANALYSIS OF PROJECT ALTERNATIVES

5.1. Introduction

This section analysis the possible project alternatives from various facets applicable to the proposed project. The major aspects that will be considered for alternatives are; project site, technology scale and waste management strategies. Alternatives should be economically feasible with minimal adverse environmental impacts and time delays. Diverse alternatives to the proposed action must be included in the ESIA. Alternatives may include both design and location options (Steinneman, 2000).

In most cases, the ESIA process often occurs too late in decision-making to consider a full range of alternatives. This can undermine ESIA goals to encourage more environmentally sound and publicly acceptable solutions. Allowing new alternatives and objectives to evolve in relation to environmental conditions, public preferences and project sustainability may be a solution to most of the environmental and socio-economic problems associated with the implementation of new projects (Anderson et al., 2003).

5.2. The Alternatives

5.2.1. Relocation Option

Relocating the proposed project to an alternative site is not a viable option. This is because the proposed site was arrived at as a result of hydrogeological survey undertaken and considering the location of the site in relation to the nearest human settlement not forgetting the said site can only be utilised as a landfill though not necessarily a sanitary one. The asbestos management guideline by NEMA stipulates that the site for asbestos disposal site should be far from human habitation such as the one in question. Other factors like surface drainage and topography of the project site and the project influence area (PIA) have been assessed and found suitable for the proposed project.

5.2.2. Zero or No Project Alternative

The No Project option in respect to the proposed project implies that the status quo is maintained. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. This option will however lead to challenges experienced in sound disposal of asbestos and ACM thereby compounding the impacts associated with poor disposal of asbestos and ACM. The **No Project Option** is the least preferred from the public health, socio-economic and environmental perspectives due to the following factors:

- Asbestos is carcinogenic and the negative impacts associated with asbestos may continue affecting human and animal health;
- The social-economic burden of dealing with health impacts associated with asbestos in terms of medical costs is unbearable;
- Landfilling is the globally acceptable method of disposing asbestos and as such the **No Project Alternative** will challenge the capacity of the nation to dispose asbestos and ACM in a sound manner.

From the analysis above, it becomes apparent that the **No Project** alternative is no alternative to the proponent.

5.2.3. Design Considerations versus Cost Estimates

a) Sustainability and Affordability

Sustainability of the proposed asbestos landfill would have a bearing on the environment in the PIA. This is because the operations of the landfill might affect the local environment positively or negatively; the proponent is expected to operate the landfill in line with the set guidelines by NEMA and internationally acceptable standards. This will be assured by developing standard operating procedures (SOPs) for the landfill that will ensure that the landfill is sustainable. Sustainability would mean the ability of the landfill to continuously serve the proponent without adverse impacts within the project influence area. This would call for designs that would ensure that the cost of operating the landfill is cost effective and does not impact negatively on the environment. Subsequently, this translates to affordability of the proposed project. Sustainability would also translate to the longevity of the asbestos landfill *vis a vis* intended use(s). Affordability is greatly determined at the design stage. Asbestos landfill design will employ simple technology that lowers the cost of constructing the landfill based on the prevailing geographical formation.

b) Analysis of Alternative Construction Materials and Technology

The proposed project will be constructed using environmentally accepted and materials compliant to engineering standards but locally available to achieve public health, safety, security and environmental aesthetic requirements.

c) Construction Technology

Construction of the landfill will involve the use of reinforced walls to make the pit lining and columns for the perimeter fence.

d) Construction Equipment

Equipment that saves energy and water will be given first priority without compromising on cost or availability factors. As noted on the previous section, the project will entail use of locally available materials like sand, cement and ballast or similar approved materials that would not have adverse impacts on the environment. The technology to be used is environmentally friendly.

5.2.4. Solid Waste Management Alternatives

The project might not generate a lot of wastes other than excess excavated top soil/spoil that the proponent would use for landscaping purposes. An integrated solid waste management system is recommendable. First, the proponent will give priority to reduction at source of the materials. This option will demand a solid waste management awareness programme in the management and the staff involved in implementing the project. Recycling and reuse options of the waste will be the second alternative in priority. This will call for a source separation programme to be put in place. Asbestos laden wastes shall be disposed on the landfill because this is the most appropriate method of disposing asbestos containing materials.

6. POTENTIAL IMPACTS IDENTIFICATION AND MITIGATION MEASURES

6.1. Introduction

There are several potential impacts associated with the activities that will be undertaken during implementation and operation of the proposed sanitary landfill. The potential impacts are classified into temporary/ transient and permanent impacts depending on the influence period of the impact. The potential impacts are also examined under two categories i.e. negative and positive environmental and social impacts. T

he various impacts in these two categories are then examined in order of their level of importance and significance. They are also examined in categories of their time of occurrence (pre-construction/design, construction, operational or decommissioning phase).

6.2. Impact Identification Checklists

The checklists below were used to identify possible impacts from the project development and the matrix to determine the significance of each identified impacts.

Table 7: Checklist Identifying Potential Impacts from the Project

Potential Impacts Likely to be Generated	Project Stage			
	Design	Construction	Operation	Decommissioning
Water quality (ground and surface)	√	√	√	√
Hydrology/ drainage	√		√	√
Air quality	√	√	√	√
Noise		√	√	√
Climate	-	-	-	-
Topology	√	√	√	√
Soil and geology	√	√	√	√
Bio-diversity (Flora and Fauna)	√	√	√	√
Pollution	√	√	√	√
Social economics	√	√	√	√
Safety and health	√	√	√	√
Waste Generation	√	√	√	√
Others	√	√	√	√

6.3. Impact Significance Matrix

The weightings of significance within the table below range from 0-3 (denoted by number of stars) whereby "0" represents no significance; "1 star" represents low significance; "2 stars" means there will be some significant effect and "3 stars" represent high environmental significance.

It also conveys the negative impacts of the project activities against identified environmental attributes.

