CHITAMBO TOWN COUNCIL

ENVIRONMENTAL PROJECT BRIEF

FOR THE PROPOSED CONSTRUCTION AND OPERATION OF A GENERAL WASTE DISPOSAL FACILITY IN MUCHINKA AREA OF CHITAMBO DISTRICT BY CHITAMBO TOWN COUNCIL

Submitted to the Zambia Environmental Management Agency

EXECUTIVE SUMMARY

Overview

This Environmental Project Brief (EPB) has been prepared to address the potential environmental impacts that could arise from the construction and operation of Chitambo Town Council disposal facility. The brief intends to ensure that the environmental and social effects of the proposed project activities are adequately and appropriately considered before decisions are made for implementation. The output of the environmental impact analysis will therefore, provide decision-makers with adequate information on environmental and social effects of the proposed project.

The purpose of the project is to alleviate the impacts of uncontrolled solid waste disposal into the environment. Proper selection, construction, and management of the solid waste facility will mitigate the negative impacts. The main sections of the EPB include overview of the legal and institutional frameworks and international agreements, description of the project and the environment, impacts assessment, identification of mitigation measures, and presentation of an environmental management plan (EMP).

Project background

Currently, solid waste generated within Chitambo District is inappropriately disposed either at a temporal disposal facility or directly in the environment. The situation is likely to expose the public to negative health impacts and lead to deterioration of natural ecosystem in the area. Chitambo is also considered as a touristic area and therefore impacts on the natural and aesthetic value have significant negative implications.

The proper waste collection and disposal of the municipal solid waste in the area is of utmost importance to avoid such impacts, and will be addressed by the construction of the disposal facility, along with other solid waste management measures. The facility will be designed to serve a total population of approximately 100, 603 (Source: Census of Population and Housing, Preliminary report 2022).

Project objectives,

The primary objective of the project is to establish a disposal facility in a bid to take care of all the municipal solid waste in Chitambo District.

The specific objectives are as follows:

i. To ensure proper solid waste management in the district,
ii. To improve the social welfare and public health of residents of Chitambo District, and
iii. To minimise the amount of waste taken to the disposal facility.

Project objectives of the Environmental Project Brief

The main objectives of the Environmental Project Brief (EPB) are as follows:

i. To describe the environmental and socio-economic baseline conditions of the project environment
ii. To assess the potential positive and negative effects of the proposed project
iii. To recommend appropriate mitigation measures that enables to avoid or minimize any undesirable effects resulting from construction, operation and closure of the proposed project.

Waste deposition capacity

The estimated initial rate of waste deposition for the proposed facility is approximately 5 tonnes per day, translating to the ultimate capacity of 36,000 tonnes the entire life cycle.

Project Lifespan

Chitambo Town Council intends to establish a solid waste dumping facility in the project area which will be operational for the next 20years commencing once all the relevant approvals for the project are obtained.

Support facilities to be constructed and or installed

i. 2 self-contained guard house

ii. 12m wide access roads
iii. 2 monitoring wells
iv. 1 gas collection point
v. Fence (2m height, 200m by 200m)
vi. Entrance gate (5m wide)
vii. Leachate collection point
viii. Weight Bridge

Project Investment

Chitambo Town Council will invest a total of One Million Kwacha (K1, 000, 000) for all the project components.

Project Location

The project is located in Chitambo District of Central Province, Muchinka area of Chief Muchinka's Chiefdom. The proposed site is accessed through the D235 approximately 13Km from Mukando Turn-Off along T2/D235 and 1.6Km along the gravel road that leads to Chitambo Planned Township, north east of D235. The proposed disposal facility is located approximately 1.58Km north of Chitambo's planned area. The proposed area covers a total area of 4 hectares (200m by 200m). The tipping face shall be 3 ha (176m x 176m), the access road will be 12m wide around the site. The proposed site is depicted in figure 7.

Legal and Policy framework

i. Environmental Management Act No 12 of 2011
ii. Environmental Impact Assessment Regulations (SI No. 28 of 1997)
iii. Environmental Management (Licensing) Regulations No. 112 of 2013
iv. The Local Government Act No. 2 of 2019
v. Urban and Regional Planning Act No. 3 of 2015
vi. Public Health Act Cap 295
vii. Occupational Health and Safety Act 36 of 2010
viii. Solid Waste Management and Regulation Act No. 20 of 2018

ix. Water Resources Management Act No. 21 of 2011
x. Forest Act No 4 of 2015
xi. Workers Compensation Act No.10 of 1999

Project Alternatives summary

The project team investigated a number of project alternatives for the major project components as presented below:

a. **Project need**
b. **Do nothing alternative**
c. **Site Alternatives**

   Two site alternatives were considered:

   Option 1: Current site (borrow pit)

   Option 2: Proposed Site

d. **Design Alternatives**

   Two alternatives were considered, the options analysed include;

   Option 1: Open dumpsite

   Option 2: Controlled disposal facility

e. **Waste Transportation Alternatives**

   Option 1: Waste transportation by road

   Option 2: Waste transportation by rail

f. **Material Alternatives**

   1. Fencing

   Two site alternatives were considered:

   Option 1: Wall fence

   Option 2: Wire fence

   2. Impermeable Barrier

   Two alternatives were considered:

   Option 1: HDPE liner

   Option 2: Clay and gravel

Major impacts

The outcome of the project will include both positive and negative environmental and socio-economic impacts in the project area. The impacts are discussed in detail in section 6 of this Environmental Project Brief.

Negative impacts

Potential adverse environmental impacts likely to be induced by the construction and operation of the proposed solid waste facility include:

a) Loss of biodiversity
b) Noise pollution
c) Litter
d) Leachate discharge
e) Gas emission
f) Dust emission
g) Erosion of soil
h) Occupational and public health hazards.
i) fires
j) Unpleasant odours.
k) Indiscriminate disposal of waste
l) Contaminations of surface and ground water.
m) Surface water contamination
n) Pest infestation
o) Scavenging

Positive impacts

In addition to the unavoidable impacts listed above, there will be several major benefits associated with the proposed projects that are summarized below:

a) Employment creation
b) Improved aesthetic value
c) Increase revenue for the council
d) Long-term environmentally sound solid waste disposal.

Proposed impact mitigation measures

a) **Loss of biodiversity**

Ensure that cutting of trees will be limited to the working face of the site so as to provide a windshield again soil erosion.

b) **Noise pollution**

Workers directly exposed to noisy equipment construction will be provided with Personal Protective Equipment (PPE) such as ear muffs.

c) **Litter control**

As part of efforts to avoid windblown litter, the operator will require the transporters entering the site to cover the loads to prevent litter from blowing off.

d) **Leachate Minimization**

The amount of leachate will be minimized by providing daily, intermediate, and final covers. The surface of the cover shall be compacted, smoothed and sloped so that they divert precipitation away from the waste pile and thus minimize the amount of leachate generated.

e) **Gas Management System**

In order to extract the most efficient gas from the disposal facility, the Council shall engage the contractor who has the expertise and experience in designing biogas digesters who shall install a portable biogas plant on site and the gas collected will be used for heating and lighting on site.

f) **Dust disturbances.**

To prevent lifting of dust in working areas, dust suppression shall be done using water bowser whenever feasible and economically viable. The frequency of spraying will depend on how intense the activity will be and shall be determined in the field.

g) **Erosion of soil**

A natural vegetation cover of 12 meters width around the facility will be left as a natural barrier to help reduce erosion.

h) **Occupational and public health hazards**

All workers will be provided with proper personal protective equipment (PPE) and regular medical check-up will be conducted to all assigned workers. All workers will have to undergo a health and safety induction training and warning signs will be installed to ensure that both the public and the staff are protected from hazards.

i) **Fires**

Compacting of waste to a relative thin layer will be done in order to minimize chances of fire outbreaks.

j) **Unpleasant odors.**

The unpleasant odors will be reduced through waste soil cover. Furthermore, all employees will be provided with appropriate PPE.

k) **Indiscriminate disposal of waste**

Proper training and supervision on waste characterization will be conducted. Additionally, construction of sorting bays coupled with sensitizing the community on the importance of separating waste at household level or from the source in order to reduce the quantity of waste being taken to the disposal facility as most of the waste

l) **Contamination of underground water**

Monitoring wells shall be sunk to monitor the possible impacts of the project to the underground water resources. At least 2 monitoring wells will be sunk; these wells shall be installed for early detection of any leaks which may result into underground water contamination.

m) **Surface Water Management**

A drainage system for surface water will be provided in order to minimize the generation of leachate. Continuous maintenance of the system and the diversion of surface waters from the landfill will be undertaken by the Operator on site.

n) **Pest infestation**

Pests will be controlled through proper soil cover of waste and compaction to prevent pest infestation.

o) **Scavenging**

The facility will have a fence installed with an entrance gate in order to prevent the entry of unauthorized persons and scavengers. This will be coupled with the construction of a guard houses for the security staff responsible for manning the disposal facility

Conclusions

Waste materials have the potential to cause adverse environmental impacts during handling, transport, storage and disposal phases. Given the design approach to be used and the existing environmental conditions, it is most likely that the establishment of the disposal facility will have negligible adverse impacts to the receiving environment. The project concept is in line with the Solid Waste Management and Regulation Act No. 20 of 2018.

This report has identified the potential impacts which are likely to be short-lived and are expected mostly during the construction and operational stage of the disposal facility. It is expected that the project will bring about positive environmental benefits wherein impacts are reduced below threshold levels once the disposal facility is in full operation. With the significant environmental issues identified and evaluated, mitigation measures and monitoring plan has been proposed to prevent and minimize the negative impacts and to enhance positive effects.

CHITAMBO TOWN COUNCIL

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Mwiche I. Mudala
Council Secretary

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1.0 INTRODUCTION

❖ Background

Chitambo Town Council was established under the Local Government Act Chapter 281 of the Laws of Zambia. As a Local Authority, the Council has an enormous task of providing sustainable services that range from waste management, land allocation and development control whilst taking into account good planning practices. Local Government Act No. 2 of 2019 and Solid Waste Management and Regulation Act No. 20 of 2018, mandates all Local Authorities to manage solid waste and may undertake this service in partnership or association with another Local Authority, Public Body or Private Entity. Therefore, Chitambo Town Council intends to engage in the construction, operation and maintenance of a disposal facility in the district.

At present, waste generated in Chitambo district is inappropriately disposed of at a borrow pit (temporal disposal site) that is located approximately 18 kilometres from T2/D235 (Mukando) Turn-Off towards Mansa and situated about 100 metres on the south west of D235 road on coordinates; N 8572975.656 and E 0220083.260 as shown in figure 1 below. The site is approximately 0.7 hectares and holds less than 30 tons of Solid Waste so far disposed of. The situation is likely to expose the public to negative health impacts and deterioration of natural ecosystem in the area. Chitambo is also considered as a touristic area and therefore impacts on the natural and aesthetic value may have significant negative implications. Thus, the proposed project is necessitated from the Council's need to dispose waste generated in the district at a designated site.

Figure 1: *Pictures showing borrow pit (current temporal waste disposal site) in Chitambo district. (Field data, 2022)*

The proper collection and disposal of the solid waste in the area is of utmost importance to avoid adverse impacts and will be addressed by the construction of the disposal facility, along with other solid waste management measures. The facility will be designed to serve a total population of approximately 100, 603 (Source: Census of Population and Housing, Preliminary report 2022).

❖ **Project objectives**

The primary objective of the project is to establish a disposal facility in a bid to take care of all the municipal solid waste in Chitambo District.

The specific objectives are as follows;

a. To ensure proper solid waste management in the district,
b. To improve the social welfare and public health of residents of Chitambo District.
c. To minimise the amount of waste taken to the disposal facility,

❖ **Project objectives of the Environmental Project Brief**

The main objectives of the Environmental Project Brief (EPB) are as follows:

a. To describe the environmental and socio-economic baseline conditions of the project environment;
b. To assess the potential positive and negative effects of the proposed project;
c. To recommend appropriate mitigation measures that enables to avoid or minimize any undesirable effects resulting from construction, operation and closure of the proposed project.