Table 8: Matrix showing significance of impact identified

Environmental Parameters	Potential Negative impacts				Cumulative Impacts			
	Design	Construction	Operation	Decommissioning	Past	Present	Future	cumulative
Flora		XXX	X	X	o	o	o	o
Fauna		XXX	XX	XXX	o	o	o	o
Soil	X	XXX	XX	XXX		o		
Air		XXX	X	XX		o		
Population	X	XX	XXX	XX		o	+	+
Micro- climate		X	X	X	o	o	o	o
Microorganisms		XX	XX	XX		o	+	+
Water availability	X	XX	XX	XXX			+	+
Economy	X	XXX	XXX	XX	+	+	+	+

Key: *X-Not significant; XX-low significance; XXX-significant; XXXX-highly significant and +Beneficial and o- occurrence*

6.4. Environment and Social-Economic Impacts Magnitude

Based upon the predictions of impacts identified and assessed with the help of the checklist developed for the proposed project, environmental scenario without the project was juxtaposed with that of the project and the results were reported in table below:

Table 9: Matrix Showing Magnitude of Assessed Impacts

	Environment Impact Units				
	Parameter	**Without project**	**With project**	**Net change**	**Magnitude**
1.	Crops	Nil	Nil	Nil	Zero
2.	Natural vegetation	Nil	Negative	Small	Low
3.	Shrubs	Nil	Negative	Small	Low
4.	Land use	Nil	Positive	high	High
5.	Wildlife (Insects)	Nil	Negative	Small	Low
	Aquatic animals	Nil	Nil	Nil	Nil
6.	Species diversity	Nil	Negative	Small	Low
7.	Water pollution	Nil	Positive	Big	High
8.	Air pollution	Nil	Positive	Big	High
9.	Noise pollution	Nil	Negative	Small	Low
10	Solid waste	Nil	Negative	Small	Low
11	Land Pollution	Nil	Positive	Big	High
12	Soil erosion	Nil	Negative	Small	Low
13	Eutrophication	Nil	Nil	Nil	Zero
14	Health	Nil	Positive	Big	High
15	Benefit to Economy	Nil	Positive	Big	High
16	Displacement/encroachment of private land	Nil	Nil	Nil	Zero

6.5. Potential Impacts During Planning and Design Phase

6.5.1. Potential Positive Impacts During Planning and Design Phase

a) Employment opportunities

With the planning and design phase of the proposed project, there will be employment opportunities especially for professionals. Those involved in planning and design include engineers, surveyors, environmentalists,

hydrogeologists and sociologists among others. Those employed will improve their living standards from the fees they will be paid for their services.

b) Creation of Awareness

During the planning and design phase of the proposed project, a lot of awareness shall be done through consultations on different aspects of the project. Awareness improves civility in project planning, implementation and operations. This is a sure formula for ensuring there is sustainability of the project.

6.5.2. Potential Negative Impacts During Planning and Design Phase

The project designers and consultants mobilized a team of skilled and unskilled human resource to undertake the surveys and other studies required for the designs. These studies shall however not allow for large scale destruction and disturbance of vegetation and soils. Mobilization of the skilled and non-skilled labour and the process of public consultations with stakeholders however lead to heightened expectations and speculations. With the foregoing, it is envisaged that there will be minimal to no negative impacts during the planning and design stage.

i. Proposed Mitigation Measures:

Impacts during this phase of the project are not significant. However, the Design Team shall take necessary measures to document any concerns and address them on as they occur. In that regard, the Design Team shall incorporate an Environmental Expert in the team and take time to sensitize and alert those within the project influence area.

6.6. Potential Impacts during Implementation/Construction Phase

6.6.1. Potential Positive Impacts during Construction Phase

a) Creation of a Market for Construction materials

The Project will require materials, most of which will be sourced locally. These include sand, cement, ballast, hard-core, lining materials, steel bars/ rods. This will provide a ready market for suppliers in and outside the project area.

b) Creation of Employment Opportunities

The construction works will require several human resources from machine operators to other skilled and unskilled labourers. Machine operators will be engaged for the any excavation works, site clearance, compaction works and backfilling. Several workers including casual labourers, plumbers and engineers are expected to work on the site for a period of time. Semi-skilled, unskilled and formal employees are expected to obtain gainful employment during the period of construction. With labour intensive construction technologies, the project will provide employment for youths.

6.6.2. Potential Negative Impacts during Project Implementation (Construction)

The following negative impacts are associated with the construction of the proposed project.

a) Interference with the Physical Setting

The project site is already disturbed through excavation that occurred during the quarrying activities. The proponent is expected to undertake further works on the project site especially clearing of the spoil heaped on the project site entrance. These activities will have minimal negative impacts and could result in:

- Changes in the local topography during excavation and relocation of spoil on site;
- Blockage of natural drainage for storm water;

The negative impacts will be temporal because the proponent is expected to mitigate all the negative impacts prior to commissioning of the landfill. The potential negative impacts on the physical environment will be addressed through the environmental management plan.

i. Proposed Mitigation Measures:

- The proponent should ensure that there is minimal disturbance to the topography of the PIA;
- The landfill design shall not interfere with local drainage or change the topography or introduce physical changes that are not in harmony with the physical setting of the project area;
- The landfill and associated structures should be aesthetically acceptable to blend in with the surroundings and;
- The proponent shall as much as possible complete the works in such a way that natural aesthetics shall be retained at the locations;
- Restoration shall be undertaken to ensure that the original setting is as much as possible retained; and
- The proponent should observe measures stipulated in the ESMP for sustainable project implementation.

b) Noise Generation

Constructions of the proposed project will most likely result in noise emissions as a result of the machines that will be used e.g. excavation equipment and construction vehicles delivering materials to site. Noise will also be generated by construction workers. Significance of noise impacts depends on whether the project would increase noise levels above the existing ambient levels by introducing new sources of noise. Noise impacts would be considered significant if the project would result in the following:

- Exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;

- Exposure of persons to, or generation of, excessive ground-borne vibration or ground-borne noise levels;
- A substantial permanent increase in ambient noise levels (more than 3dBA) in the project vicinity above levels existing before the project; and
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing before the project.