❖ **Details of the developer**

Developer	**Chitambo Town Council**
Contact person	Mwiche I. Mudala
Position	Council Secretary
Mobile	+260976431515
Postal address	P. O. Box 850016, Civic Centre Chitambo
Email	chitambotowncouncil@gmail.com
Physical address	

❖ **Particulars of shareholders and directors**

Sn	Name	Nationality	Shares	Physical Address
1	Chitambo Town Council	NA	100%	Chitambo Civic Centre, in Chitambo District

❖ **Track record**

Chitambo Town Council was established under the Local Government Act Chapter 281 of the Laws of Zambia. Local Government Act No. 2 of 2019 and Solid Waste Management and Regulation Act No. 20 of 2018, mandates all Local Authorities to manage solid waste and may undertake this service in partnership or association with another Local Authority, Public Body or Private Entity. Therefore, Chitambo Town Council intends to engage in the construction, operation and maintenance of a disposal facility in the district. The proposed construction of a disposal facility is the first solid waste management project that Chitambo Town Council intends to undertake.

- **Total Project cost/investment**

  Chitambo Town Council will invest a total of Five Hundred Thousand Kwacha K500, 000 for all the project components.

- **Proposed project implementation date**

  Chitambo Town Council will undertake the implementation of the project once all the relevant approvals for the project are obtained preferably by October, 2022.

- **Methodology**

  Primary data was collected through site inspection and consultative discussions were held with the District Planning Officer. In addition, semi structured interviews were conducted to find out the major socio-economic activities, land use and facilities around the proposed area. Additionally, environmental characteristics were assessed through observation and literature review. The impacts were analysed in terms of the geographical impacts, frequency, sensitivity, likelihood, duration and severity.

2.0 REVIEW OF RELEVANT LEGISLATION

2.1 Policy, Legal and Institutional Framework relevant to the Project

i. Environmental Management Act No 12 of 2011

The legislative responsibility for EIA is vested in the ZEMA, which administers the Zambia Environmental Management Agency Act (ZEMA) No.12 of 2011. This is the principal Act governing and regulating environmental issues in Zambia. The Act's main functions include the protection of the environment and control of pollution in particular to provide for the health and welfare of people, animals, plants and the environment in general. The EIA Regulation of 1997 requires that an environmental impact assessment be carried out for this kind of development before commencement of the proposed project works.

Relevance: - Implementation of the project is dependent on approval from ZEMA

Compliance: - The project Proponent carried out the EBP study in compliance with the Environmental Management Act.

ii. Environmental Impact Assessment Regulations (SI No. 28 of 1997)

The regulations state that ‚a developer shall not implement a project for which a project brief or an environmental impact statement is required under these Regulations, unless the project brief or an environmental impact assessment has been concluded in accordance with these Regulations and ZEMA has issued a decision letter".

Relevance: Being a project that includes construction of a district disposal facility with potential negative effects. The legislation guides on how the assessment should be undertaken and the scope of assessment.

Compliance: This EPB is being prepared in compliance with the above legal provisions.

iii. Environmental Management (Licensing) Regulations No. 112 of 2013

The regulation provides for air pollution control, water pollution control, waste management and hazardous waste management.

Relevance: The regulations are relevant in that the proposed project shall have potential to pollute the environment. Further, provides for licensing of the operations.

Compliance: the developer shall take cognizance of the need to prevent pollution of the aquatic environment. The proposed assessment is aimed at establishing whether or not pollution of the aquatic environment will occur so as to remedy the situation.

iv. Local Government Act No. 2 of 2019

An Act to provide for an integrated local government system; give effect to the decentralization of functions, responsibilities and services at all levels of local government; ensure democratic participation in, and control of, decision making by the people at the local level; revise the functions of local authorities; provide for the review of tariffs, charges and fees within the area of a local authority; provide for the proceedings of the council and committees; provide for the role of traditional leadership in democratic governance; repeal and replace the

Local Government Act, 1991; and provide for matters connected with, or incidental to, the foregoing

Relevance: - The Local Authority is charged with the responsibility of administration and ensuring that the people of Chitambo District are provided with the necessary municipal services.

Compliance: - The project will ensure adherence to Local Government Act No. 2 of 2019 in managing solid waste.

v. **The Urban and Regional Planning Act No 3 of 2015**

This act governs the zoning and location of the project. This piece of legislation provides for the appointment of planning authorities whose main responsibilities are preparation, approval and revocation of development plans. It also provides for the control of development and subdivision of land.

Relevance: Careful consideration of the planned land use for the proposed area was considered in order to comply with the requirements of this Act.

Compliance: Operations will be done within the confines of the planned area.

vi. **Public Health Act Cap 295**

An act to provide for the prevention and suppression of diseases and generally to regulate all matters connected with public health in Zambia.

Relevance: The project poses risks to public health matters of both the workers and the community.

Compliance: - The disposal facility will be in conformity with the Public Health Act cap 295 of the Laws of Zambia due to the fact that it will provide an ideal final disposal site for waste which will in turn prevent the occurrence of various forms of nuisances.

vii. **Occupational Health and Safety Act 36 of 2010**

An act to establish the occupational health and safety institutes and provides for its functions; provides for the establishment of health and safety committees at workplaces and for health, safety and welfare of persons at work; provide for the protection of persons other than persons at work, against risks to health or safety arising from, or in connection with, the activities of the person at work; and provide for matters connected with or incidental to, the foregoing.

Relevance: - During the project implementation, persons involved in construction and operation will be required to adhere to the best practices with regards to occupational health and safety.

Compliance: - The project will ensure adherence to Occupational Health and Safety Act 36 of 2010 to provide for health and safe work environment.

viii. **Solid Waste Regulation and Management Act No. 20 of 2018**

An Act to provide for the sustainable regulation and management of solid waste; general and self-service solid waste services; the incorporation of solid waste management companies and define their statutory functions; the licensing and functions of solid waste service providers, operators and self-service solid waste providers and provide for their functions; the regulation, operation, maintenance and construction of landfills and other disposal facilities; the setting and approval of tariffs for management of solid waste and provision of solid waste services; and matters connected with, or incidental to, the foregoing.

Relevance: - the project proponent intends to construct a disposal facility where solid waste is disposed. The Act provides for the management of solid waste.

Compliance: The project concept implemented in line with the Solid Waste Management and Regulation Act No. 20 of 2018 and will ensure that the provisions are followed.

ix. Water Resources Management Act of 2011

The Water Resources Management Act of 2011 repeals the Water Act of 1949. It was enacted by the Parliament of Zambia to establish the Water Resource Management Authority and, amongst other things, to provide for the management and protection of water resources and its eco-system and to create an enabling environment for adaptation to climate change.

Relevance: The Act safeguards water courses and ground water from pollution; hence the developer will ensure all measures are implemented to prevent any pollution of the underground water.

Compliance: The project shall comply with the provisions of the Act in getting the necessary water rights it may require.

x. Forest Act No 4 of 2015

The Act provides for establishment, gazetting and degazetting of forests. It also provides for monitoring, forest inventories, management and regulation of forest areas and forest products, particularly national and local forests.

Relevance: Some trees will be cut during site clearing and actual project execution.

Compliance: Clearing will be restricted to project site.

xi. Workers Compensation Act No.10 of 1999

This is a social security Act which has provisions for employee compensation in case of injury or death of an employee whilst at work. It is a requirement under this Act that all employers register their employees with the workers Compensation Fund and make periodic subscriptions for compensation of their employees.

Relevance: - Whenever formal employment is provided, it is a requirement by this Act that such workers must be registered and financial contributions made by the employer for their compensation in case of an accident or death while at work.

3.0 DESCRIPTION OF THE PROJECT

3.1 Location

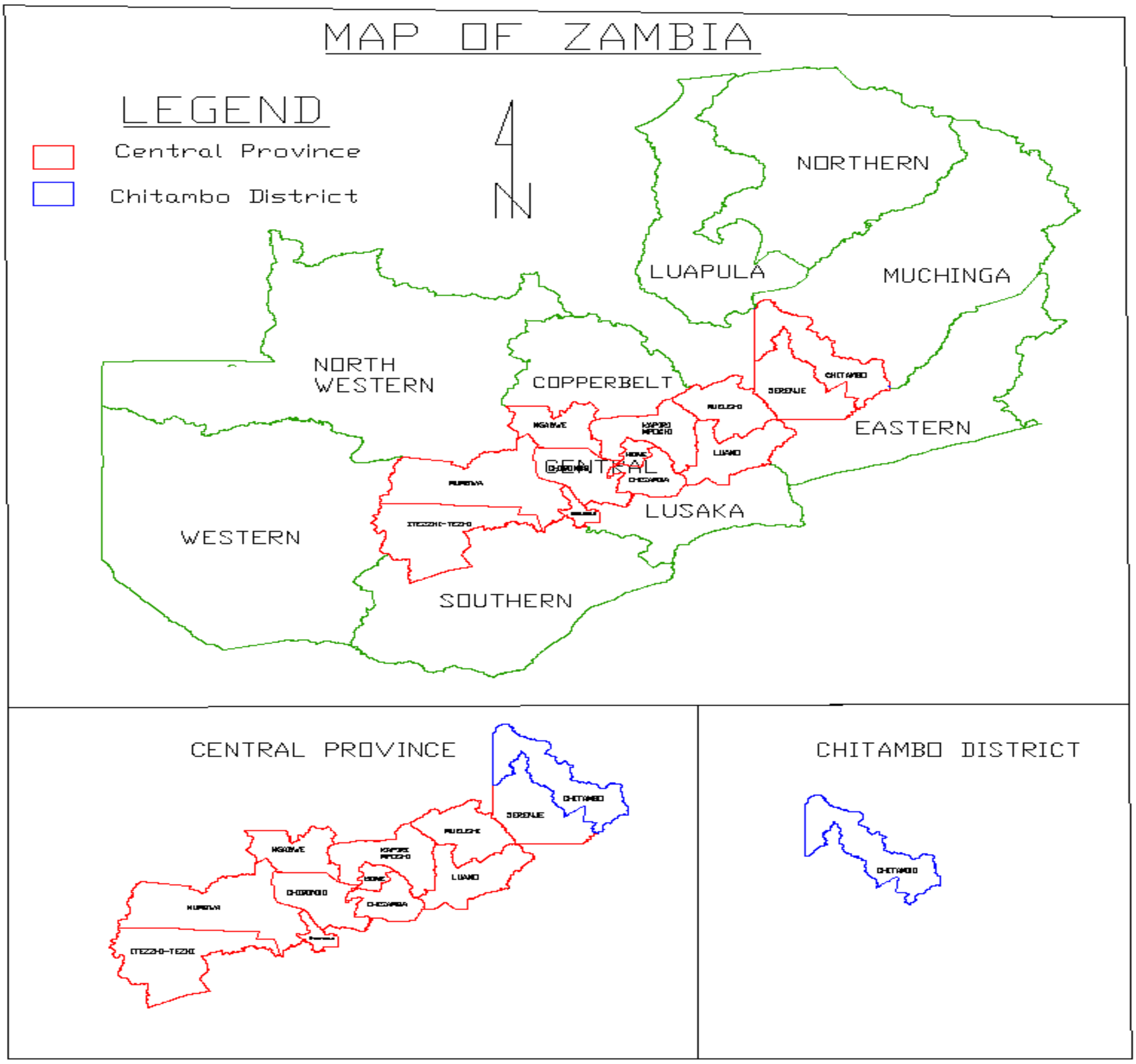
The proposed project is located in Chitambo District of Central Province of Zambia in Muchinka area of Chief Muchinka's Chiefdom. Chitambo District is one of the Twelve (12) districts in Central Province of Zambia. Chitambo district shares boundaries with Serenje District in the South, Lavushimanda district in the North East, Samfya district in the North-west, Lusangazi district in the East and Democratic Republic of Congo in the west. The project is located in Chitambo District of Central Province, Muchinka area of Chief Muchinka's Chiefdom. The proposed site is accessed through the D235 approximately 12mk from Mukando Turn-Off along T2/D235 and 1.5 km along the gravel road that leads to Chitambo Planned Township, North East of D235. Chitambo district has one constituency called Chitambo constituency with Ten (10) wards namely: Chitambo ward, Muchinka ward, Chalilo ward, Mpelembe ward, Luombwa ward, Chipundu ward, Nakatambo ward, Lusenga ward, Lulimala ward and katonga ward, .

The proposed area covers a total area of 4 hectares (200m by 200m) and the proposed disposal facility is located approximately 1.58Km north east of Chitambo planned administrative area, depicted in figure 5 below. The boundary for the proposed site is defined by the following corner coordinates:

Table 1: Proposed site coordinates

Proposed Site Coordinates		
UTM 33		
DATUM: ARC 1950 ZONE 36S		
Point	**N**	**E**
A	8571300.199	224423.1
B	8571234.346	224612
C	8571423.193	224677.8
D	8571489.046	224489

Figure 2: Map of Zambia



Source: Planning Department, Chitambo Town Council (2022)

Figure 3: Point location of the proposed disposal facility in Muchinka Area Chief Muchinka in Chitambo District

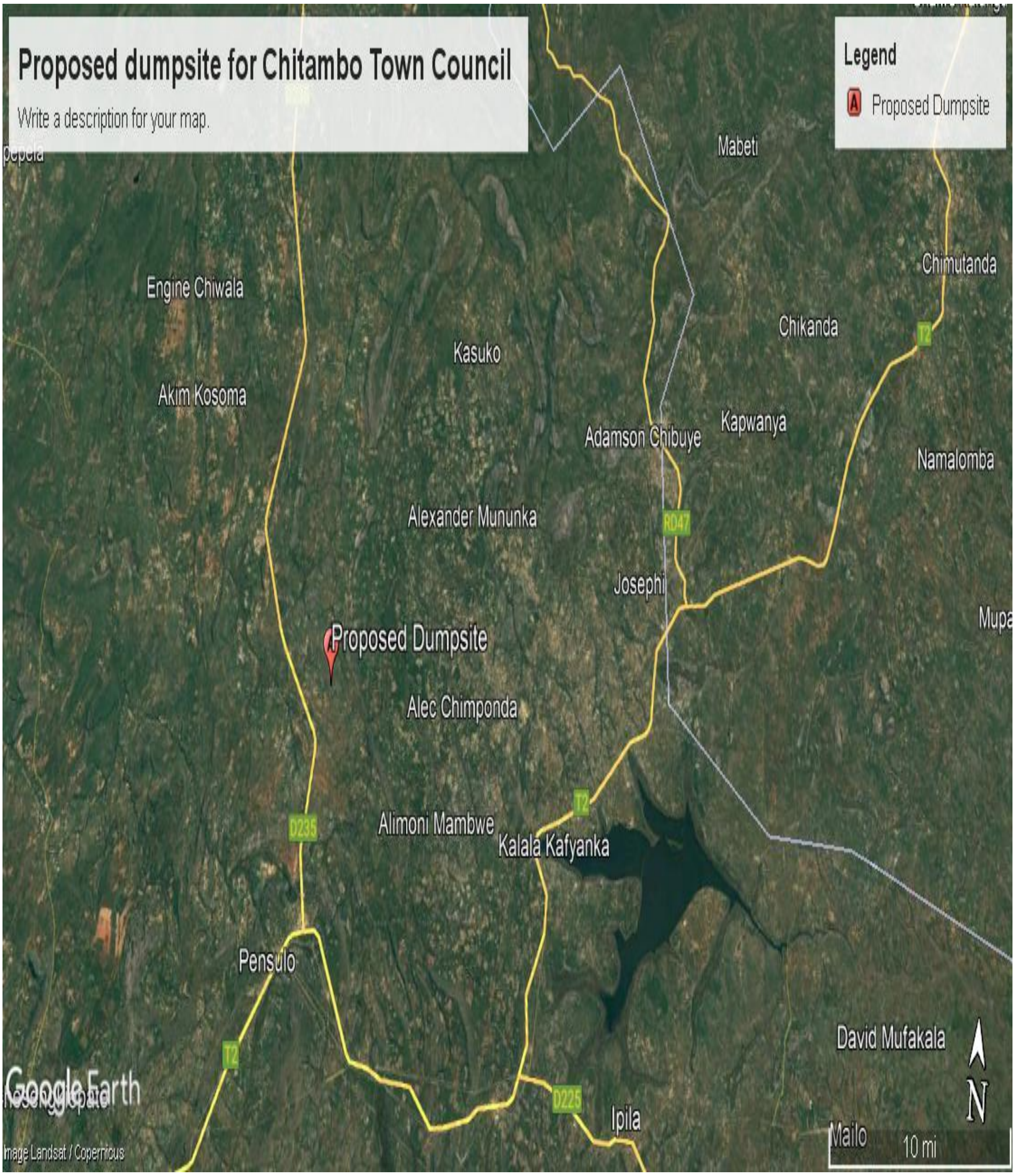
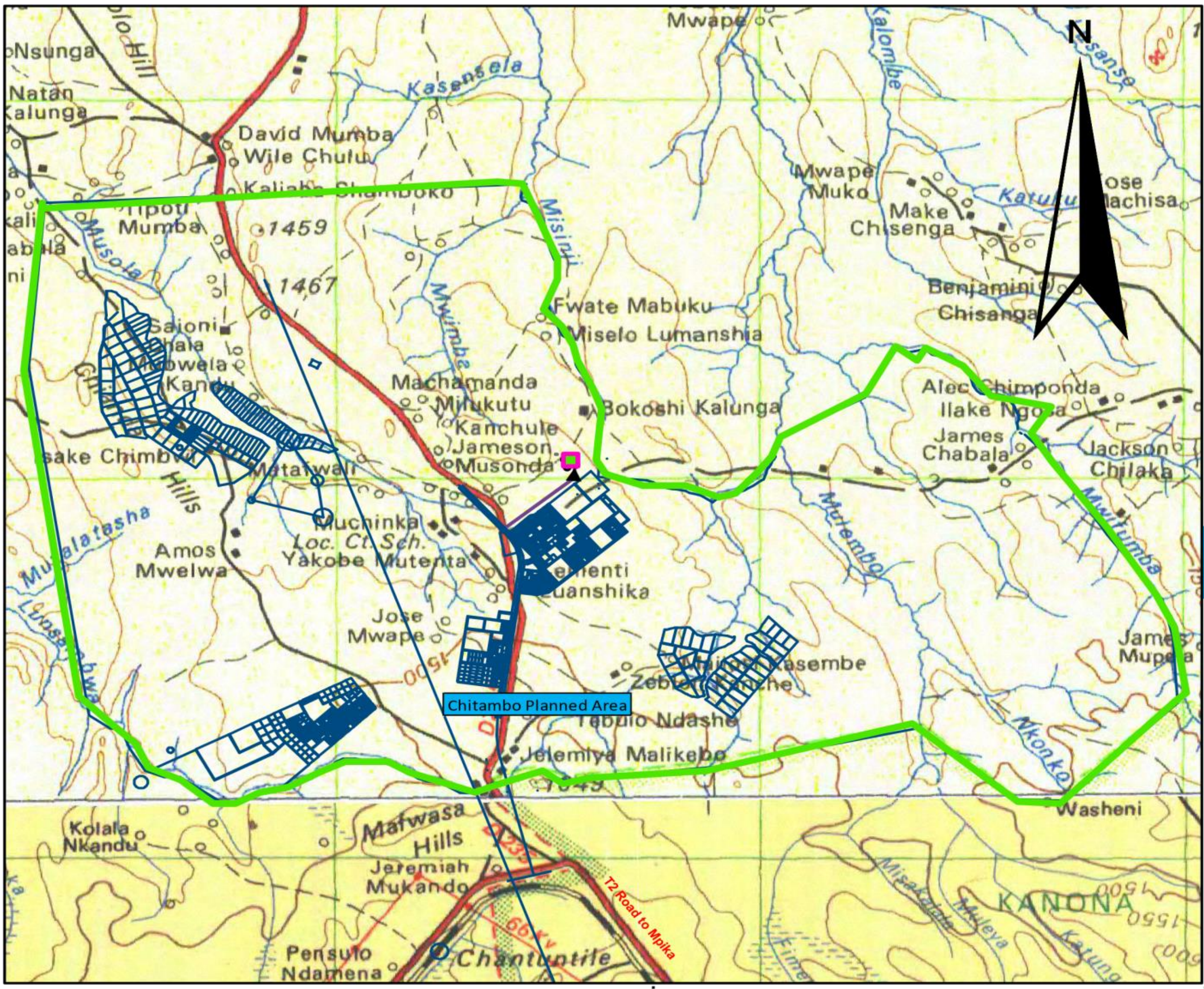


Figure 4: Location Site Map for the Disposal Site in Muchinka Area

Chief Muchinka in Chitambo District



LEGEND

Township boundary

Proposed Dumpsite

Access Road

SCALE 1:150000

Source: *Planning Department, Chitambo Town Council* (2022)