The project proponent through the contractor shall put in place several measures that will mitigate noise pollution during the construction phase such as the following:

- Install portable barriers to shield compressors and other small stationary equipment where necessary;
- Use of quiet equipment (i.e. equipment designed with noise control elements);
- Limit pickup trucks and other small equipment to a minimum idling time and observe a common-sense approach to vehicle use, and encourage workers to shut off vehicle engines whenever possible;
- Provision of appropriate Personnel Protective Equipment (PPE);
- Construct mainly during the day;
- Consider labour based construction methodologies; and
- The provisions of EMCA CAP 387 as stipulated in table 3 should be observed.

c) Dust Emissions

Dust will be emitted during excavation and related earthworks. Air-borne particulate matter pollution is likely to occur during the excavation works. This is likely to affect site workers, in extreme situations leading to respiratory problems. To ameliorate these, the following mitigations measures are proposed:

- Minimizing the number of motorized vehicles on use;
- Rehabilitate disturbed areas;
- Provide scour checks on over-15% slopes or when working in loose soils;
- Use predetermined tracks; and
- Wet all active construction areas as and when necessary to reduce dust.

d) Disposal of Spoil

Project construction will involve earthworks and excavation. There exists a lot of spoil in the project site that requires carting away; additional spoil is expected to be generated during the construction of the landfill. The proponent is expected to sort out the spoil and preserve the suitable soils for future use in covering the disposed asbestos and asbestos containing materials. The waste spoil may affect the surrounding environment if not adequately disposed. This can be ameliorated by observing the following measures:

- Maximizing the re-use of excavated materials in the works as far as feasible to ensure that no permanent spoil dumps are created;
- The right grade marram that forms part of the spoil should be sold to road contractors and this will generate revenue for the proponent while at the same time paying the requisite taxes (cess) to the local authority; in so doing the proponent will reduce construction costs associated with disposal of the spoil;
- Extra loads of marram should be used to make good the access road; this should be done in conjunction with the local authority (County Government of Kiambu);
- Besides, the local community should be given the first priority while disposing the extra loads of marram excavated during the quarrying activities; this should be done at a consideration (reasonable fee) or better still donated in case of public use;
- Properly disposing off the spoil in an area identified by the design team and approved by the confirmed land owners as well as by NEMA; and
- Care should be taken to avoid spoil location in land that could otherwise be used for productive purposes.

e) Solid Waste Generation

Solid wastes generated during construction include papers used for packing, plastics, cuttings and trimmings of materials among others. Dumping around the site will interfere with the aesthetic status and has a direct effect on the surrounding community. Disposal of the same solid wastes off-site could also be a social inconvenience if done in the wrong places. The off-site effects could be aesthetic, pest breeding, pollution of physical environment including water resource, invasion of scavengers and informal recycling by communities. The proposed mitigations for this impact include the following:

- Construction waste should be recycled or reused as much as possible to ensure that materials that would otherwise be disposed off as waste are diverted for productive uses;
- The Proponent shall put in place measures to ensure that construction materials requirements are carefully budgeted and to ensure that the amount of construction materials left on site after construction is kept minimal;
- Minimization of solid waste during construction of the proposed project through use of durable, long-lasting materials that will not need to be replaced often, thereby reducing the amount of construction waste generated over time;
- Skips and bins should be strategically placed within the labour campsite/ site office, if any, and construction site, they should also be adequately designed and covered as well as emptied regularly to prevent access by vermin and minimize odour;
- Measures to ensure that waste materials from the project are disposed at suitable sites will be taken.

These will include engaging only reputable truckers and conducting appropriate spot checks to verify that disposals are done in accordance with the requirements of NEMA, hence the ultimate fate of the wastes should be monitored so that they are not illegally disposed off; and

- Provide portable sanitary conveniences for the construction workers for control of sewage waste. A ratio of approximately 25 workers per chemical toilet should be used.

f) Vegetation Loss

The project site is an abandoned quarry pit; there is no vegetation in the quarry pit save for few seasonal/herbaceous plants and shrubs growing on the heaps of spoil excavated when the quarry was active. The significance of the vegetation loss during the site clearance is minimal. To contain the potential negative impacts related to vegetation loss, the following mitigation measures are recommended:

- The contractor will ensure proper demarcation of the project area to be affected by the construction works;
- Strict control of construction vehicles to ensure that they operate only within the area to be disturbed by access routes and other works;
- Retention of herbaceous plants and shrubs, where possible on the potential sites for screening of the visual impact;
- Where the construction activities requires removal of any vegetation, care will be taken to minimize the destruction or damage of herbs and shrubs; and
- Re-planting of plant biodiversity in the disturbed surfaces should be done.

g) Accidental Spills and Leakages

The principal chemicals held on the site during the construction site are likely to be vehicle fuel and greases/ oils. Spillage or escape of such compounds are likely to have an immediate impact upon the local water resources Ndarugu River) and consequently on the terrestrial and aquatic flora and fauna. This can be checked by observing the following measures:

- Maintain vehicles and machineries at manufacturers specifications;
- Ensure proper storage of chemicals / materials; and
- During the course of the construction works, temporary drainage channels should be constructed to encourage dispersal of meteoric waters.

h) Workers /Public Accidents, Hazards and Safety

Construction workers are likely to have injuries and hazards as the construction works unavoidably expose workers to occupational safety and health risks. The workers are also likely to be exposed to risk of accidents

and injuries resulting from accidental falls and injuries from hand tools and construction equipment.