Figure 5: Proposed Site

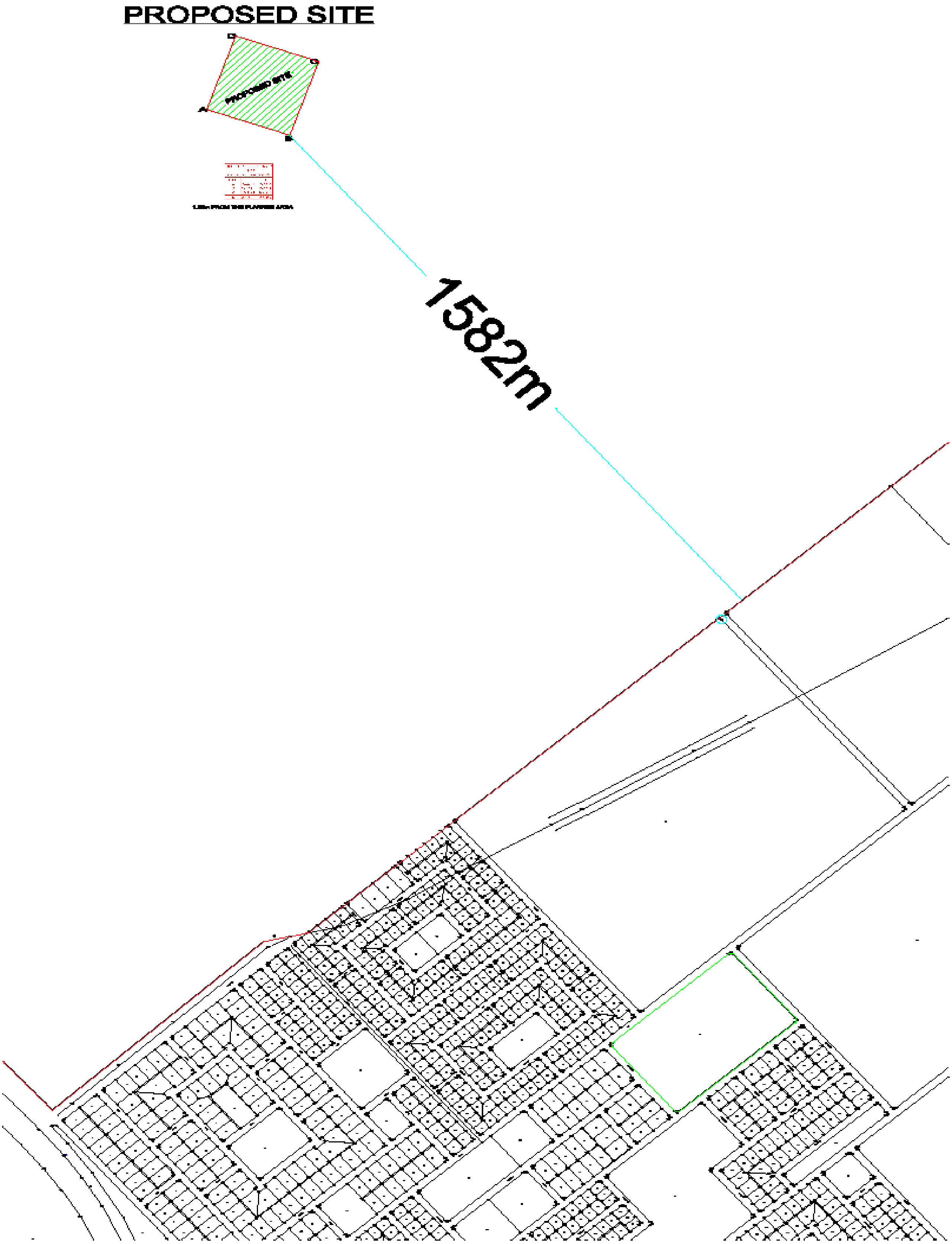
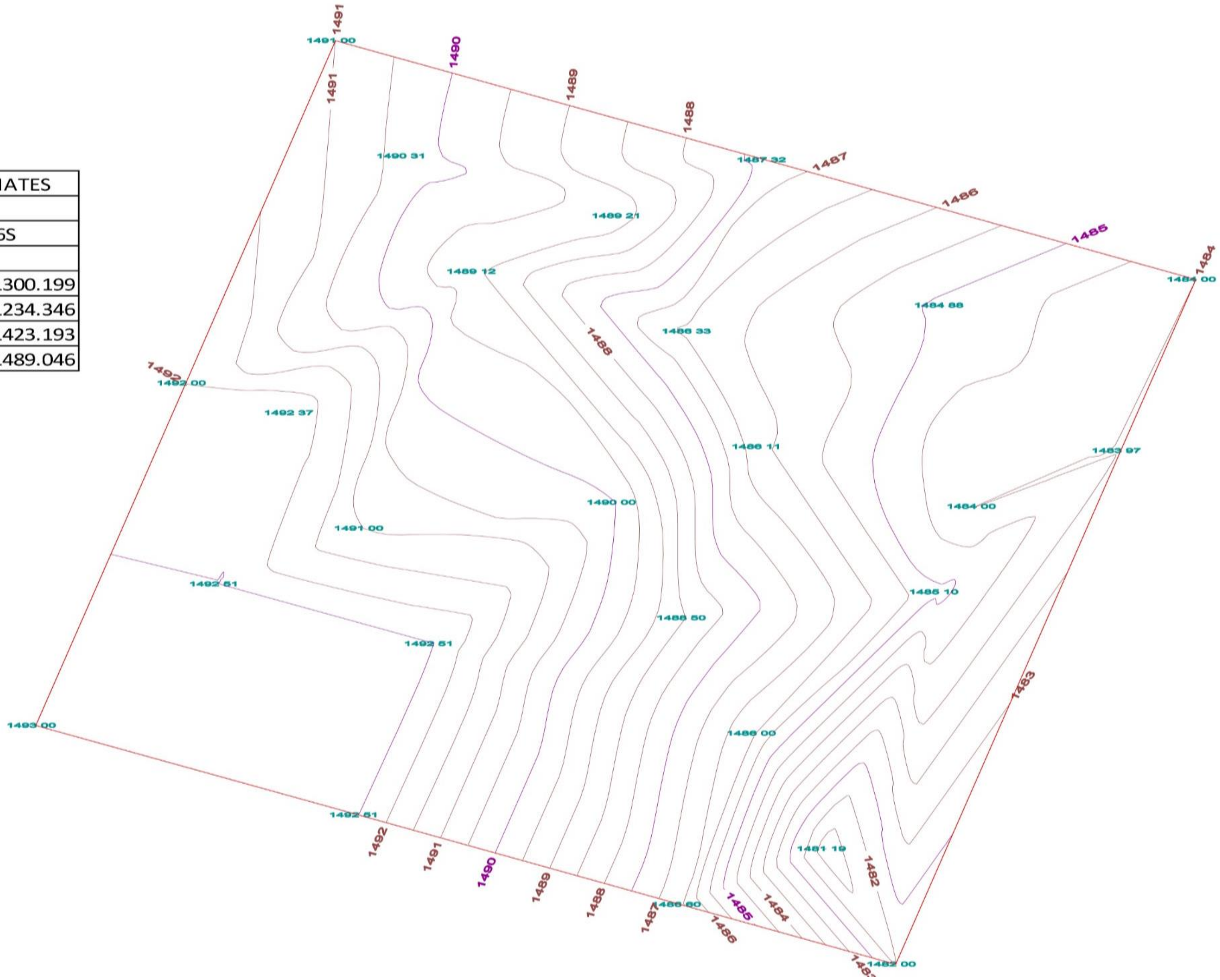


Figure 6: Topographic Map

PROPOSED SITE CO-ORDINATES		
UTM 33		
DATUM: ARC 1950 ZONE 36S		
CODE	E	N
A	224423.1	8571300.199
B	224612	8571234.346
C	224677.8	8571423.193
D	224489	8571489.046



3.2 Nature of the Project

a. Raw materials

During construction the raw materials will include;

- Machinery (excavators, dump truck and compactor)
- Fencing wire
- Construction materials for the following facilities
  - ✓ guard house
  - ✓ Gas vent
  - ✓ Monitoring wells
  - ✓ Access road
- Gravel and clay

During operational phase the raw materials will include;

- Machinery
- Gravel for waste cover
- General waste such as but not limited to; plastics, paper, agricultural waste (crop residue), domestic waste, packaging materials, metal.

b. Process and technology

The full size of the proposed project site is 4 hectares. About Twelve Metres (12m) ring road after which the site will be segmented into four (4) equal parts quadrants with the dimension of 88m by 88m. Two gates will be provided on the southern boundary, gate one as an entrance and gate two as exist in order to avoid traffic congestion. Waste disposal will begin with the first quadrant up to the fourth one in a clockwise direction. In addition, two guard houses will be provided adjacent to gates one and two respectively.

The basic technology behind the proposed project is typically the Multi Barrier approach using the natural barrier (base formation) to ensure a long term, environmentally sound disposal solution using two layers of clay and gravel. Low permeability clay of about 500mm and gravel of about 150mm will be compacted to achieve the minimum permeability as shown on figure 8 below.

Figure 7: Site plan for the proposed disposal facility.

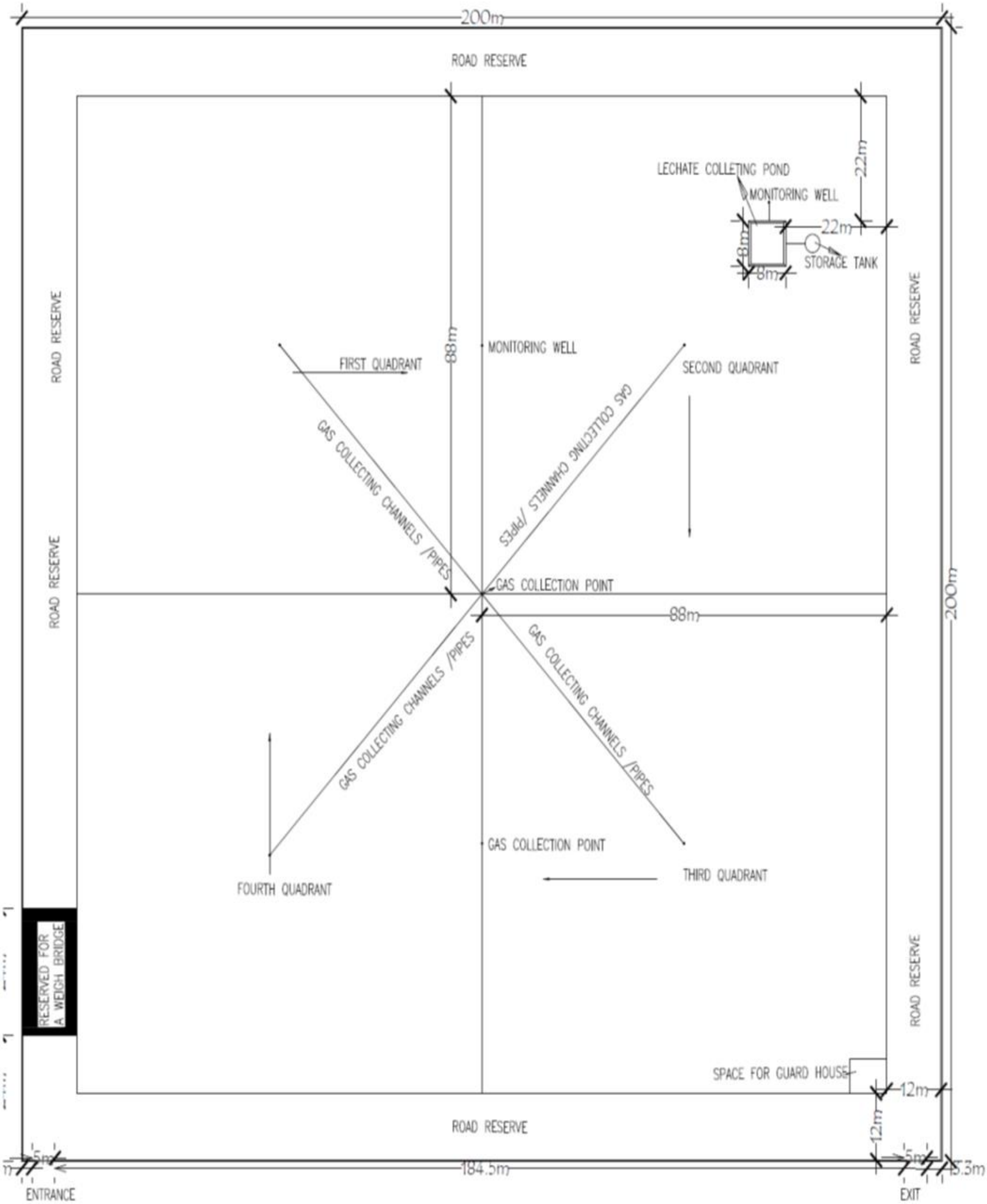
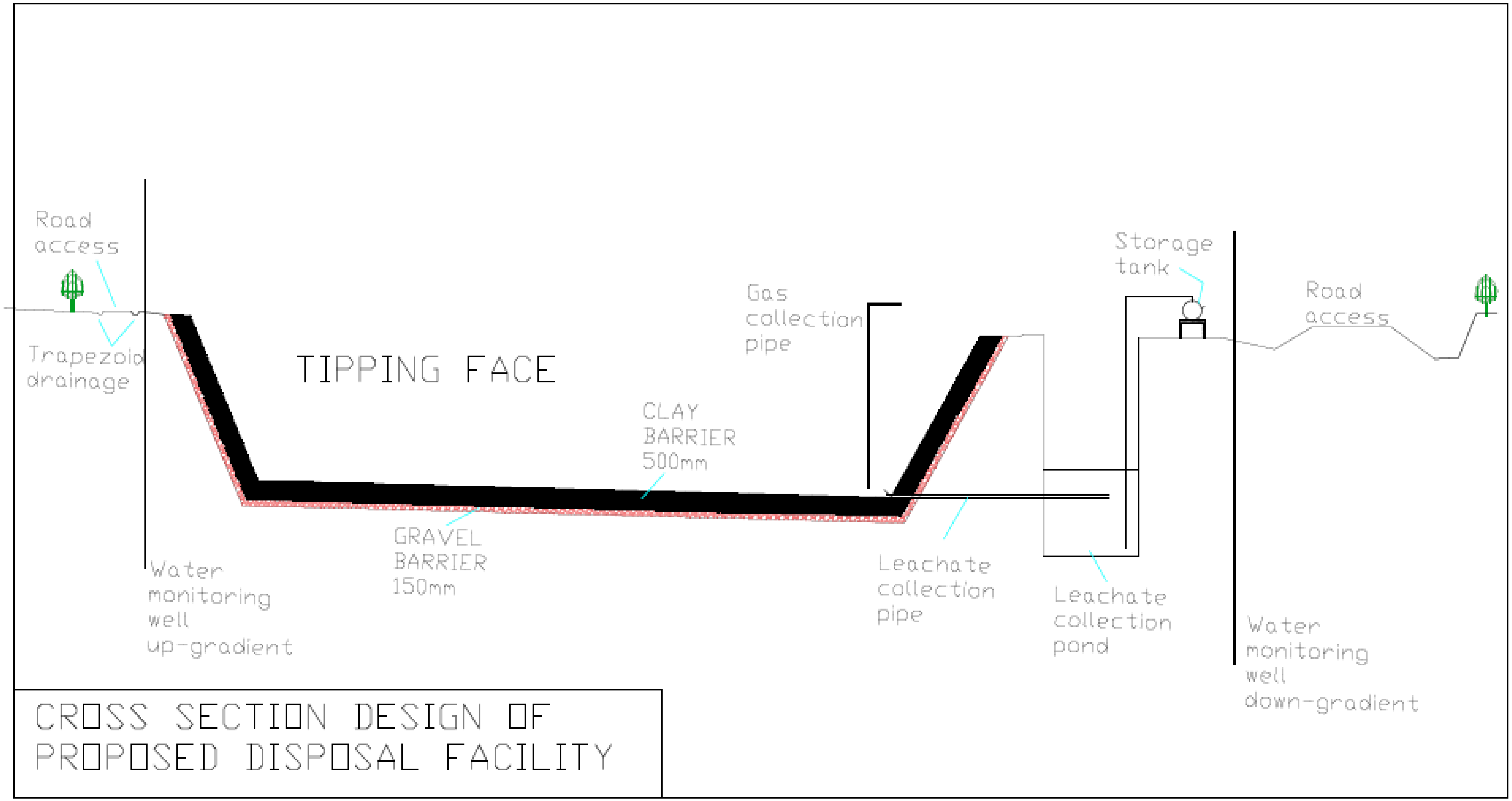