In relation to public safety, the most serious threats will be on the areas with heavy plant and equipment moving in and out of the contractor's yard and at the construction site as well as construction materials storage areas. There will also be an increased risk of traffic accidents where delays and diversions are imposed or altered without adequate warning. This can be avoided by observing the following:

- To reduce on the workers accidents and hazards, the proponent will develop and commit the contractors to Site Occupational Safety and health rules and regulations as stipulated in the Occupational Safety and Health Act, 2007;
- All construction workers should be advised of the dangers associated with construction work;
- Workers should be provided with suitable PPE;
- Provision of adequate sanitary facilities to workers;
- Train all workers on Safety Health and Environment (SHE) with an aim of improving awareness;
- Trenches over 1.5m deep or wherever soil conditions dictate should be secured against accidental entry by workers and the public;
- Install safety signage along the work areas; and
- Where construction activities interfere with the movement of traffic, the site should be signed and controlled by trained flagmen/flag women and lit by night;
- Task based risk assessment should be done on daily basis to assess the risks and hazards thereby prescribing the appropriate prevention measures.

i) Extraction and Use of Construction Materials

Construction materials that will be used in the construction such building blocks, ballast, sand and cementt will be obtained from quarries, hardware shops and sand harvesters who extract such materials from natural resource banks such as rivers and land. To check on the impacts of material extraction, the following is recommended:

- The Contractors will source construction materials such as sand and ballast from registered and approved quarry and sand mining firms/groups whose projects have undergone satisfactory EIA/EA and received NEMA approval. Since such firms are expected to apply acceptable environmental performance standards, the negative impacts of their activities at the extraction sites are considerably well mitigated;
- The Contractor will only order for what will be required through accurate budgeting and estimation of actual construction requirements.

j) Increased Water Demand

During the construction phase of the proposed project, both the construction workers and the construction works will create demand for water in addition to the existing demand. Water will mostly be used during construction for wetting surfaces or cleaning/curing completed structures. It will also be used by the construction workers to wash and drink. To check on its sustainable use, the following mitigation measures have been proposed:

- The proponent through the contractor shall ensure that water is used efficiently at the site by sensitizing construction staff to avoid irresponsible water use; and
- Any water handling equipment, facility and systems shall be appropriate for the intended usage. Water used on the construction shall reflect the level of conservation achieved by the contractors. Documentation of amounts of water used will therefore be mandatory.

k) Archaeological and Other Cultural Properties

From the field studies, there are no known impacts on archaeologically protected monuments and cultural properties in the proposed project area. Should any archaeological or culturally important artefact be discovered during the construction process, the contractor should develop and implement a ***chance find procedure*** that should be approved by National Museum of Kenya.

l) Spread of Communicable Diseases and Other Infections

During the construction phase there is a risk of spread of communicable diseases such as tuberculosis and pulmonary infections. Aspects of the physical environment that promote transmission of diseases include: disposal of wastes and ventilation which are likely to occur during the construction phase of the project. With the influx of people during construction, there will be a likelihood of increase in diseases such as typhoid, tuberculosis, diarrhoeal diseases, respiratory diseases, dysentery and cholera. Proposed mitigation measures include the following:

- Treat affected local and migrant workers which will control the movement of disease vectors (through contaminated water and between people);
- Provision of personal hygiene facilities in good condition with adequate water supply; and
- Ensure awareness raising on proper sanitation and personal hygiene to promote proper health.

m) Increase in HIV/AIDS Prevalence and other STIs

As the project is going to bring in a significant population of new people in the project area it is forecasted that rates of new infections will increase. This is due to the fact that the contractors, traders and workers will have money to attract women/men from the project area in a bid to solicit for sex, thereby creating avenues for

spread of HIV/AIDS and other STIs. The most vulnerable members of the community are women as they don't have access to resources necessary for production and wealth creation, in this case land. This will further predispose them to sex pests and consequently HIV/AIDS.

It is recommended that the project proponent and the contractor should ensure that prevention and management of STIs occurrence as a result of social interaction between immigrant workers and local populations is conducted through:

- ✓ Selecting appropriate locations away from concentration of human settlements for construction camps;
- ✓ Education and sensitization of workers and the local communities on STIs including provision of condoms to the project team and the public;
- ✓ The contractor has to institute HIV/AIDS awareness and prevention campaign amongst workers for the duration of the contract e.g. erect and maintain HIV/AIDS information posters at prominent locations as specified by the Resident Engineer;
- ✓ The contractor has to ensure that staff are made aware of the risks of contracting or spreading sexually transmitted diseases; and
- ✓ The contractor should ensure that the project workers are sensitized on the local culture.

6.7. Summary of the Potential Impacts Related to Project Implementation (Operation)

6.7.1. Summary Potential Positive Impacts

- The landfill will provide a facility for sound and safe disposal of asbestos and ACM thereby protecting the environment from potential/ real negative impacts of poor haphazard disposal of asbestos and ACM;
- By providing sound asbestos disposal services, there will reduce predisposing of human and wildlife population to asbestos & ACM thereby reducing the medical costs associated with exposure to asbestos;
- The facility will lessen the challenge that is currently prevailing with regards to disposal of asbestos and ACM; this is largely due to the fact that there are few asbestos disposal facility and incidences of illegal dumping of asbestos are on the rise;
- The facility will contribute in ensuring that monitoring of sound disposal of asbestos and ACM can be done by undertaking the necessary monitoring exercises;
- The landfill will provide employment opportunities directly and indirectly; there will be staff employed to run the operations of the facility, transporters of asbestos and ACM to the facility, contracted asbestos roof replacers and other persons who will be indirectly engaged in the entire process of asbestos disposal that solely depends on the availability of the disposal facility (Landfill); and
- Finally, the facility will provide a return on investment to the proponent while at the same time ensuring that the proponent pays the requisite taxes to the government (Local and national government).

6.7.2. Summary Potential Negative Impacts

Potential negative impacts will be associated with bypassing/ compromising the set standards that will ensure the facility does not function at the expected standard. Some of the potential negative impacts will entail:

- Pollution of ground water in the event of poor lining of the facility;
- Pollution of surface water in the event of interfering with local drainage and topology thereby exposing the landfill to the elements of weather (runoff);
- Air pollution by poor packaging of asbestos thereby exposing the friable asbestos to the elements of weather;
- Predisposing the human and wildlife population to asbestos by not observing the set guidelines on: handling, temporary storage, packaging, transporting, disposing and post-disposal procedures; and
- Social-economic impacts associated with unbearable medical costs and eventual loss of life resulting from predisposing human and wildlife population to asbestos and ACM as result of poor operating procedures in the landfill.

6.8. Potential Impacts to Physical Resources

6.8.1. Impacts on Ground Water

Even though the hydrogeological survey augmented by professional opinion from Water Resources Managers (the Authority) have concluded that the project site is appropriate for the proposed project; the project proponent is expected to undertake all the necessary measures that will prevent occurrence of leachate penetrating to the underground water resources. This could occur in the event of poor lining of the facility. This could have long-term adverse effects on groundwater quality, well water quality, and surface water quality stemming from discharge of the groundwater to the surface water. There are identifiable boreholes in the project influence areas and they can be used for monitoring purposes.

i. Proposed Mitigation Measure

- The standard mitigative practice in landfill operations is to provide a liner in the entire landfill; the liner could either be natural or synthetic. The proponent stands guided by the national asbestos disposal guidelines on the design of the landfill.
- It is important to note that the landfill will not be used to dispose biodegradable wastes that are associated with harmful leachate and emissions. Well packaged asbestos harnessed by proper lining of landfill facility will provide Zero chances of asbestos fibres mixing with underground water.

6.8.2. Potential Impacts on Surface Water

There is the possibility that asbestos contaminants from the facility might enter surface runoff water from the

landfill and reach major surface water courses such as the Ndarugu River.

i. Proposed Mitigation Measures

- All landfill surface runoff will be directed to on-site holding pond where it will undergo necessary pretreatment.
- Only surface water that has not come into contact with the waste material (i.e., noncontact surface water) will be allowed to directly enter the storm water drainage;
- All contact water will be conveyed to the pretreatment pond. In the initial stages of operation of each landfill cell the surface run-off will be diverted into the pretreatment pond, until it can be adequately handled as clean water;
- During construction, appropriate measures including provision of silt traps, etc., will be taken to ensure that significant amounts of sediments do not impact adjacent watercourses; and
- Upon closure of the landfill, the surfaces will be contoured and re-vegetated in such a way as to prevent erosion and resulting sedimentation of adjacent surface waters.
- Since the non-contact surface water or pretreated water alone will be allowed to directly enter the surface water drainage, regular monitoring of surface water quality at key locations shall be conducted at critical points in operational life of the landfill.

Where the above measures are implemented during the construction, operations and closure phases of the landfill development, there is no significant adverse impacts on surrounding surface waters are anticipated.

6.8.3. Potential Impacts on Flora and Fauna

The project site is already disturbed with little vegetation and few traces of insect life; this however does not rule out potential impacts of the proposed project on the flora and fauna in the project influence area. The development of a proper landfill site entails clearing and re-contouring activities, as well as the operations of the facility itself. This can result in loss of habitat for wildlife and natural vegetation. The proposed landfill site will not represent a significant loss in terms of habitat for plants or animals, nor for commercially important plants/animals. The site is already cleared and the neighborhood is equally disturbed with active quarries.

i. Proposed Mitigation Measures

- Minimal disturbance to the undisturbed sections of the project site where the landfill activities will not affect;
- Landscaping of the entire project site to create favourable environment for plant growth; plants will in return provide habitat for animals mainly insects.
- Favourable contouring and re-vegetation of the decommissioned landfill shall be conducted so as to promote

its value as habitat. Suggested vegetation plans include restoring it to be similar to surrounding landscapes.

6.8.4. Potential Impacts on Geology

The Proposed project would normally have a significant effect on the environment if it would:

- ✓ Expose people or structures to major geologic hazards, which is not the case as concerns the proposed project

6.8.5. Potential Impacts on Soils Resources

The Proposed development would normally have a significant effect on the environment if it would:

- Cause substantial erosion; and
- Cause substantial destruction of agricultural crops.

But during the implementation and operation of the proposed project, no soil erosion (via water or wind) will be allowed to take place neither is the project located in an agricultural land.

6.8.6. Impacts on Air Resources

The Proposed Action would normally have a significant effect on the environment if it would:

- Violate any regulatory requirement of NEMA; or
- Violate any ambient air quality standard; or
- Expose sensitive receptors to substantial air pollutant concentrations.

The proposed landfill will strictly be used for disposing asbestos and ACM only. Therefore, landfill gases associated with municipal wastes such as biodegradable wastes are not expected from the proposed landfill. Bedsides asbestos is odourless and therefore there will no incidences of foul smell emanating from the proposed landfill during operations.

i. Proposed Mitigation measures

- **Dust and Smoke-**The facility may create some dust and smoke (vehicular emissions) resulting from vehicle movements; the dust generated during the operational phase is mitigatable while provision for dust suppression will be incorporated in the standard operating procedures.

6.8.7. Mitigation Measures on the Impacts of Waste Disposal

a) Solid Waste

- ✓ Specific attention would be given to minimizing and reducing the quantities of solid waste produced

during operation of the facility;

- ✓ A waste management plan would be prepared and followed;
- ✓ To avoid the harmful effects of poor solid waste disposal adequate arrangement would be to dispose of solid waste at the authorized dumpsite. Re-using as much of waste (cut trees as firewood, soil as water traps) is also encouraged;
- ✓ Strategically located and maintained latrine facilities should be made available for workers.

6.8.8. Site Access-Mitigation Measures

- ✓ An appropriate schedule of activities during the operation phase will help to alleviate the impacts of increased noise, dust, etc. likely to result from operation activities;
- ✓ The activity schedule should be communicated to residents of the surrounding community; and
- ✓ Operations activities will take place during periods when disturbances to the surrounding residents are minimized, i.e. during day time only. No work should go into the night.

6.8.9. Potential Impact on Safety and Health

Workers involved in handling, transporting and disposal of asbestos waste at collection, transfer and landfill facility can encounter different safety and health hazards. These may include, exposure to asbestos, chemical hazards, physical hazards such as noise, and weather factors cold and hot weather and mechanical hazards.

a) 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. 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.

i. **Proposed Mitigation**

- All employees will wear the appropriate PPE/ clothing during the exercise. Each asbestos worker will be provided and equipped with:
    - An approved unused disposable overall
    - Clean gum boots
    - 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.
- Warning & Safety signage will be placed at the areas within the disposal site.
- No member of the public to be allowed near of the works area.
- All personnel involved with the asbestos disposal process will be subjected to medical surveillance.
- Asbestos contaminated areas shall be sprayed with water prior to commencement of cleaning activities in order to suppress the release of fibres.
- Clearing of asbestos at any site shall be completed entirely before moving onto a new working site.