Figure 8: Cross Section Design of the Proposed Disposal Facility



c. **Waste input**

Different types of wastes are generated by commercial, residential and trade enterprises in Chitambo. The different types of wastes are described further as follows:

i. **Packaging Waste**

This waste includes plastic bags, plastic bottles, carton box, perforated aluminium foil.

ii. **Commercial /Trade Waste**

Waste from offices, shops, lodges, restaurants and garages. Commercial waste includes various paper and plastic packaging materials from retail outlets, food waste and packaging from restaurants and hotels, paper from offices, and automotive parts (i.e. metal and plastic parts) and packaging from garages.

iii. **Household and Institutional Waste**

Waste from dwellings, schools government offices and hospitals. Household waste generally consists of food waste, paper, plastic packaging, containers used for a range of uses for food, cleaners and clothes. Institutional waste from schools and government offices and consist of paper, cardboard, food waste, and plastic packaging.

d. **By-products**

- ✓ Dust
- ✓ Compost
- ✓ Leachate
- ✓ Gas

e. **Waste deposition capacity**

The estimated initial rate of waste deposition for the proposed facility is approximately 5 tonnes per day, translating to the ultimate capacity of 36, 000 tonnes the entire life cycle and the waste generation area has an expected growth rate of about 2%.

f. Project lifespan

Chitambo Town Council intends to establish a solid waste dumping facility in the project area which will be operational for the next 20years commencing once all the relevant approvals for the project are obtained.

3.3 Main activities

The proposed project will be implemented in three stages namely; preparation Phase, operational phase and decommissioning phase as shown in the table 2 below.

Table 2: Main activities

SN	PHASE	ACTIVITIES
i.	Preparation phase	Setting out
		Clearing and grubbing
		Excavation and base formation
		Compaction and leveling
		Construct of guard house
		Drilling of monitoring wells
		Drainage creation/ leachate control system
		Construction of the access road
		Fencing
		Installation gas management system
		Installation of weigh bridge
ii.	Operation phase	Provision of Equipment
		Safety training
		Site Security
		Transportation of waste
		Incoming waste procedure
		Waste placement (disposal)
		Fill Sequence
		Compaction
iii.	Decommissioning phase	Removal of all re-usable items
		Backfilling
		Compacting
		Re - vegetation

i. PREPARATION PHASE

A 4-hectare plot was considered to be the site of the disposal facility and its associated facilities. Approximately 25% of the total allocated area will be opened for development and prepared for the establishment of the disposal facility and its associated facilities. The remaining 75% will be used in phases for future expansion.

Figure 9: Picture of the partial proposed solid waste disposal site

The following activities will be conducted in support of the functional requirements of the facility;

a) Setting out

This activity will involve establishing location points for the site boundaries. The activity will be used to stake out the exact position of the proposed project to ensure that the construction is done within the legal boundary.

b) Clearing and grubbing

This activity will involve the removal of vegetation in preparation for construction activities. Clearing of vegetation will be restricted to areas that will be necessary for project facilities.

c) Excavation and base formation

This activity will involve cutting and filling of the land in order to attain the designed ground elevation. During the process, areas above the design elevation shall be cut and spoils shall be used to fill areas below the designed elevation. The area will be free of any obstructions in areas where the general design elevation will be attained. Cut and fill activities will be carried out using heavy mechanical equipment. The proposed disposal facility has a total area of 200m by 200m (4 hectares) available for excavation cover and its associated facilities. The average depth of excavatable cover will be 1.25m.

d) Compacting and levelling

The ground will be compacted until the desired base capacity is attained. This will ensure that base for disposal facility will not be subjected to subsidence. To reinforce the natural barrier against leachate, the design will integrate the use of at least 50cm of clay soil and 15cm of gravel for compaction.

e) Drilling of Monitoring wells

Monitoring wells will be established to monitor the possible impact of the project to the groundwater resources. At least two (2) monitoring wells will be established, one monitoring well will be established on the northern part of the site and the other on the southern part of the project site. These wells will be installed for early detection of any leaks which may result into groundwater contamination.

f) Construction of a guard house

Two self-contained guard houses (6m x 6m) will be constructed and be used by the staff that will be in charge of the disposal site to control the disposal of waste and monitor scavenging activities.

g) Construction of the Access road

A twelve meter access road will be constructed to give access to the disposal facility and for maintenance to the tipping face area. The roads will be utilized by the operator to service site and equipment on site as well as to haul materials such as daily cover.

h) Fencing and Site Entrance

A fence with height of 2 meters from the ground and an entrance gate of 5 meters width will be installed in order to prevent the entry of unauthorized persons, potential scavengers and shall serve as a final barrier to wind-blown litter. A warning sign shall be prominently displayed at the entrance to the site. The sign shall warn the public that this is the entrance to the Chitambo waste disposal Site. The sign shall state that only authorized vehicles and persons are permitted.

i) Drainage creation/ leachate control

Discharge points will be identified and upon which trapezoid drains will be created to divert and minimize the risk of runoff water. Underground pipes will be installed at appropriate road crossing order to protect the access roads from erosion. The base of disposal facility will typically be designed in such a way that the base will be sloped to a low point where leachate will be collected and removed from the site. A leachate pipe network will be installed on the downstream to collect and channel leachate to a leachate concrete pond thereafter pumped into a storage tank. Leachate collected at the disposal facility will be transported in consultation with Lukanga Water and Sewage Company to their sewage ponds in Serenje District.

j) Installation gas management system

Gas collection point (vent) will be installed at the centre of the facility to collect and channel all gas from the mass to the centre using metal pipe. In order to extract the most efficient gas from the disposal facility, the Council shall engage the contractor who has the expertise and experience in designing biogas digesters who shall install a portable biogas plant on site and the gas collected will be used for heating and lighting on site.

k) Installation of weighbridge

The weigh bridge shall be installed at the entrance to the site to weigh waste vehicles on arrival in order to record and verify the load data.

ii. OPERATION PHASE

Once the facility is operational, it will require a minimum of about 12 employees in its operation. The following manpower positions will be needed to operate the facility and other administrative activities;

- ❖ Site manager
- ❖ Equipment Operator
- ❖ General workers

The following machinery will be used to operate the proposed disposal site;

- ❖ Dump Truck
- ❖ Dozer
- ❖ Waste Compactor.

Hours of Operation

The hours of operation for the Chitambo waste disposal site will be as follows:

Monday to Friday	07: 00hours to 17: 00 hours
Saturday, Sunday & Holidays	07: 00 to 13: 00 hours

The hours of operation will be posted at the entrance to the landfill site.

The following activities will be conducted during the operational phase

a) Provision of Equipment

The site manager will ensure that all the workers shall be provided with all necessary equipment to ensure the safety of personnel on any possible health risks and accidents. The following equipment is to be used.

i. Personal Protective Equipment (PPE)
   - Hard hat

- Safety boots (with steel toe and sole)
- Durable rubber gloves
- Eye protection (goggles or safety glasses)
- Dust masks (should provide suitable respiratory protection)
- Overalls
- Safety vest

ii. Safety Equipment
- Fire extinguisher
- First Aid kit

iii. Inspection Equipment
- Inspection forms
- Rake, shovel, small spade
- Suitable containers to store samples
- Camera
- Measuring tape
- Disinfectants

b) Safety training

Safety training will be to be given to new personnel and as a refresher to current site operators. Safety procedures for waste inspection will be reviewed on a regular basis. Operators will be informed of potentially new materials suspected in the waste and preventative measures required when inspecting loads by the Health Inspector. Operators performing waste inspections will be provided with information in new material ban/waste reduction programs and the level of compliance required for each program. Regular monitoring and system checks will be conducted by the Health Inspector to ensure efficiency and to minimize the incidence of accidents.

c) Site Security

The Council will ensure the site is secure and will provide security patrol around the disposal site.

The Operator will be responsible for:

i. Disposal facility entrance security;
ii. On-site office (once installed);
iii. On-site vehicles and equipment; and
iv. Reporting of security incidents to Public Health Unit. \

d) Transportation

Waste collection trucks will deliver wastes from the waste collection points. The proposed waste collection point will include;

- All the markets in the district namely Mukando turn off business area, Chansa market and Chitambo market
- Private institutions
- Public institutions and
- Residential areas

e) Incoming Waste Procedures

i. Waste Inspection

There will be two occasions for inspection of waste material brought to the site for disposal at the Chitambo disposal site namely;

a. A preliminary inspection of each load of waste brought to the site;

The Council will post at the entrance of the site, a signboard that indicates what wastes are acceptable at the dumping facility and which types of wastes are not acceptable. To enforce the disposal of only acceptable waste, each load of waste entering the site shall undergo a cursory level of inspection. The operator will carry out the preliminary inspection by;

- Asking the customer the type of waste they wish to dispose
- The origin of the waste
- Informing the customer of unacceptable wastes and recyclables
- Brief visual preliminary inspection of load

If the preliminary inspection clearly indicates that a load contains unacceptable waste, the operator will inform the Customer that the waste cannot be accepted at the site and may refer the driver to alternate to the approved facilities.

b. Spot Check inspection

The Operator will perform regularly scheduled spot check inspections of waste at the Chitambo disposal site as part of the regular activities of operating the site. One of the main purposes of conducting regular spot checks of waste is to enforce the acceptable waste categories for disposal at Chitambo disposal site and thereby minimizing the environmental and health impacts of disposing of unacceptable wastes at the site.

ii. Weight Estimates and Recording

Weighing and recording the quantities of incoming waste will be conducted at the entrance using weighbridge to estimate the quantities the dump truck and recorded log book.

f) Waste placement (Disposal of waste)

After carrying out formal entrance inspection, the trucks will be ushered to the appropriate disposal area. The precise registration of waste delivered will be carried out through the proper documentation of the type and volume of waste and the specific location in the disposal site where the waste will be deposited. Daily operations at the Tipping Face consist of the following primary tasks:

- Removal of Daily cover
- Preparation of the tipping face and the site road and relocation of Direction Signs
- Notification to the site manager when ready to accept Refuse Collection Vehicles
- Directing Refuse Collection Vehicles at the Tipping Face
- Spread Waste to 0.5m thick, maintaining slope less than 5:1

- Compact Waste to required density (usually 3 or more passes with compactor)
- Arrange for following day's tipping location

g) Fill Sequence Plan

The first layer of waste shall be placed beginning from the end of the site and extending southwards towards the main access road. Each lift will be placed in strips of 10 to 15 meters width starting at the north end of facility and parallel to the north end of the disposal facility. Waste filling will proceed southwards throughout the width of the site, which will allow the subsurface soils to consolidate uniformly and promote the stability of the landfill.

After the first lift of waste is placed over the entire site to the specified height, the second lift of waste shall be placed starting again at the end of landfill. The second lift at the northern end of the landfill, will allow time for recently placed waste to provide stability to the underlying ground. The waste transportation road constructed for the placement of the initial lift will be used for vehicle movement during the second lift. This plan of filling the site shall be applied in placing all subsequent lifts.

h) Compaction

After disposal, a waste compactor will then spread and compact the waste in relative thin layer at a convenient time.

iii. DECOMMISSIONING PHASE

Once the last quadrant is fully utilized, final closure will commence. The activities will include removal of equipment, then the site will be backfilled and landscaped, fitting to the surrounding environment. The existing buildings will be demolished and the area will be landscaped and re-vegetated in accordance with the legally set standards.

4.0 PROJECT ALTERNATIVES

The project team investigated a number of project alternatives for the major project components. This section presents the major project findings and justification for the proposed project.

a. Project need

This option means there is need to implement a proposed project. Otherwise, indiscriminate disposal of municipal waste will result in compromised scenic beauty of the district, which ultimately would culminate in communicable diseases.

b. Do nothing alternative

This option means that no facility will be constructed to address the potential environmental and socio-economic impacts relating to indiscriminate disposal of solid waste in the district.

Reason for disqualification

Do nothing option would greatly affect the construction of a solid waste disposal site. The option would deprive the local people of the environmentally sound solid waste disposal that would ensure capacity for the disposal of wastes in line with solid waste management regulations.

c. Site Alternatives

Two alternatives were considered:

option 1: This option entails the current site (borrow pit) being used for waste disposal that lays approximately 18 km from T2/D235 (Mukando Turn-Off) as one drives towards Mansa and situated about 70 metres on the South-west side of the road. The site is estimated to be 0.7 hectares and holds less than 30 tons of Municipal Solid Waste deposited so far. Another landmark is a swampy area in the South-West direction of the said site.

Option 2: This option entails a site which is approximately 12 km from T2/D235 (Mukando Turn-Off) and 1.5 km north east of D235 road.

Option 2 is more suitable option on which to develop the solid waste disposal facility. The site is characterised by a strong layer of loam soil an ideal natural barrier. This is complimented by a deep groundwater aquifer of about 60m. The area is located on the north east of the township; hence there are no settlements adjacent to the proposed disposal facility. Additionally, there are currently no artificial activities on site; hence it would be easy to implement the project as planned

Reasons for disqualification:

Option 1*:* – is a borrow pit where gravel is currently acquired for feeder road maintenance. Additionally, the site is near the main road (D235) and near a swampy area.

d. Design Alternatives

Two alternatives were considered as options for the design. The options analysed include;

Option 1: Open dumpsite

Open dumpsites are not regulated; hence they are susceptible to open burning, scavengers and disease vectors.

Option 2: Controlled disposal facility

Controlled disposal facility are subject to basic control mechanization such as the presence of an authority figure on site, control of access to the facility, and basic waste handling techniques to ensure control and consolidation of the total body of waste. As well as segmenting the site into four (4) equal parts

Option 2 was found to be much more favourable; Controlled disposal facility was considered to be a better design due to the fact that the design does not promote open burning and chances of scavengers accessing the site are likely to be minimal. Further option 2 was considered as it would prioritise segmenting the disposal facility into four (4) equal parts. Each segment will fully be utilised before opening up the next one.

Reasons for disqualification:

Option 1: Open disposal facility

Open dumpsites are normally associated with air pollution due to open burning. It is easily accessible by scavengers who may significantly be exposed to disease vectors; hence the option was discarded.

e. Waste Transportation Alternatives

Only one option was considered for the transportation waste to the disposal facility.

Option 1: Waste transportation by road

Option 2: Waste transportation by rail

Option 1 was alternative considered as a feasible alternative for transportation of solid waste since the site can easily be accessible by road. The proposed project is approximately 13.5km from Mukando Turn-off. The site can easily be accessible from Mukando turn off through Mansa Road for the first 12km and 1.5km gravel road off Mansa Road.

Reasons for disqualification

Option 2 was disqualified because the site under consideration is located approximately 13.5km from Tazara rail line.

f. Material Alternatives

Fencing

Option 1: Wall fence

This option implies that a wall fence will be built around the project site using concrete blocks.

Option 2: Wire fence

Option 2 suggests use of a wire (medium mesh) when fencing the project site. The option was considered more favourable and cost effective than option 1.

Impermeable Barrier

Option 1: HDPE liner

This option implies the use of High-Density Polyethylene (HDPE) liner to create leachate impermeable barrier.

Option 2: Clay and gravel

Option 2 suggests use of clay and gravel as a natural barrier to reduce and minimise permeability of leachate.

This option 2 was considered more favourable than option 1.

Reasons for disqualification:

Option1 was discarded because it proved to be more costly compared to the option 2.

g. Justification for the selected option(s)

The selected alternatives were critically analysed in order to ensure a practical implementation of the project. Financial implications among other factors were considered in all the alternatives in order to avoid elements that might be counterproductive.

h. Preferred alternatives

Based on the above analysis, the preferred alternatives for the construction of a solid waste disposal are listed in the table 4 below:

Table 3: Preferred alternatives

SN	Alternative	Option
1	Project Need	Lone option
2	Site	Proposed Site 2
3	Design	Controlled Disposal facility and segmenting the site into four (4) equal parts
4	Waste Transportation	Road
5	Materials	• Wire Fence, Clay and Gravel

5.0 DESCRIPTION OF THE BASELINE ENVIRONMENT

5.1 Ecological Resources

a. Fauna

The proposed area does not have macro mammals due to human activities in the area. Majority of animal species are rarely found in the project area. Most importantly, there are no endangered species in and around the proposed project site.

b. Flora

The district has indigenous vegetation type and is predominantly composed of Miombo woodland of both primary and secondary regeneration which include the following common tree species Brachystegia Species, Parinari Curatellifolia Julbernadia Paniculata, Isob0erlina Angolensis, Faurea Saligna, Erythrophleum Africanum, Monotesi Africanum, Pterocarpus Angolensis (Mukwa), Swartzia Madagascariensis, Strychnos Cocculoides, Protea Gaguedi, Pericopsis Angolensis And Uapaca Kirkiana /Nitida. The Proposed Site Is Relatively Stocked With Secondary Indigenous Tree Species With Average Diameters Ranging From 5cm To 10cm And Average Tree Heights Ranging From 2m To 5m.

5.2 Geology

The project area lies in the Irumide Belt (De Waele, 2009. This is a Mesoproterozoic terrain of deformed basement and folded supracrustals, which occurs along the southern margin of an Achaean/Palaeoterozoic unit called the Bangweulu Bloc in Zambia.

5.3 Hydrology

Chitambo district has three major rivers namely Luombwa, Luapula and Mulembo rivers. Chitambo is also drained by a number of streams such as Musangashi, Chitikilo, Njelele, Mpulumba, Lusenga, among others. Some of these rivers are seasonal and therefore are dry most parts of the year.

5.4 Climate

Chitambo district has a tropical type of climate**.** The annual average temperature ranges between 10° C and 30° C. The lowest recordings are during the cold season (May-July), where temperatures may fall below 10° C. On the other hand, the highest temperature recordings are during the dry season (August-October). The district has a rainfall pattern of between 1200mm and 1800mm in a season which usually runs from November to March/April. The rainfall pattern is influenced by moist Congo air mass making the district a high rainfall Zone.

5.5 Landscape and topography

The proposed project site is flanked by relatively hilly and flat land giving an excellent scenic view of an overall district. The proposed project is 1453 metres above sea level.

5.6 Land use

a. Forests

Chitambo District has a total of three forests, two of which are local forest reserves namely Mulembo and Musola with Kanona being under national status with a total hectarage of 55,547. The forests are primarily conservation areas for environmental stability which include protection of water catchment areas, wildlife habitats, cultural sites and fragile soils.

b. Game management area

The Kafinda Game Management Area covers about 3,805.5km^2. It is the sanctuary for wild life.

c. District administration

The District Council Planning area is 30,000 hectares, which has been planned for residential, commercial, institutional, small holdings, industrial infrastructure investment and other ancillary uses.

5.7 Air quality and noise

Air quality in the area is generally good and within the local legislative limits as there are no industries that can cause air pollution. However, during the dry part of the year, bush fires may compromise on the amount of Carbon Monoxide discharged into the atmosphere and this normally occurs between August and October each year. The nearest settlements are about 0.5km from the project site. Therefore, Natural noise from birds and crickets predominate the project area.

5.8 Social, economic and cultural issues

a. Traditional Leadership

Chitambo is home of the Lala people whose primary language is Lala. The Lala language like most languages spoken in the Copperbelt and Central Provinces of Zambia is classified as belonging to the Bemba language group. The Lala people, like most ethnic groups in Central, Northern and North-Western Provinces of Zambia are said to have descended from the Luba-Lunda Kingdom in present-day, Democratic Republic of Congo. Chitambo District comprises two chiefdoms namely: Muchinka and Chitambo.

b. Agriculture Sector

Chitambo District is predominantly a rural area and as such Agriculture (Crop and Livestock Production) is the main economic industry as there are no other major industries providing income resource to the local people. The district has large areas of under-utilized arable land, while the productivity from existing land by many farmers is still very low.

c. Tourism

Chitambo district is one of Zambia’s touristic districts. The district hosts two major tourism facilities namely; Kasanka National Park and David Livingstone’s memorial site in Chipundu. In addition, other sites which are rarely visited include Nsalu Caves.

5.9 Built Environment

a. Transport Network

Chitambo district is accessible by road and railway. The great north road (T2), which runs from Lusaka through Kapiri Mposhi to Dar-es salaam in Tanzania and Tuta road off the great North via Samfya to Mansa (D235), Makes travelling by road easier. The Tanzania Zambia Railway line (TAZARA) connects Chitambo to Kapiri Mposhi in the south, Dar-es-salaam, in the neighboring Tanzania in the north. The district has a network of gravel roads some of which become impassable during the rainy season.

b. Health Facilities

The district currently has number of facilities that are fully operational namely; Chitambo Hospital, Mpelembe Zonal Health Center, Chitambo Hospital Affiliated Health Centre, Mapepala Rural Health Centre, Muchinka Rural Health Centre, Chalilo Rural Health Centre, Chipundu Rural Health Centre, Gibson Rural Health Centre. Nakatambo Rural Health Post, Yoram Mwanje Rural Health Post, Mulaushi Rural Health Post, Kafinda Health Post and Mwibula Rural Health Post.