- Temporary storage of waste: the area currently used for stockpiling of excavated material shall be lined with impermeable material.
- All machinery involved in an asbestos disposal process will be jet-washed prior to leaving site.
- Asbestos air sampling will be conducted on the sites for clean-up
- The employer must not allow anybody to work in or to enter an environment in which they may be exposed to asbestos that will exceed the exposure limit for asbestos.
- When there is a visible dust or winds in excess of 20 knots, any asbestos disposal and cleaning process will be stopped.
- Thorough, complete and up to date records should be kept of:
    - Medical surveillance of asbestos workers for a minimum period of 40 years;
    - Maintenance of control measures for a period of 3 years;
    - Asbestos inventory for minimum period of 40 years;
    - 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
    - Assessments and air monitoring at the sites that were cleaned
- Transportation
    - Ensure all asbestos is collected and loaded into a transportation vehicle licensed by NEMA
    - The transporting vessel (truck will be lined with polythene).
    - The transporting vessel shall be labelled <HAZARDOUS WASTE<
    - The waste shall be transported to the disposal site in an enclosed vehicle.

ii. 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.

b) 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, Waste Afrika Kenya Limited management 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.

i. Proposed Mitigation:

- Waste Afrika Kenya Limited management 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:
    - An approved unused disposable overall
    - gum boots
    - PVC gloves
    - 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 Safety and health representative.
- The asbestos site manager shall establish a safety and health committee. The committee shall comprise of the following personnel:
    - Site manager
    - SHE representative
    - Premises representative
- There must be a safety and health plan that is kept onsite which must contain appropriate safety measures.
- Employees must be trained on the contents of the safety and health plan
- The premises first aiders must be available to the asbestos workers
- A first aid kit must be kept onsite.

ii. Cumulative Impacts:

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

6.8.10. Potential 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.

i. Proposed Mitigation:

- If necessary, backfill areas which have undergone a substantial amount of excavation with stones or soil

ii. Cumulative Impacts

- None

iii. Residual Impacts

- None

6.8.11. 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.

i. **Proposed Mitigation**

- 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.
- General waste will be handled by a NEMA licensed waste handler.
- Littering on the site (general waste) is prohibited.
- Waste receptacles for general waste should occur in designated areas
- 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.

iii. Proposed Mitigation measures

These hazards are preventable by observing the necessary safety and health measures especially donning/ wearing the right grade PPEs.

6.8.12. Potential Impacts on Archaeological Resources

There was no site of archeological/ cultural importance identified on the site and in the project influence area and as such there will no impacts on such sites emanating from the proposed project.

6.9. Other Potential Impacts

6.9.1. Mitigation Measures

- ✓ Monitoring and management of the area drainage to prevent polluting of local water resources;
- ✓ Solid Waste: Arrangement must be in place to ensure that solid waste is properly disposed off;
- ✓ Other wastes such as biodegradables would be preserved and composted or suitably secured;
- ✓ The use of adequate equipment and vehicles to reduce on dust pollution and noise would be employed;
- ✓ Frequent wetting of the site during operations will also help to alleviate the problem of fugitive dust; and
- ✓ Noise should be kept to a level which does not exceed 70dB at 50m from the site boundary at any given time.

7. ENVIRONMENTAL MANGEMENT AND MONITORING PLAN

A number of activities have to be carried out during the various phases of the proposed project to ensure adequate environmental and social impact management. These include, but are not limited, to the following:

7.1. Project Preparation

i. Collection of baseline data for monitoring purposes (e.g. vegetation type, ambient noise);
ii. Training of the relevant project staff in environmental management;
iii. Verification of design details.
iv. Inclusion of environmental specifications in Tender Documents, and development of Code of Conduct for the Contractor.
v. Preparation of an occupational safety and health manual for use during project construction, operation and decommissioning.

7.2. Construction

i. Incorporation of mitigation measures;
ii. Enforcement of occupational safety and health requirements (conditions at the Contractor's Yard, materials storage, condition of equipment, protective clothing, etc.);
iii. Collection of data on noise and vibration levels;
iv. Disposal of construction solid, liquid and sanitary wastes in an acceptable manner and in conformance with regulations;
v. Ensuring that the Contractor is following the Code of Conduct and environmental specifications in the Tender Documents;
vi. Training the Contractor's workforce in environmental and social awareness and responsibility (including STD/HIV/AIDS awareness); and
vii. Liaison with local administration and community leaders in matters of disturbance to the public, security issues, and other matters arising from the project.

7.3. Operation

i. Maintenance, calibration and checking of all equipment as specified in respective manuals or regulations;
ii. Monitoring leakages and spills;
iii. Collection of data on water (surface and ground), and noise and vibration levels, to be used for analysis and remediation where necessary;

iv. Disposal of solid and sanitary wastes in an acceptable manner and in conformance with regulations;
v. Compliance with occupational safety and health manual to be prepared by project proponent/ management during the project preparation phase;
vi. Environmental performance reporting (based on evaluation of data collected, investigations, etc.;
vii. Observing Standard Operating Procedures (SOP) designed for proposed facility; and
viii. Observing and implementing all the guidelines in the National Guidelines on Safe Management and Disposal of Asbestos (2015).

The table below represents environmental management and monitoring plan. It describes how each of the main mitigation measures proposed should be implemented, the frequencycy, and the responsible party during the construction and operation. Monitoring indicators and means of monitoring have also been included in the table. It is imperative that this Environmental Study Report is made available to the contractor at the tendering stage so that they can appreciate what is involved in implementing proposed mitigation measures and will be able to include mitigation measures in the bills of quantities.

Prior to mobilization, the Contractor should also prepare his own EMP for review by the Supervising Engineer. In his schedule of works, the Contractor must include all proposed mitigation measures, and the Supervising Engineer should ensure that the schedule and environmental management/monitoring plans are complied with. This will also lend a sense of ownership to the Contractor, in addition to instilling in him/ her, a thorough understanding of the pertinent issues.

The responsibility for supervision of the implementation of all the proposed mitigation measures during construction and the defects liability period will lie with the Supervising Engineer, while the Contractor will be responsible for day to day operational matters of construction, which will include implementation of mitigation measures that he is responsible for.

After the defects liability period, responsibility for the operation and maintenance of the facility will rest with the property owner (proponent). The table also presents an estimate of the costs of environmental management and mitigation.

Table 10: Environmental Management Plan

Impacts	Proposed Mitigation	Monitoring Indicators	Responsibility	Costs (Ksh)
Soil				
Soil erosion	-Re-vegetation -Aappropriate measures including provision of berms and silt traps during construction -Reduce velocity of water by using effective contouring to reduce slope grades, ditch blocks to reduce runoff velocities	-Vegetation cover -Silt traps -Contours	Project Manager	150,000.00
Soil compaction	Compaction to Engineers specification	Type of machinery and equipment	Project manager	
Paving	Reduction of paved/compacted areas	Percentage of compacted area	Project manager	
Water				
Surface run off and waste water.	Embankment, re-vegetation, Proper drainage systems	Amounts of storm and wastewater; Size and type of drainage system	The project manager	200,000.00
Contaminations of surface and ground water	-all water from the waste should be kept in an appropriate leachate pond -use appropriate liners- either natural or synthetic to contain leachate -Proper asbestos wastes management within the facility	Incidences of groundwater pollution; Composition of run off; poor wastes management	Project manager and facility users	
Air				
Dust	-Wetting of asbestos/ ACM on site -Watering of uncovered area/ watering area; Construction of a dust screen around the site, Dust masks for the workers, daily covering of disposed wastes; use of dust suppressors;	Amounts of dust raised	The project manager	100,000.00
Emissions	Use of low emission machinery; use of scrubbers;	Type of machinery Amounts of emission	Contractor/ project manager	
Noise	Construction during day time; Using silencers in heavy machines, use of PPE such as ear muffs	Decibels	The project manager	20,000.00
Biodiversity				
Degradation of vegetation	Planting more vegetation	Vegetation Coverage; State of landscaped vegetation	Project manager and proponent	30,000.00
Social concerns and General Safety				
Insecurity / public safety	Contracting a security firm and fencing the facility	Presence of a security Personnel; fence around the landfill site	The proponent Project manager	30,000.00 month
Protective Gear	Use of protective clothing all the time	Provision of right grade safety gear and equipment	Proponent; Project manager	50, 000.00
Accidents and falling objects	Erecting hazards warning signs. Using smaller trucks that make narrow turnings	Signboards and size of trucks	Proponent/ manager/ contractor	
Occupational and public health hazards	✓ provision and use of proper personal protective equipment ✓ regular medical check-up and provision of appropriate sanitary facilities ✓ provision and use of proper personal protective equipment ✓ regular medical check-up and provision of appropriate sanitary facilities			

Table 2: Environmental Monitoring Plan for each Phase

Ref. No	Affected Environment	Objective to Address Impact	Mitigation Measures	Responsible party	Due Date / Frequency	Monitoring Activity	Estimate cost-Ksh
Construction Phase							
C1	Air Quality	-To eradicate incidences of asbestos escaping to atmosphere. -To minimize exhaust pollution and nuisance	The use of well-maintained construction plant and equipment	Project Manager	continuous	Routine inspection / maintenance records	20, 000.00 month
C2	Occupational Safety and health (OHS)	To ensure Safety and health on and around the construction site	All construction activities will be conducted in accordance with applicable Kenyan Construction OSH Standards	Project Manager	continuous	Joint site inspection by relevant authorities	50, 000.00 to purchase PPE and put in place proper signage
C3	Occupational Safety and health	To ensure Safety and health on the construction site	The Contractor will comply with OHS regulations agreed with the proponent.	Project Manager	continuous Daily / As required	Routine inspection of worksites / Obtaining necessary permits	
C4	Occupational Safety and health	To prevent injury to the workers and the public	Securing the site with perimeter fence and warning signs will be put in place in relevant strategic places -Providing PPEs to all workers	Project Manager	Twice daily/ As required	Visual inspection	5, 000.00 per month
Operational Phase							
O1	Water quality	To prevent pollution of ground and surface waters water	Control runoff and leachate infiltration	Project Manager	As required	Monitoring water quality records	20, 000.00 per month
O2	Water erosion and storm water management	Prevent localized erosion To ensure that there is no ponding on the disposal site or flowing water	Proper maintenance of storm drains Ensure all storm water from the site is directed towards the established water drains	Project Manager	Continuous	Visual inspection	30, 000.00 per three months
Q3	Air quality	Prevent Air pollution To minimize air pollution To prevent asbestos fibres from being airborne	-Put in place all necessary air pollution control measures especially wetting of asbestos wastes Establish air quality monitoring systems and implement operational management plans to ensure that the system is being maintained	Project Manager	Continuous	Monitoring air quality records	300,000.00 per moth

			properly and that the outputs of the monitoring system are providing suitable data on air quality. b) Appoint a dust monitoring system to monitor and analyse dust and air quality c) Air monitoring should be done continuously in areas related to asbestos removal works.				
O4	Public health	Prevent disease outbreaks	Proper management of asbestos in and around the facility	Project Manager	As required	Visual inspection of number of dust bins and other public health measures.	30, 000.00 per month
O5	Land use	Prevent de-vegetation	Plant more vegetation	Project manager/ proponent	As required	Visual inspection	5, 000.00 per month
O6	Conflicts	To Make sure all stakeholders are comfortable with project implementation.	Creating a conflict management plan	Proponent, community, leaders and government officials	Continued Interaction and engagement	No of meeting/ consultations held	-
O7	General Conditions	This will help prepare the workers for the asbestos disposal and cleaning process	Notify workers about the upcoming activity Prepare appropriate PPE complying with international good practise Post appropriate signpost of the site that will inform the workers of key rules and regulations to follow	Manager	During preparation for the proposed activity	appropriate signpost appropriate PPE	60, 000
O8	Waste Management	To ensure a clean and healthy environment	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	Manager	During the cleaning and disposal process	A clean environment	80, 000

			paper generated at the work site in scrap paper bins. Notify the waste paper removal worker /contractor when the temporary scrap paper storage area reaches capacity, for removal of the scrap paper to a recycling facility. d) Place all general / domestic waste in refuse bins.				
O9	Asbestos management	To prevent asbestos dust from becoming airborne; To minimize personal exposure to asbestos fibres	(a) Asbestos disposal site shall be marked clearly as hazardous material (b) The asbestos will be appropriately contained and sealed to minimize exposure (c) The asbestos prior to removal should be treated with a wetting agent to minimize asbestos dust (d) Asbestos should be handled and disposed by skilled & experienced professionals (e) If asbestos material is being stored temporarily, the wastes should be securely enclosed inside closed containments and marked appropriately. Security measures will be taken against unauthorized removal from the site. (f) The removed asbestos will not be	Manager	Preparation and disposal of the asbestos	Well marked asbestos site Well contained asbestos	300, 000

			reused				
O10	Traffic and Pedestrian Safety	To avoid the spread of asbestos dust To reduce the potential to contaminate, as asbestos fibres can be spread through various mediums including living persons To eliminate risks of exposure to asbestos fibres	(a) Signposting, warning signs, barriers and traffic diversions: site should be clearly visible and the workers warned of all potential hazards (b) Provision of safe passages and crossings for pedestrians be made (c) Active management by trained and visible staff at the site, if required for safe and convenient passage for the workers. (d) Ensuring safe and continuous access to office facilities, shops and residences during disposal and cleaning activities, if the facility is in operation during this activity	Manager	At preparation stages	Well posted warning signs Safe passages and crossings Well trained staff	100, 000
O11	Management of temporary waste storage sites	To ensure that the wastes are removed effectively and in time	a) Ensure management of temporary waste storage sites is in line set procedures and legal requirements. b) Register and monitor waste volumes at the temporary waste storage site c) Oversee the physical removal of the waste from the temporary waste storage sites	Manager	During preparation and disposal stages	Register and monitoring reports of waste volumes at the temporary waste storage site	100, 000
O12	Information and training	To provide awareness on the risks of asbestos	Training on the potential health risk caused by exposure to asbestos and how to reduce these risks	Manager	Before the disposal process commences	Training reports and certificates	50, 000

O13	Asbestos exposure	To minimise risks of contracting diseases associated with exposure to asbestos fibres, e.g. cancer	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.	Manager	At, during and after the disposal and cleaning process	Air quality monitoring reports	100, 000
O14	Medical observation	To minimize incidents of occurrence of occupational diseases, notably those caused by exposure to asbestos fibres	Ensure medical surveillance of an occupational medical practitioner after the disposal exercise	Manager	During and after the disposal exercise	Medical extermination reports	100, 000
O15	Disposal Scheduling and Hours	To prevent risk of inhaling asbestos fibres, which is possible if one does not clearly see the area of work due to darkness	The disposal and cleaning activities should be limited from 7 am or sunrise (whichever is later) to 5 pm or sunset	Manager	During the disposal and cleaning exercise	Disposal Schedule	-
O16	Underground water contamination	This will reduce possibility of underground water contamination	Proper lining for the and in the asbestos disposal site	Manager	Before disposing the asbestos	Readily available lining material	50, 000 per disposal
O17	**Emergence of new environmental concerns**	To detect any environmental concerns that could have come up during the operationalization of the project	Undertake an environmental audit after operation commences as required by law	Manager / Environmental Experts	Within 12 months after operation commences and every subsequent 12 months of operation	Annual Environmental Audit Reports	100, 000 per Audit

7.4. Decommissioning

Decommissioning is an important phase in the project cycle and comes last to wind up the operational activities of a particular project. It refers to the final disposal of the project and associated materials at the expiry of the project lifespan. If such a stage is reached, the proponent needs to formulate a decommissioning management plan that will guide the decommissioning process and seek approvals/ permits from all the relevant government agencies.

8. CONCLUSSION AND RECOMMENDATION

8.1. Conclusion

In accordance with EMCA CAP 387 (Amended 2015) and the Environmental (Impact and Audit) Regulations, 2003, the findings of the ESIA carried out for this project indicate that possible environmental impacts generated during construction operations and decommissioning phases can be addressed effectively by the proponent through the mitigation measures indicated in the matrix above. As per the above analysis of the aspects of both positive and negative environmental impacts of the project's development, we, the experts found **NO SIGNIFICANT NEGATIVE IMPACTS** that could pose adverse effects to the extent of barring the proposed project from being implemented. However, the identified potential negative impacts of the proposed project could be managed with the suggested environmental and social mitigation management plan. Having considered the data collected, analysed and collated information that is available, it is the experts' considered opinion that:

i. The project does not pose any serious environmental concerns, other than those of a minor scale that accompany similar projects;
ii. The positive impacts of the project outweigh the negative ones, which will be adequately contained by following the prescribed environmental and social impact management plans;
iii. As such, the project could be allowed to commence, and activities be managed within the provided EMP and sound environmental management practices that are locally and internationally recognized.

8.2. Statutory Compliance

The proponent and the contractor shall ensure that they implement and adhere to the statutory provisions of the statutes mentioned in Chapter three of this report and any other relevant ones provided for in Kenya.

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10. APPENDICES

i. Appendix 10.1: NEMA Experts Practicing License

ii. Appendix 10.2: Key Stakeholder Responses/ Statutory Correspondences

iii. Appendix 10.3: Land Ownership Documents

iv. Appendix 10.4: Asbestos Disposal Guidelines

v. Appendix 10.5: Minutes of Area Residents and Stakeholders Meeting

10.1 Appendix 10.1: NEMA Experts Practicing License

FORM 7 (r.15(2))

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/12407

Application Reference No: NEMA/EIA/EL/16570

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registration number **2355**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **3/11/2020** Expiry Date: **12/31/2020**

Signature…..

(Seal)
Director General
The National Environment Management Authority

P.T.O.

ISO 9001: 2008 Certified

FORM 7 (r.15(2))

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

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Issued Date: **3/11/2020**

Expiry Date: **12/31/2020**

Signature…..

(Seal)
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FORM 7 (r.15(2))

mazingira yetu | uhai wetu | wajibu wetu

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

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P.T.O.

ISO 9001: 2008 Certified

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