6.0 ENVIRONMENTAL IMPACTS

6.1 Negative Environmental and Socio – Economic Impacts

a. **Loss of biodiversity**
The removal of vegetation will reduce the vegetation on the project site. This will lead to losses of tree species thereby contributing towards climate change.

b. **Noise pollution**
The project may increase existing noise levels in the area and will potentially expose people to excessive noise.

c. **Littering**
The uncontrolled spread of litter at site could be a persistent operating, environmental and public nuisance when not controlled. Wind is the primary cause for fugitive litter around a facility.

d. **Leachate discharge**
Uncontrolled leachate can contaminate surface and ground water resources. Clean up and remediation of these resources could very difficult and costly.

e. **Gas emission**
Landfill gas likely to be emitted is methane gas, which has an imminent health hazard. Pressure gradient moves methane through the soil by convection. The other gases include carbon dioxide (CO_2) and hydrogen sulfide (H_2S). Carbon dioxide and hydrogen sulfide (rotten egg odour) can asphyxiate humans in confined spaces.

f. **Dust emission**
It is expected that fugitive dust generation during construction activities.

g. **Erosion of soil**
Changes in contours due to land preparation, modification of the physical features common to the area due to displacement of soil may possibly increase erosion of soils.

h. **Occupational and public health hazards.**
Personnel involved in transporting and handling waste collection, transfer and disposal can encounter different health and safety hazards.

i. **Fires**
Waste fires pose a serious risk to health, safety and environment and can be difficult to extinguish as it can cause damage to the solid waste disposal facility. The fire can be started by scavengers in a bid to find valuable materials for recycling such as metal.

j. **Unpleasant odours.**
Obnoxious odours are expected at the disposal facility due to certain factors such as the waste to be handled, humidity, temperature and moisture content, among others.

k. **Indiscriminate disposal of waste**
Lack of training and supervision in characterization of wastes may result in indiscriminate disposal of waste.

l. **Contaminations underground water.**
Contamination of the underground water resources is one of the most likely impacts of disposal facility. In case of leakage, leachate may percolate into the ground and contaminate underground water resources.

m. **Surface water contamination**
Waste from operations during extraction process such as oil spills if not properly handled can pollute surface water.

n. **Pest infestation**
Workers can be exposed to pathogens contained in the solid waste such as kitchen waste, diapers and yard trimmings containing animal waste.

o. **scavenging**
Scavenging could be disastrous, particularly health issues that may include headaches, diarrhoea and respiratory problems as well as sustaining injuries from sharp objects.

6.2 Positive Environmental and Socio-Economic Impacts

6.2.1 Socio-economic environment

a. Employment creation

The establishment of a disposal facility will ensure to employ a significant local labour force at the disposal facility, for waste collection, transportation and during construction.

b. Improved aesthetic value

Establishment of a disposal facility will enhance the aesthetic beauty of the district by ensuring that, no waste is indiscriminately disposed. The establishment of the facility is also perceived to improve the current aesthetic status of the site.

c. Increase revenue for the council

Construction of a disposal facility will enhance revenue collection for the Local Authority as it will increase revenue collection through service charges for waste collection.

d. Long-term environmentally sound solid waste disposal

Construction of the disposal

6.2.2 Physical environment

The construction of the disposal facility will result into disposal of waste at a designated facility minimising negative impacts of poor waste disposal and this will ensure capacity for the disposal of wastes consistent with solid waste management with the laid down statutory requirements.

6.2.3 Biological environment

The proposed project will enable the Local Authority to safeguard and improve the ecological character of the natural environment from pollution.

6.3 Evaluated Impacts

Table 4: Social and Environmental risk assessment

SN	Impact	Positive or Negative	Severity	spatial extent	duration	Frequency	Likelihood	Sensitivity
i.	Employment of local labor force	**Positive**	High	Local	Long term	Continuous	Certain	High
ii.	Improved aesthetic beauty	**Positive**	High	Local	Long term	Continuous	Certain	Medium
iii.	Increased revenue for the Council	**Positive**	High	Regional	Long term	Continuous	Certain	High
iv.	Environmentally sound solid waste disposal	**Positive**	High	Local	Lon term	Continuous	Certain	High
v.	Safeguard the natural environment	**Positive**	High	Regional	Long term	Continuous	Certain	Medium

vi.	Loss of biodiversity	**Negative**	Low	Local	Long term	Occasional	Likely	Medium
vii.	Erosion of soil	**Negative**	Low	Local	Short term	Occasional	Likely	Low
viii.	Occupational and public health hazards	**Negative**	High	Local	All project phases	Occasional	Likely	High
ix.	Noise disturbances	**Negative**	Medium	Local	Short term	Occasional	Likely	Low
x.	Dust emission	**Negative**	Medium	Local	Short term	Occasional	Likely	Low
xi.	Contaminations of surface and ground water.	**Negative**	Low	Local	Medium term	Occasional	Unlikely	Medium
xii.	Fires	**Negative**	Medium	Local	Short term	Occasional	Unlikely	Negligible
xiii.	Generation of odors	**Negative**	Medium	Local	Long term	Occasional	Likely	Medium

xiv.	Indiscriminate disposal of waste	**Negative**	Low	Local	Short term	Occasional	Unlikely	Low
xv.	Pest infestation	**Negative**	Low	Local	Short term	Occasional	Unlikely	Negligible
xvi.	Scavenging	**Negative**	Low	Local	Short term	Occasional	unlikely	Low

7.0 ENVIRONMENTAL MANAGEMENT PLAN.

The following mitigation measures have been proposed below for the identified potential impacts in section 6 of this Environmental Project Brief.

a) **Loss of biodiversity**

The Council shall ensure that cutting of trees will be limited to the working face of the site so as to provide a windshield again soil erosion. In addition, there will be re-introduction of local occurring vegetative cover in areas within the site where it will be most appropriate.

b) **Noise pollution**

Noise will be reduced through the establishment of a buffer zone and proper maintenance of machineries and use of low noise equipment. Workers directly exposed to noisy equipment construction will be provided with Personal Protective Equipment (PPE) such as ear muffs.

c) **Litter control**

As part of efforts to avoid windblown litter, the operator will require the transporters entering the site to cover the loads to prevent litter from blowing off. The main control for windblown litter will begin at the tipping face through the rapid spreading and compacting of refuse, and placement of daily cover over all exposed refuse at the end of each working day. To control the spread of windblown litter, the Council will implement the following remedies;

- Maintain a minimum tipping area to provide efficient vehicle offloading and equipment operation.
- Lift height at the tipping face shall not exceed equipment capabilities to spread, compact and cover wastes.

- Ensure the tipping face is adequately covered with a layer of cover material at the end of each working day.
- Maintain trees and grass in inactive areas of the facility to shield windblown litter.
- Perform hand picking of litter around the site, including internal roadways, site offices and fencing at least two times per week.
- Implement fencing to collect litter, as necessary.

d) **Leachate Minimization**

The amount of leachate will be minimized by providing daily, intermediate, and final covers. The surface of the cover shall be compacted, smoothed and sloped so that they divert precipitation away from the waste pile and thus minimize the amount of leachate generated. Drains will be constructed on the final landfill cover, which will convey the collected storm water away from the landfill. Leachate collected at the disposal facility will be transported in consultation with Lukanga Water and Sewage Company to their sewage treatment plant in Serenje District.

e) **Gas Management System**

The Council shall engage the contractor who has the expertise and experience in designing biogas digesters who shall install a portable biogas plant on site and the gas collected will be used for heating and lighting on site.

In addition, the Operator will take appropriate measures to warn anyone entering the disposal facility of the potential hazards associated with landfill gas. The operator will communicate the hazard warning with prominent signs. The staff shall be train landfill staff about the hazards of landfill gas, and ensure facilities are maintained to minimize the potential of gas migration and ignition.

Since methane gas is ignitable, and has no visible flame or odour, its presence is difficult to detect without sensors. As a result of the potential hazards, a “no smoking” policy is to be implemented for all areas of the site, except for designated locations. Signs are to be posted at the landfill entrance indicating the policy and the hazards. Areas where no smoking is to occur include the disposal area, inside buildings and by the gas vent.

f) **Dust disturbances.**

To prevent lifting of dust in working areas, dust suppression shall be done using water bowser whenever feasible and economically viable. The frequency of spraying will depend on how intense the activity will be and shall be determined in the field.

g) **Erosion of soil**

A natural vegetation cover of 12 meters width around the facility will be left as a natural barrier to help reduce erosion. Soil erosion will also be reduced through using effective contouring to reduce slope grades and ditch blocks to minimise runoff water velocity, which will stabilize the soil and help reduce run-off water. In addition, discharge points will be identified upon which trapezoid drains will be created to divert and minimize the risk of runoff water. Underground pipes will be installed at appropriate road crossing order to protect the access roads from erosion.

h) **Occupational and public health hazards.**

All workers will be provided with proper personal protective equipment (PPE) and regular medical check-up will be conducted to all assigned workers.

Public Health Section shall prepare Occupational Health and Safety policy for implementation at the facility. The costs for implementing this will be incorporated in the maintenance and operational expense budget of Chitambo Town Council.

All workers will have to undergo a health and safety induction training and warning signs will be installed to ensure that both the public and the staff are protected from hazards. In the case of minor on-site personnel accidents or injuries, first aid shall be administered as appropriate by facility personnel. In the case of more serious injuries, emergency response personnel will to be notified. All accidents will be sufficiently documented in order to aid in future accident prevention. The Health Officer will be contacted with regards to notifiable accidents and injuries. Key staff will be designated and trained in first-aid, and will be responsible for coordinating any response to serious personnel injuries.

An emergency contact list will be established and posted in prominent locations. The list will include telephone or Mobile numbers for the following:

- The Council Secretary
- District Planning Officer
- Health Inspector (Public Health Section)
- Local medical facility (Ambulance service)
- Fire Section
- Police
- Site Manager

i) **Fires**

Compacting of waste to a relative thin layer will be done in order to minimize chances of fire outbreaks.

j) **Unpleasant odors.**

The unpleasant odors will be reduced through waste soil cover. Furthermore, all employees will be provided with appropriate PPE.

k) **Indiscriminate disposal of waste**

Proper training and supervision on waste characterization will be conducted. Additionally, the Council shall install sorting bins in all public places and sensitize the community on the importance of separating waste at household level or from the source in order to reduce the quantity of waste being taken to the disposal facility as most of the waste could be recycled such waste will include;

- Organic waste
- Plastic waste
- Paper waste
- Glass waste
- Metal waste

l) **Contamination of underground water.**

Monitoring wells shall be sunk to monitor the possible impacts of the project to the underground water resources. At least 2 monitoring wells will be sunk; these wells shall be installed for early detection of any leaks which may result into underground water contamination.

m) **Surface Water Management**

Surface Water management around and within Chitambo disposal site is an extremely important aspect of landfill management. Surface water that enters the landfill becomes contaminated and is therefore treated as leachate. A drainage system for surface water will be provided in order to minimize the generation of leachate. Continuous maintenance of the system and the diversion of surface waters from the landfill will be undertaken by the Operator on site.

In the event of an accidental discharge of leachate or other potentially dangerous liquid during transportation on the site, the following action will be taken immediately;

- Isolate the waste zone and deny any untrained/unauthorized people access to the discharge area.
- Contain the spill or slow the material's rate of spread if it can be done without risk of harm or injury. For small spills, pick up the material with a shovel and place it into a safe container. For large spills, create a dike of soil to contain run-off and to prevent further spreading. Cover with a tarpaulin or plastic liner to reduce the rate of spreading. Use appropriate absorbent material to soak up the liquid.
- Stop any remaining leakage
- Clean up the liquid waste spill immediately

n) **Pest infestation**

Pests will be controlled through proper soil cover of waste and compaction to prevent pest infestation.

o) **scavenging**

The facility will have a fence installed with an entrance gate in order to prevent the entry of unauthorized persons and scavengers. This will be coupled with the construction of a guard houses for the security staff responsible for manning the facility.

7.1 Environmental Monitoring Plan

Monitoring the impacts of the project is therefore a vital part of the activity. By monitoring the possible impacts of the project, it will be possible to act or react accordingly by instituting the most effective and efficient measures to minimize the operational impacts. The appropriate monitoring program is prepared as a framework for the project. It contains the list of environmental components to be considered, environmental management cost estimates, the responsible persons, and the frequency of monitoring.

Table 5: Environmental Monitoring Plan

Aspect	**Impact**	**Mitigation/ Enhancement measure**	**Frequency of Monitoring**	**Time frame**	**Performance indicator**	**Responsible person**	**Cost ZMW (K)**
Land clearing	Generation of fugitive dusts	Dust suppression through water Minimize movement of vehicles inside the construction area Establishment of a buffer zones	Daily	Preparation phase	No visible dust Buffer zones established.	Director of Works	50, 000

	Soil erosion	Discharge points will be identified and upon which trapezoid drains will be created to divert and minimize the risk of runoff water. Underground pipes will be installed at appropriate road crossing order to protect the access roads from erosion	Daily	Preparation phase/ Construction phase	Records of measures implemented and visual checks	Director of Works/ Surveyor	30, 000
	Loss Flora	Clearing will be restricted to the disposal facility area. Re-introduce local occurring vegetative cover in areas within the area where it would be most appropriate.	Annually	Preparation phase	Minimal vegetation alteration	District Planning Officer	10, 000
Air Quality	Air pollution/ odour (gas	Gas control vents will be installed in the completed	Bi-annual	Throughout the life	Minimal odours emitted	Health Inspecto	40, 000

	emission)	portions of the site for sampling and analysing the following gases; • Methane • H_2S • CO_2 Provide all employees with appropriate PPE Waste soil cover to minimise odour emission	Daily	cycle of the project		r/ Site Manager	
Occupational Health and Safety	Occupational Health and Safety issues	All workers and personnel shall be provided with appropriate PPE	Annually	Preparation phase/ Operational phase	No reported accident/injuries	Health Inspector/ Site Manager	100, 000
		Conduct awareness and training programs on safety and health issues	Monthly		Training records Warning signs		

		Provide required safety signs and placards and restrict movement of personnel in danger zones.					
		Regular medical check-up and provision of appropriate sanitary facilities					
Scavenging	Outbreak of diseases and risk of physical injuries	Fencing of the disposal facility area	Daily	Operational phase	Presence of fence around the disposal facility	Site Manager	100, 000

Water	Groundwater Contamination	Monitoring wells will be installed for the purpose of monitoring groundwater quality. groundwater samples are to be collected and analysed from all monitoring wells and compacting of clay soil will be done to reduce permeability	Biannually	Operational phase	Water monitoring report	Water Coordinator/ Health Inspector	40, 000
	Surface water contamination	Drainage system (trapezoid drains) will be provided in order to minimize the generation of leachate.	Monthly	Construction phase	No reports of water contamination	Health inspector	20, 000
Land pollution	Indiscriminate disposal of waste	Separation and sorting of waste	Daily	Operational phase	Characterization of wastes Efficiency of storage facilities	Health Inspector	50, 000

8.0 DECOMMISSIONING AND CLOSURE PLAN

The disposal facility decommissioning and closure activities will be similar to those of the construction phase. Once waste capacity is exhausted, formal site closure procedures will begin. Rehabilitation plan will be prepared in consultation with the ZEMA. The disposal site area will be progressively completed and rehabilitated as disposal facility development reaches final contours.

Therefore, the same mitigation measures that will be used during construction phase will be adopted during the decommissioning phase. The main works for the closure will require earthworks to be done on the entire footprint of the disposal facility. The entire dumping area will be backfilled with suitable fill to cover the waste.

The process of rehabilitating a disposal facility to usable land will be a phased activity which will depends on the risks and the financial aspects. To start with, all wastes that will be scattered outside the working area will be pushed back in and spread. Once a final cover and topsoil layer has been placed, a vegetative cover will to be established. In addition, final landscaping and screening of the site will be implemented.

A new sign indicating that the landfill has been closed will be placed at the site entrance. After which the site will be modified to suit other purposes upon closure.

The works will require vigilant supervision to ensure the working face is maintained well and no waste is dumped outside the dumping area. The cost estimates of activities to be undertaken and related cost are listed in table 7 below.

Table 7: Decommissioning activities and cost estimates

Activity	Responsible officer	Cost (K)
Removal of all re-usable items	Director of works	15, 000
Backfilling and compacting	Director of works	35, 000
Re- vegetation	Planner	10, 000
Total Costs		**60, 000**

9.0 DECLARATION

Chitambo Town Council hereby affirms that we understand the commitments in the Environmental Project Brief for the proposed construction of the disposal facility and we shall abide by the environmental commitments contained.

CHITAMBO TOWN COUNCIL

…………………………

Mwiche I. Mudala

Council Secretary

10.0 BIBLIOGRAPHY

i. Environmental Management No 12 of Act 2011
ii. Environmental Impact Assessment Regulations (SI No. 28 of 1997)
iii. Environmental Management (Licensing) Regulations No. 112 of 2013
iv. Forest Act No 4 of 2015
v. Karim M. A. and Wetterhan J. T., "A comparative study of solid waste management in the United States, Europe and Asia," Annals of Civil and Environmental Engineering, vol. 4, pp. 003–011, 2020.
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vii. Public Health Act Cap 295
viii. Solid Waste Management and Regulation Act No. 20 of 2018
ix. The Air pollution Control Regulations, Si 141 of 1996
x. The Local Government Act No. 2 of 2019
xi. Urban and Regional Planning Act No. 3 of 2015
xii. Vaverkova M. D., "Landfill impacts on the environment review," Geosciences, vol. 9, no. 10, pp. 2–16, 2019.
xiii. Water Resources Management Act No. 21 of 2011
xiv. Wilson D. C. and Velis C. A., "Waste management—still a global challenge in the 21st century: an evidence-based call for action," Waste Management & Research: Journal for a Sustainable Circular Economy, vol. 33, no. 12, pp. 1049–1051, 2015.
xv. Workers Compensation Act No.10 of 1999

11.0 APPENDENCES

Appendix A: Minutes of the Full Council

CHITAMBO TOWN COUNCIL
EXTRACT OF
MINUTES OF THE PROCEEDINGS OF THE COUNCIL MEETING HELD AT KINGS HABOUR LODGE ON TUESDAY 26TH JULY, 2022 AT 10:00 HOURS.

PRESENT			**WARD**
Brian Mwelwa		-	Council (Chairperson)
Councillor	Mabvuto Phiri	-	Chalilo (Vice Council Chairperson)
Councillor	Chalwe Morgan	-	Mpelembe
Councillor	Robson Mufalali	-	Chitambo
Councillor	Chibaka Sydney	-	Lusenga
Councillor	Mumba Young	-	Luombwa
Councillor	Mwansa Richard	-	Nakatambo
Councillor	Sydney Mwela Bwale	-	Muchinka
Councillor	Owen Kapolo Mibenge	-	Chipundu
Councillor	Shephered Chama	-	Lulimala
Councillor	Mausala Chiluba	-	Katonga
Councillor	Nkandu Kunda Boas	-	His Royal Highness Chief Chitambo

IN ATTENDANCE,

Mwiche I. Mudala	-	Council Secretary
Derrick Chongo	-	Deputy Council Secretary
Martha Chikwanda	-	District Planning Officer
Mulenga Kahembi	-	Town Planner
Webster Kayombo	-	Administrative Officer
Paul Mwale	-	Deputy Director of Works
Joseph Mwenya	-	Internal Auditor
Chishimba Chimpinde	-	District Forestry Officer
Elidad Siame	-	District Fisheries Coordinator
Racheal Chilolo	-	Assistant Commercial Manager
Mwinga Pharaoh	-	District Education Standard Officer
Harvey Simuyala	-	District Community Development Officer
Oscar Phiri	-	Procurement Officer

Nambela Hope	-	Socio Economic Planner
Carolyn Muleya	-	Community Development Officer
Moses Nyati	-	Agriculture Officer
Dr. Jackson Phiri	-	District Health Officer
Isaac Kantaka	-	
Christabel Kakungu	-	Health Inspector
Limbisani Tembo	-	District Planning Officer (Education)
Mutusha Katakwe	-	Systems Analyst
Mwansa Bruce	-	Assistant Procurement Officer
Moffat Mugala	-	Water Coordinator
Chishale John	-	District Social Welfare Officer
Mutakwa Augustine	-	Chief Human Resource Officer
Chamwaza Mashata	-	Committee Clerk

Prior to the commencement of the meeting an opening prayer was given.

C/116/07/22 **NOTICE OF MEETING**

The notice convening the Meeting was read and the meeting called to order at 10:38 hours.

C/118/07/22 **CONSIDERATION AND ADOPTION OF THE MINUTES OF THE MEETING OF THE HEALTH, ENVIRONMENT AND SOCIAL SERVICES COMMITTEE HELD ON 19TH MAY, 2022**

On a proposal by Councillor R.Mufalali and seconded by Councillor S.Chama

IT WAS RESOLVED THAT: The minutes of the meeting of the Health, Environment and Social Services Committee Meeting held on Thursday 19th May, 2022 be **received** and **adopted** as part of the proceedings of the Council.

Certified true copy of the Minutes of the Full Council Meeting held on 26th July, 2022 and was approved vide Minute Number **C/118/07/22**

SIGNED:..**DATE**..............................
COUNCIL SECRETARY

REPUBLIC OF ZAMBIA
MINISTRY OF LOCAL GOVERNMENT
28 JUL 2022
CHITAMBO TOWN COUNCIL
OFFICE OF THE COUNCIL SECRETARY
P.O. BOX 850016, CHITAMBO.

CHITAMBO TOWN COUNCIL
EXTRACT OF
MINUTES OF THE HEALTH, ENVIRONMENT AND SOCIAL SERVICES COMMITTEE MEETING HELD AT KINGS HABOUR LODGE ON THURSDAY 19Th MAY, 2022 AT 10:00 HOURS.

PRESENT			**WARD**
Councillor	Robson Mufalali	-	Chitambo (Committee Chairperson)
Councillor	Owen Kapolo Mibenge	-	Chipundu
Councillor	Shephered Chama	-	Lulimala
Brian Mwelwa		-	Council (Ex-Officio)
Councillor	Mabvuto Phiri	-	Chalilo (Ex-Officio)

IN ATTENDANCE,

Derrick Chongo	-	Deputy Council Secretary
Martha Chikwanda	-	District Planning Officer
Sylvester Mubita	-	Deputy Council Treasurer
Jordan Sichona	-	Livestock Development
Langstad Hamwitala	-	Health
Oscar Phiri	-	Procurement Officer
Tembo Limbisani	-	District Planning Officer (Education)
Mutusha Katakwe	-	Systems Analyst
Webster Kayombo	-	Administrative Officer
Chamwaza Mashata	-	Committee Clerk
Rodrick Nyirenda	-	Public Relations Officer

Prior to the commencement of the meeting an opening prayer was given.

HESS/61/05/22 **NOTICE OF MEETING**

The notice convening the Meeting was read and the meeting called to orde at 11:20 hours.

HESS/67/05/22 **CREATION OF A DUMPSITE**

The District Planning Officer reported to the Committee that the Council was in a process of creating a dump site in extent of 4 hectare's which is situated in Chitambo Town township, and an Environmental Planner from Serenje Council had been engaged to help in the process .Kindly note that this was a requirement that we needed to submit an EIA and Environmental Project Brief report to ZEMA for consideration .This was in accordance with the requirements of the Environmental Management Act NO.12 of 2011 and the Environmental Impact Assessment (EIA) regulations, statutory Instrument No.28 of 1997.

After some deliberations on the matter, on a proposal by Councillor S. Chama, seconded by Councillor M. Phiri.

IT WAS RESOLVED THAT: The creation of Dumpsite be considered.

Certified true copy of the Minutes of the Health, Environment and Social Services Committee Meeting held on 19th May, 2022 and was approved vide Minute Number **HESS/67/05/22**

SIGNED:...**DATE**: REPUBLIC OF ZAMBIA MINISTRY OF LOCAL GOVERNMENT 28 JUL 2022 CHITAMBO TOWN COUNCIL OFFICE OF THE COUNCIL SECRETARY P. O. BOX 850016, CHITAMBO.

COUNCIL SECRETARY

Appendix B: Waste Inspection Form for Chitambo Disposal Site

Date & Time on Scales: ……………………………………………………

Details of Vehicle Carrying the Waste: License Plate No. Make and Model of Vehicle: Capacity of Vehicle in tonnes and cubic meters: Weight of Waste:
Personnel Details: Name of Driver: Name of Owner: Address of Owner:
Origin of Waste: **Brief Description of the Waste:**
Reason for Refusal:
Action Taken:

Inspection Performed by:	**Date:**	**Time:**
Accepted by:		

Appendix C: Complaint Form

Date and Time of Complaint: ……………………………………….

Details of Person(s) making the Complaint:	
Name:	
Address:	
Telephone No.	

Complaint Details. Use additional sheet if necessary.
Date and Time of Incident:
Weather Conditions at Time of Incident

Attach photos if available

Follow-up Actions:

Complaint Recorded by:

Date and Time: