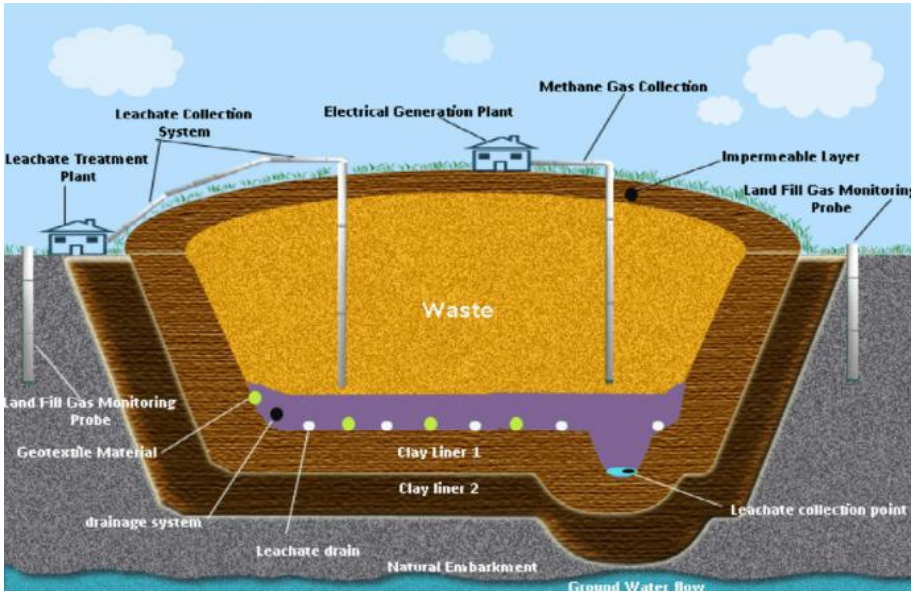
KAMATIVI SANITARY LANDFILL PROJECT

EIA REPORT

MATEBELELAND NORTH PROVINCE

PROJECT NUMBER 20468



PREPARED BY

Developing with Sustainable Minds

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PROPONENT'S FULL DETAILS

ENVIRONMENTAL MANAGEMENT AGENCY EIA REVIEW GUIDELINES

PROJECT COST: $70, 966.50

AMOUNT INVOICED:

INVOICE NUMBER:

DATE INVOICE:

AMOUNT PAID:

RECEIPT NUMBER: .....

DATE PAID:

I. DETAILS OF APPLICANT DEVELOPER

FULL NAME: FIRST NAME: Ye Jian Guo **SURNAME:**

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COMPANY NAME: Kamativi Mining Company

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II. DETAILS OF PROJECT

NAME OF DEVELOPMENT PROJECT: KAMATIVI SANITARY LANDFILL PROJECT

PHYSICAL ADDRESS/LOCATION OF PROJECT:

TYPE OF PROJECT: LANDFILL CONSTRUCTION

TELEPHONE AT SITE: +263 774360063

PROJECT NUMBER: 20468

PROVINCE/DISTRICT: HWANGE DISTRICT, MATEBELAND NORTH PROVINCE

DOCUMENT CONTROL AND EIA TEAM

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EXCUTIVE SUMMARY

GreenCloud Environmental Consultancy (Pty) Ltd, an entity duly accredited by the Environmental Management Agency (EMA), has been commissioned by Kamativi Mining Company (KMC) to spearhead a comprehensive Environmental Social Impact Assessment (ESIA) for a proposed sanitary landfill for Kamativi Community, a project representing a capital investment of approximately $70,966.50. Executed in strict alignment with the Environmental Management Act [Chapter 20:27], this study provides a robust Environmental and Social Impact Assessment (ESIA) framework designed to mitigate the cumulative ecological footprint and potential anthropogenic impacts associated with mining-related waste streams. Strategically located within KMC claims, the facility features a design capacity of 7,255.5 m^3 supported by a 3,700 m^3 engineered leachate containment system to prevent subterranean plume migration and ensure the integrity of local hydrogeological regimes. By transitioning from substandard disposal to this modern Integrated Solid Waste Management (ISWM) solution, the project ensures that regional industrial expansion is balanced with ecosystem services preservation and long-term environmental stewardship, with the facility eventually being institutionalized under the Hwange RDC for ongoing compliance monitoring and auditing.

The scope of the proposed development encompasses the full project lifecycle, including land clearing for access infrastructure, technical excavation, construction, and eventual decommissioning. While the assessment identified potential anthropogenic impacts specifically localized biodiversity loss, soil compaction, and accelerated erosion during the trenching phase these risks are classified as manageable through the rigorous implementation of a comprehensive Environmental Management Plan (EMP). To safeguard the integrity of the surrounding biophysical environment, vegetation clearing will be strictly confined to the immediate project footprint, utilizing spatial buffers to prevent broader ecosystem fragmentation. Backed by Kamativi Mining Company's commitment to environmental stewardship, GreenCloud Environmental Consultancy concludes that these ecological stressors will be effectively neutralized; furthermore, the consultant will provide continuous environmental auditing and technical oversight to ensure strict regulatory compliance and the realization of sustainable development goals.

To ensure transparency and foster community inclusivity, a rigorous stakeholder engagement process was executed, utilizing participatory workshops and structured socioeconomic questionnaires to solicit input from local inhabitants and regulatory authorities. The resulting data confirms a robust social license to operate, with stakeholders expressing unanimous consensus in favor of the development. Central to the project's mission is the mitigation of existing public health risks through the implementation of an engineered waste management solution, replacing substandard disposal practices with a modern, high-standard facility within the Hwange RDC jurisdiction. By synchronizing industrial expansion with ecological preservation, the project directly contributes to Zimbabwe's National Development Strategy and sustainability targets, ensuring that the socio-economic advancement of the Kamativi region is underpinned by environmental integrity and the long-term well-being of the surrounding human-ecological landscape.

In strict accordance with international best practices and the statutory mandates of the Environmental Management Act [Chapter 20:27], specifically Statutory Instrument 7 of 2007, GreenCloud Environmental Consultancy was commissioned to develop this EIA report to harmonize the proposed

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service station with the principles of sustainable development. To ensure a transparent socio-ecological assessment, a comprehensive stakeholder consultation was executed through structured questionnaires and interviews with the Kamativi local community and relevant regulatory authorities, the results of which yielded a favourable consensus for the project. While the engagement process identified potential environmental stressors, a rigorous Environmental Management Plan (EMP) has been engineered to neutralize these risks and prevent habitat degradation. This EMP prioritizes the mitigation of atmospheric pollutants through dust suppression, the implementation of robust emergency response protocols for fire and spill containment, and the promotion of occupational health and safety through continuous education. By integrating systematic environmental monitoring and adherence to the prevailing legislative framework, the project aims to facilitate industrial growth while maintaining the biophysical integrity of the host environment.

In summary, while the assessment indicates that the proposed project entails a spectrum of biophysical and socio-economic impacts, the findings confirm that all identified adverse effects are manageable through the rigorous application of the prescribed mitigation hierarchy. Central to this commitment is the Environmental Management Plan (EMP), which serves as a strategic framework for maintaining ecological equilibrium and ensuring that all construction and operational activities remain in strict statutory compliance with the Environmental Management Act [Chapter 20:27]. Crucially, the project's success hinges on the precise execution of technical engineering specifications as detailed in the approved site drawings, integrated with continuous environmental auditing by regulatory agents. By adhering to these dual pillars of engineering precision and environmental stewardship, the proponent will facilitate a sustainable developmental model that minimizes the project's carbon footprint and prevents habitat degradation throughout its lifecycle.

IMPACTS OF THE PROJECT

The proposed land development project has few potential negative and more positive impacts on the local environment, local community, and the nation as a whole. The following potential impacts will be carefully interrogated in this Environmental and Social Impact Assessment (ESIA) report.

POSITIVE IMPACTS

ENVIRONMENTAL ISSUES	POSSIBLE CAUSE	POTENTIAL IMPACTS
Air Pollution and noise		
Dust	Excavations, movement and transport of development materials and operational waste	Public nuisance Air pollution Settling on surrounding community
Smoke	Vehicle emissions and burning on site	Health problems Air pollution
Fumes	Fumes from vehicles and machinery	Impact negatively on air quality
Noise	Vehicles and machinery Transport and movement of materials and waste for disposal	Nuisance Noise pollution
Water quality		

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ENVIRONMENTAL ISSUES	POSSIBLE CAUSE	POTENTIAL IMPACTS
Pollution of water sources (Surface and groundwater)	Spillage of toxic leachate into the natural environment Solid waste in storm water into drainage lines Erosion from cleared areas during site preparation Sanitation of workers on site	Health risk Lower water quality Eutrophication of aquatic ecosystem Water pollution and Soil degradation Effect on surface and ground water
Land/soil degradation		
Soil contamination and degradation	Spillage and leakage of contaminants from landfill site Incorrect material management – stockpiling and digging or excavations for design. Clearing of sites for operations and waste storage Leakages of fuel on site and contaminants over long term.	Effect soil ecology/ground water – soil pollution Loss of biodiversity Public nuisance Loss of topsoil
Cultural Aspects		
Impact on natural resources	If pollution of the nearby stream occurs, downstream users will be affected Pollution to ground water could affect the entire catchment borehole network	
Impact on heritage sites	None	
Biodiversity		
Impact on flora, fauna and aquatic habitats	Clearing of sites for development and operations Large clearance area and removal of vegetation Degradation or destroying of nearby ecosystems Interference with natural movement patterns	Loss of biodiversity Killing of animals Loss of genetic diversity
Visual impact		
Visual impact	Construction equipment on site and open areas of cleared soil surface Operational vehicles delivering waste on a daily or weekly basis Presence of structures and equipment around site Stockpiling of construction material	Obstruction Visual intrusion Public nuisance

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ENVIRONMENTAL ISSUES	POSSIBLE CAUSE	POTENTIAL IMPACTS
Socio-economic impacts		
Safety and security	Construction machinery and equipment Operational vehicles and fires during burning of waste Criminal aspect Fire hazard to surrounding grasslands	Vehicle accidents Deaths/injuries to people Loss of personal possessions
Bio-safety	Long term waste mismanagement could be highly hazardous to people and the environment. Mistreatment of municipal waste could also negatively impact on residents' health	
Noise, smell and visual pollution	Traffic of vehicles and movement of machinery, noise from construction equipment Waste could pose high risk if mismanaged Potentialwaste dispersal by wind or rain affecting downstream water users	Nuisance to local people and environment
Employment	Several jobs should be created if development is initiated	Positive for local community

Environmental Monitoring and Management Plan

To ensure the efficacious implementation of mitigation strategies, systematic parameter monitoring, and periodic environmental auditing, a robust Environmental Management and Monitoring Plan (EMMP) has been established. This framework delineates specific remediation protocols tailored to the project's distinct ecological impacts and assigns clear stewardship responsibilities to key stakeholders across all developmental phases. During the operational lifecycle, the EMMP prioritizes the monitoring of critical environmental indicators, including the integrated management of solid waste streams (covering storage, diversion, and final disposal), the hydrological integrity of onsite aquifers through the tracking of groundwater abstraction rates and static levels, and the rigorous physicochemical analysis of borehole water to ensure potable quality. By maintaining these high standards of environmental vigilance, the project ensures continuous alignment with public health mandates and statutory regulatory requirements.

LEGAL FRAMEWORK FOR THE PROJECT

This project will be guided by quite a number of Zimbabwe legislations to facilitate smooth running of the project with minimum environmental degradation. The laws and regulations that will guide this project are as follows;

1. Environmental Impact Assessment Policy
2. Environmental Management Act (Chapter 20:27) and related Statutory Instruments:
3. S.I. 7 of 2007 (EIA and Ecosystems Protection Regulations).
4. S.I. 6 of 2007 (Effluent and Solid waste disposal)
5. Explosives Regulations

6. Regional Town and Country Planning Act
7. The Water Act (Chapter20:24)
8. Factories and Works Act (Chapter 14:08)
9. Health and Safety Policies
10. Public Health Act Chapter 15:09
11. National Social Security Authority (accidents Prevention and Workers, Compensation Scheme Notice, 1990, Statutory Instrument 68 of 1990t
12. Pneumoconiosis Act (Chapter15:08)
13. PETROLEUM ACT (CAP 13:29).
14. PETROLEUM (LIQUID PETROLEUM GAS) REGULATIONS (S.I 57 OF 2014)

In conclusion, results from ESIA study show that the proposed project has mild impacts on the environment. Implementation of an ESMMP will assist in dealing with environmental issues during the project cycle. There are also guidelines for addressing environmental health and safety. This project is recommendable for approval by EMA for issuance of an EIA license.

Recommendations

The EIA team underscores that the project's success is predicated on the following high-priority recommendations to ensure ecological resilience and social cohesion:

- Systemic EMP Execution: Immediate and rigorous implementation of the Environmental Management Plan (EMP) to serve as the baseline for all site activities.
- Dynamic Environmental Monitoring: Continuous oversight of EMP protocols to ensure real-time adaptation to ecosystem fluctuations and mitigation efficacy.
- Institutional Governance: Establishment of a formal framework for the supervision, reporting, and auditing of environmental performance, ensuring that biophysical impact mitigation is natively integrated into the project's engineering design.
- Socio-Ecological Collaboration: Active engagement with local stakeholders to pre-emptively address social externalities and potential upheavals, fostering a stable social license to operate.
- Collaborative Policy Refinement: Partnering with community and regulatory authorities to enforce and iteratively update the Emergency Response Plan (ERP) and environmental protocols, ensuring the project remains aligned with the evolving sustainability landscape.

ACRONYMS

ACRONYM	MEANING
BOD	Biological Oxygen Demand
CEC	Cation Exchange Capacity
COD	Chemical Oxygen Demand

CSR	Corporate Social Responsibility
DA	District Administrator
EIA	Environment Impact Assessment
EMA	Environment Management Agency
EMP	Environmental Management Plan
GDP	Gross Domestic Productivity
GC	GreenCloud (consultant)
HRT	Harare Residents Trust
SDGs	Sustainable Development Goals
MOU	Memorandum of Understanding
NSSA	National Social Security Authority
OVC	Orphan and Vulnerable Children
PVC	Polyvinyl Chloride (pipes)
TOR	Terms of Reference
ZESA	Zimbabwe Electricity Supply Authority
ZINWA	Zimbabwe National Water Authority
ZRP	Zimbabwe Republic Police

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TABLE OF CONTENTS

PROPONENT'S FULL DETAILS i
EXCUTIVE SUMMARY iii
IMPACTS OF THE PROJECT iv
LEGAL FRAMEWORK FOR THE PROJECT vi
ACRONYMS vii
LIST OF FIGURES xiii
LIST OF TABLES xiii
CHAPTER 1: INTRODUCTION ..... - 1 -
1.1. THE PROPONENT ..... - 1 -
1.2 GREENCLOUD ENVIRONMENTAL CONSULTANT BACKGROUND ..... - 2 -
1.3. PROJECT JUSTIFICATION ..... - 2 -
1.4 TERMS OF REFERENCE ..... - 3 -
1.5 EIA REPORT STRUCTURE ..... - 4 -
CHAPTER 2: PROJECT DESCRIPTION ..... - 5 -
2.1. PROJECT LOCATION ..... - 5 -
2.2. ACCESSS TO SITE ..... - 6 -
2.3. PROJECT SCOPE ..... - 2 -
2.3.1 Site Clearing and Preparation ..... - 2 -
2.3.2 Excavation and construction of access roads ..... - 3 -
2.3.3 Lining and Compaction ..... - 3 -
2.3.4 Construction Activities, Facilities & Resources ..... - 4 -
2.3.5 Engineering designs and calculations for the landfill site ..... - 5 -
2.3.6 Engineering drawings ..... - 12 -
2.5. WATER AND SANITATION ..... - 14 -
2.5.1. SOURCE OF ENERGY ..... - 15 -
2.5 WASTE MANAGEMENT ..... - 16 -
2.3.7 Commission of the project ..... - 17 -
2.6 ALTERNATIVES ..... - 18 -
2.6.1 NO GO OPTION ..... - 18 -
2.6.2 ALTERNATIVE PROJECT SITE ..... - 18 -
2.7 THE PROJECT COST ..... - 18 -
1. Preliminary and General (P&G) Costs ..... - 18 -
2. Material Costs ..... - 19 -

GreenCloud Pvt Ltd, Suite 16, First Floor, West Wing Plaza, Strathaven, Harare
E-mail: sales@greencloud.co.zw

3. Construction Costs.....- 19 -
Summary Table.....- 19 -
CHAPTER 3: ENVIRONMENTAL AND SOCIO-ECONOMIC SETTING.....- 20 -
3.1 TOPOGRAPHY.....- 20 -
3.2 CLIMATOLOGY.....- 21 -
3.2.1 Climate in Kamativi.....- 21 -
3.2.2 Average Temperature in Kamativi Mine.....- 22 -
3.2.3 Precipitation.....- 23 -
3.2.4 Rainfall.....- 24 -
3.2.5 Sun experienced in Kamativi.....- 25 -
3.3 SOIL.....- 26 -
3.4 HYDRO-GEOLOGY.....- 27 -
3.4.1 HYDROLOGY.....- 27 -
3.4.2 GEOLOGY.....- 30 -
3.7 ARCHEOLOGICAL ASSESSMENT.....- 32 -
3.7.1 THE ARCHEOLOGICAL ASSESSEMENT LETTER.....- 32 -
3.7 SOCIO-ECONOMIC ENVIRONMENT.....- 33 -
3.7.1 ADMINISTRATIVE STRUCTURES.....- 34 -
3.7.2 POPULATION CHARACTERISTICS.....- 35 -
3.7.3 ECONOMIC ACTIVITIES.....- 36 -
3.7.8 NEWS & INFORMATION.....- 36 -
3.7.9 TRANSPORT.....- 37 -
3.7.11 HISTORICAL AND CULTURAL SITES.....- 38 -
3.7.12 SAFETY HEALTH ENVIRONMENT AND QUALITY ASSURANCE.....- 38 -
3.7.13 COPORATE SOCIAL RESPONSIBILITY (CSR).....- 39 -
3.7.14 EMPLOYEE WELFARE.....- 40 -
CHAPTER 4: LEGAL AND POLICY REVIEW SETTING.....- 41 -
4.1 NATIONAL MUSEUMS AND MONUMENTS ACT Chapter 25:11.....- 41 -
4.1.1 The Requirement for an Archaeological Impact Assessment (AIA).....- 41 -
4.1.2 Protection of "Ancient Workings" and "Relics".....- 41 -
4.2 THE ENVIRONMENTAL MANAGEMENT ACT (CAP 20:27).....- 42 -
4.3 FOREST ACT [CHAPTER 19:05].....- 43 -
4.3.1 Protection of Indigenous Vegetation.....- 43 -
4.3.2 Mining Timber Rights & Constraints.....- 43 -

GreenCloud Pvt Ltd, Suite 16, First Floor, West Wing Plaza, Strathaven, Harare
E-mail: sales@greencloud.co.zw

4.3.3 Fire Management and Prevention ..... - 44 -
4.3.4 Reforestation and Rehabilitation ..... - 44 -
4.4 WATER ACT (CAP 20:24) ..... - 44 -
4.4.1 Protection of Water Resources (Section 68) ..... - 44 -
4.4.2 Water Use and Permits (Section 34) ..... - 44 -
4.4.3 Control of Water Pollution (Part VI) ..... - 45 -
4.4.4 The "Polluter Pays" Principle ..... - 45 -
4.5 NATIONAL SOCIAL SECURITY AUTHORITY (S.I 68 OF 1990) ..... - 45 -
(ACCIDENT PREVENTION AND WORKER'S COMPENSATION SCHEME) ..... - 45 -
4.5.1 Registration and Assessment (Section 3 & 4) ..... - 45 -
4.5.2 Mandatory Accident Reporting (Section 56) ..... - 45 -
4.5.3 Occupational Health Surveys & Monitoring ..... - 46 -
4.5.4 Provision of Personal Protective Equipment (PPE) ..... - 46 -
4.6 PUBLIC HEALTH ACT (CAP 15:09 – REVISED 1996) ..... - 46 -
4.6 1 Prevention of "Statutory Nuisances" (Part IX) ..... - 46 -
4.6.2 Vector Control and Disease Prevention (Part IV) ..... - 47 -
4.6.3 Protection of Water Supplies (Section 114) ..... - 47 -
4.6.4 Sanitation and Waste Management (Part XI) ..... - 47 -
4.7 PNEUMOCONIOSIS ACT (CHAPTER15:08) ..... - 47 -
4.7.1 Definition of "Dusty Occupations" ..... - 47 -
4.7.2 Mandatory Medical Examinations (Part IV) ..... - 48 -
4.7.3 Dust Control and Monitoring (Part VI) ..... - 48 -
4.7.4 Compensation and Liability ..... - 48 -
4.8 IRMA ..... - 48 -
4.8.1 Environmental Responsibility (Chapter 4.1: Waste Management) ..... - 48 -
4.8.2 Planning for Positive Legacies (Chapter 2.1 & 2.6) ..... - 49 -
4.8.3 Social Responsibility (Chapter 3.3: Community Health & Safety) ..... - 49 -
4.9 ISO STANDARDS ..... - 49 -
4.9.1 ISO 14001: Environmental Management Systems (EMS) ..... - 49 -
4.9.2 ISO 45001: Occupational Health and Safety ..... - 49 -
4.9.3 ISO 31000: Risk Management ..... - 50 -
4.10 CONCLUSION ..... - 50 -
CHAPTER 5: STAKEHOLDER CONSULTATION ..... - 51 -
5.1 INTRODUCTION ..... - 51 -

GreenCloud Pvt Ltd, Suite 16, First Floor, West Wing Plaza, Strathaven, Harare
E-mail: sales@greencloud.co.zw

5.2 WHY STAKEHOLDER CONSULTATION WAS CONDUCTED ..... - 51 -
5.3 METHODOLOGY OF THE STAKEHOLDERS CONSULTATION ..... - 52 -
Damage to Underground and Overhead Electrical Infrastructure ..... - 54 -
Power Supply Interruptions ..... - 54 -
5.3 SUMMARY OF CONCERNS ..... - 58 -
CHAPTER 6: ASSESSMENT EVALUATION OF IMPACTS ..... - 59 -
6.1 IMPACT ANALYSIS ..... - 59 -
6.2 IMPACT ASSESSMENT ..... - 59 -
CHAPTER 7: ENVIRONMENT MANAGEMENT PLAN (EMP) ..... - 71 -
7.1 ENVIRONMENT MANAGEMENT PLAN ..... - 71 -
7.3 ENVIRONMENTAL MONITORING PLAN ..... - 74 -
CHAPTER 8: CONCLUSIONS AND RECOMMENDATIONS ..... - 81 -
8.1 CONCLUSION ..... - 81 -
8.2 RECOMMENDATION ..... - 81 -
8.2.1 Technical and Engineering Safeguards ..... - 81 -
8.2.2 Community Integration and "Zero Harm" ..... - 81 -
8.2.3 Institutional Capacity Building for HRDC ..... - 81 -
8.2.4 Regulatory Compliance and Financial Assurance ..... - 82 -
8.2.5 Biodiversity and Landscape Restoration ..... - 82 -
REFERENCES ..... - 83 -
Appendix A: Proof Of Land Ownership ..... - 84 -
Appendix B: Stakeholder Consultation Input ..... - 85 -
Appendix C: EIA Certificate of the whole KMC Boundaries – Archaeological Assessment confirmation ..... - 86 -
Appendix D: Engineering Drawings ..... - 87 -

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LIST OF FIGURES

Figure 2.1 Showing Google earth Picture of the project site ..... - 5 -
Figure 2.1: Showing KMC Boundaries and the Project Site ..... - 6 -
Figure 2.2: Showing KMC Boundaries and the Project Site on Google Earth Map ..... - 7 -
Figure 2.3: Showing 1:25 000 Map showing the Project Site ..... - 1 -
Figure 2.4: landfill and leachate pond drawing ..... - 12 -
Figure 2.5: Cross Section of the landfill ..... - 13 -
Figure 2.6: Cross Section of the leachate pond ..... - 14 -
Figure 3.1: Shows the topography of the project site ..... - 21 -
Figure 3.2: Showing Climate in Kamativi Mine ..... - 22 -
Figure 3.3: Showing Average High and Low Temperatures in Kamativi Mine ..... - 23 -
Figure 3.4: Showing a diagram of Daily Chance of precipitation in Kamativi Mine ..... - 24 -
Figure 3.5: Showing a diagram Average Monthly Rainfall in Kamativi Mine ..... - 25 -
Figure 3.6: Showing a diagram of hours of daylight and Twilight in Kamativi Mine ..... - 26 -
Figure 3.7: Showing Kamativi Soils ..... - 27 -
Figure 3.8: Showing the Hydrological Map ..... - 29 -
Figure 3.9: Showing the Geological map ..... - 30 -
Figure 5.1: Shows classes of stakeholder ..... - 51 -

LIST OF TABLES

Table 2.1 Showing Project Site Coordinates ..... - 5 -
Table 2.2 Showing Lining and Compaction results ..... - 3 -
Table 2.3 Showing Waste Generated in Kamativi ..... - 6 -
Table 2.4 Showing Zimbabwe Meteorological services, World bank Climate data ..... - 6 -
Table 2.6: Shows the project cost ..... - 18 -
Table 5.1 Summary of stakeholder concerns ..... - 53 -
Table 6.1 Key for impact intensity, importance and significance ..... - 60 -
Table 6.2 Positive Impacts analysis and evaluation ..... - 63 -
Table 6.3: Negative impacts analysis and evaluation ..... - 67 -
Table 7.1 Summary of the Environmental Management Milestones ..... - 72 -
Table 7.2: Environment Monitoring Plan ..... - 75 -

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CHAPTER 1: INTRODUCTION

GreenCloud Environmental Consultancy (Pty) Ltd has been formally commissioned by Kamativi Mining Company (KMC) to spearhead a comprehensive Environmental Impact Assessment (EIA) for the development of an engineered sanitary landfill, a critical waste-containment infrastructure project valued at approximately $70,966.50. Strategically situated within KMC mining claims, the facility is designed with a volumetric capacity of 7,255.5 m³ and features a robust 3,700 m³ leachate collection and treatment pond (LCTP) specifically engineered to manage hazardous liquid effluents and prevent subterranean plume migration through high-density polyethylene (HDPE) lining or equivalent geosynthetic barriers. By replacing archaic, substandard disposal methods with this modern Integrated Solid Waste Management (ISWM) system, the project aims to effectively neutralize existing public health pathways and mitigate the risk of heavy metal or chemical leaching into the local human-ecological landscape. This technical intervention not only synchronizes industrial expansion with rigorous ecological preservation but also ensures alignment with Zimbabwe's National Development Strategy (NDS1) and international sustainability benchmarks, providing a resilient socio-economic foundation for the Kamativi region through advanced environmental stewardship and the safeguarding of groundwater integrity and local biodiversity.

According to the Environmental Management Act Chapter 20:27 of 2002, landfill sites and all related activities require an Environmental Impact Assessment study (EIA). The procedure for conducting the EIA process is outlined in Statutory Instrument Number 7 of 2007, and the consultant (GreenCloud Environmental Consultancy) will endeavour to accurately reflect the required information within this report. The main outcome being to define existing or potential impacts on the environment as a whole and to advise on mitigation measures to reduce these impacts in a sustainable manner. Additionally, the consultant will undertake the following:

- Identify and outline the applicant's obligations in terms of the above legislation with respect to authorisations;
- Manage the EIA process in accordance with the legislated requirements;
- Liaise with the relevant authorities regarding the information requirements for each process, including possible specialist studies, and advise the client accordingly;
- Advise the client with regard to the possibilities and practicalities of integrating these information requirements so as to minimize duplication of effort and costs;
- Liaise with the consulting engineers and other professionals engaged in the design of project components with respect to the identified authorization/permitting and license application process requirements;
- Indicate the skills and expertise which they possess in terms of undertaking studies and processes, and producing reports required for the relevant applications;
- Ensure that the required independence of the EAP is given.

1.1. THE PROPONENT

KMC adheres to the corporate spirit of "scientific development, green mines, working together with the community, and sharing benefits" - integrating social responsibility into the corporate development strategy and actively participates in supporting community welfare activities.

VISION

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We envisage the development strategy of "scientific planning and rational development" that will fully promote the construction of Kamativi Mine, and make outstanding contributions to building a high-quality enterprise with "world-famous mines".

VALUES

Our Core values are discipline, teamwork, zero harm, responsible mining, social responsibility and scientific development

ZERO HARM IS OUR BELIEF

At Kamativi Mining Company (KMC), we are committed to a working environment that is safe for our employees, contractors and stakeholders. We ensure safety and wellbeing as a strategic essential for our business. We believe everyone has the right to a safe working environment and that every employee should go home safe and unharmed, every single day. We believe all incidents and injuries are preventable, so our focus is on identifying, managing and, where possible, eliminating risks.

OUR APPROACH

Our approach to sustainability is governed by our Mission “KMC adheres to the corporate spirit of "scientific development, green mines, working together with the community, and sharing benefits" - integrating social responsibility into the corporate development strategy and actively participates in supporting community welfare activities.” Our business operations contribute to twelve United Nations Sustainable Developmental Goals (SDGs) 1, 3, 4, 5, 6, 8, 9, 10, 12, 13, 15 and 16. Partnerships for SDG 17 reflects our approach to sustainability and is fundamental to the way KMC runs its operations.

1.2 GREENCLOUD ENVIRONMENTAL CONSULTANT BACKGROUND

The Consultant is GreenCloud Private Limited Company. The company is registered with the Environmental Management Agency (EMA) as an EIA Consultancy Company in Zimbabwe. The company is authorised to undertake environmental impact assessment studies for all development projects in Zimbabwe. GreenCloud Private Limited Company was contracted to conduct the EIA study for the proposed housing project that is at the prospectus stage. Today the company is one of the rising Environmental Consultant in Zimbabwe leading with professional specialists in sustainable development. GreenCloud Private Limited Company was contracted by the proponent to conduct the EIA study for the fuel service station project. The consultancy team is qualified to set up and develop safety (ISO 18001), quality (ISO 9001), and environmental management systems (ISO 14001) in various industries. Adoption of such systems is important in driving towards the concept of green economy and quality assurance and sustainable development.

1.3. PROJECT JUSTIFICATION

This study is anchored in the principles of Integrated Environmental Management (IEM) as mandated by the Environmental Management Act [Chapter 20:27] and Statutory Instrument 7 of 2007, ensuring that the project aligns with both national and international sustainability benchmarks. The overarching justification for this assessment is to facilitate sustainable development by ensuring that industrial growth does not compromise the ecological carrying capacity of the region. This is achieved through the following strategic objectives:

- Holistic Impact Integration: Balancing the physical, ecological, social, and economic dimensions of the development to ensure a net-positive contribution to the local socio-economic landscape.

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- Pollution Prevention & Habitat Protection: Prioritizing the mitigation hierarchy to avoid or minimize the carbon footprint, chemical contamination, and the fragmentation of ecosystems.
- Heritage & Cultural Conservation: Safeguarding the socio-cultural fabric by ensuring no disturbance to sites of archaeological or cultural significance.
- Precautionary Principle & Risk Management: Applying a risk-averse, cautious approach to project modeling to protect both the biophysical environment and the environmental rights of the local community.
- Inclusive Governance: Promoting transparency through robust public participation, ensuring that the voices of Interested and Affected Parties (IAPs) shape the project's environmental safeguards.
- Waste Hierarchy Alignment: Justifying the project as a critical intervention for resource recovery and controlled waste containment, which prevents the proliferation of illegal dumpsites and subsequent groundwater contamination.
- Regulatory Compliance & Modernization: Transitioning regional waste practices from archaic methods to an engineered sanitary system, thereby fulfilling the local authority's mandate for improved sanitation and public hygiene.

1.4 TERMS OF REFERENCE

According to the Environmental Management Act Chapter 20:27 of 2002, landfill sites and all related activities require an Environmental Impact Assessment study (EIA). The procedure for conducting the EIA process is outlined in Statutory Instrument Number 7 of 2007, and the consultant (GreenCloud Environmental Consultancy) will endeavour to accurately reflect the required information within this report. The main outcome being to define existing or potential impacts on the environment as a whole and to advise on mitigation measures to reduce these impacts in a sustainable manner. Additionally, the consultant will undertake the following:

- Identify and outline the applicant's obligations in terms of the above legislation with respect to authorisations;
- Manage the EIA process in accordance with the legislated requirements;
- Liaise with the relevant authorities regarding the information requirements for each process, including possible specialist studies, and advise the client accordingly;
- Advise the client with regard to the possibilities and practicalities of integrating these information requirements so as to minimize duplication of effort and costs;
- Liaise with the consulting engineers and other professionals engaged in the design of project components with respect to the identified authorization/permitting and license application process requirements;
- Indicate the skills and expertise which they possess in terms of undertaking studies and processes, and producing reports required for the relevant applications;
- Ensure that the required independence of the EAP is given.

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1.5 EIA REPORT STRUCTURE

The remaining part of this EIA report has been categorised into the following aspects chronologically; this is the acceptable Green Resources standard on EIA report format.

- Chapter 2- Project Description.
- Chapter 3- Environmental and Socio-economic Setting.
- Chapter 4- Legal and Policy Settings.
- Chapter 5- Public Consultation.
- Chapter 6- Impact Identification, Analysis.
- Chapter 7- Environmental Management Plan (EMP).
- Chapter 8- Conclusions and Recommendations.

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CHAPTER 2: PROJECT DESCRIPTION

2.1. PROJECT LOCATION

Strategically positioned at the confluence of the Kamativi-Cross Dete and Kamativi-Binga corridors, the project site offers optimal logistical accessibility, ensuring an efficient and low-emission transport route for regional waste streams. Occupying a spatial footprint of 4,320 m², the facility is designed to serve as a centralized hub for integrated waste management, catering to the Kamativi mining enclave and its surrounding peri-urban settlements. Topographically, the site is situated at an elevation of 916m above the Cape Town Datum, a characteristic that influences local hydrological drainage patterns and geomorphological stability. The precise geospatial boundaries of the development are delineated by the geodetic coordinates provided in Table 2.1, ensuring the facility is contained within a strictly defined environmental management zone to prevent encroachment into sensitive adjacent ecosystems.

Table 2.1 Showing Project Site Coordinates

Beacon	X	Y
A	508907.08	7973825.70
B	509157.32	7973754.12
C	509130.10	7973658.23
D	508879.66	7973729.92

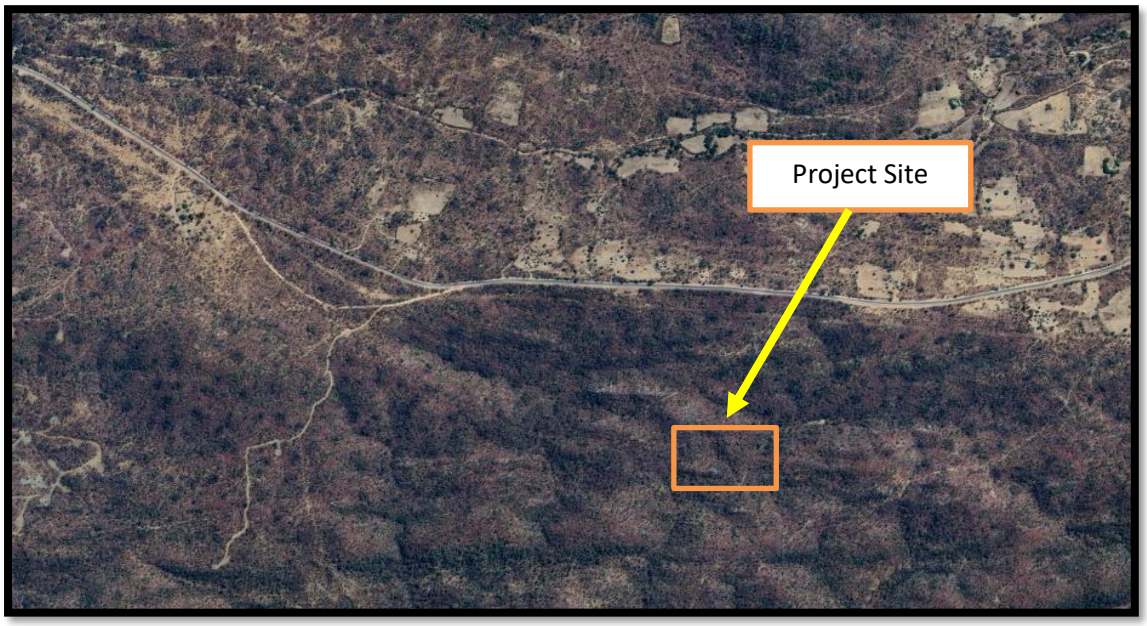


Figure 2.1 Showing Google earth Picture of the project site

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2.2. ACCESSS TO SITE

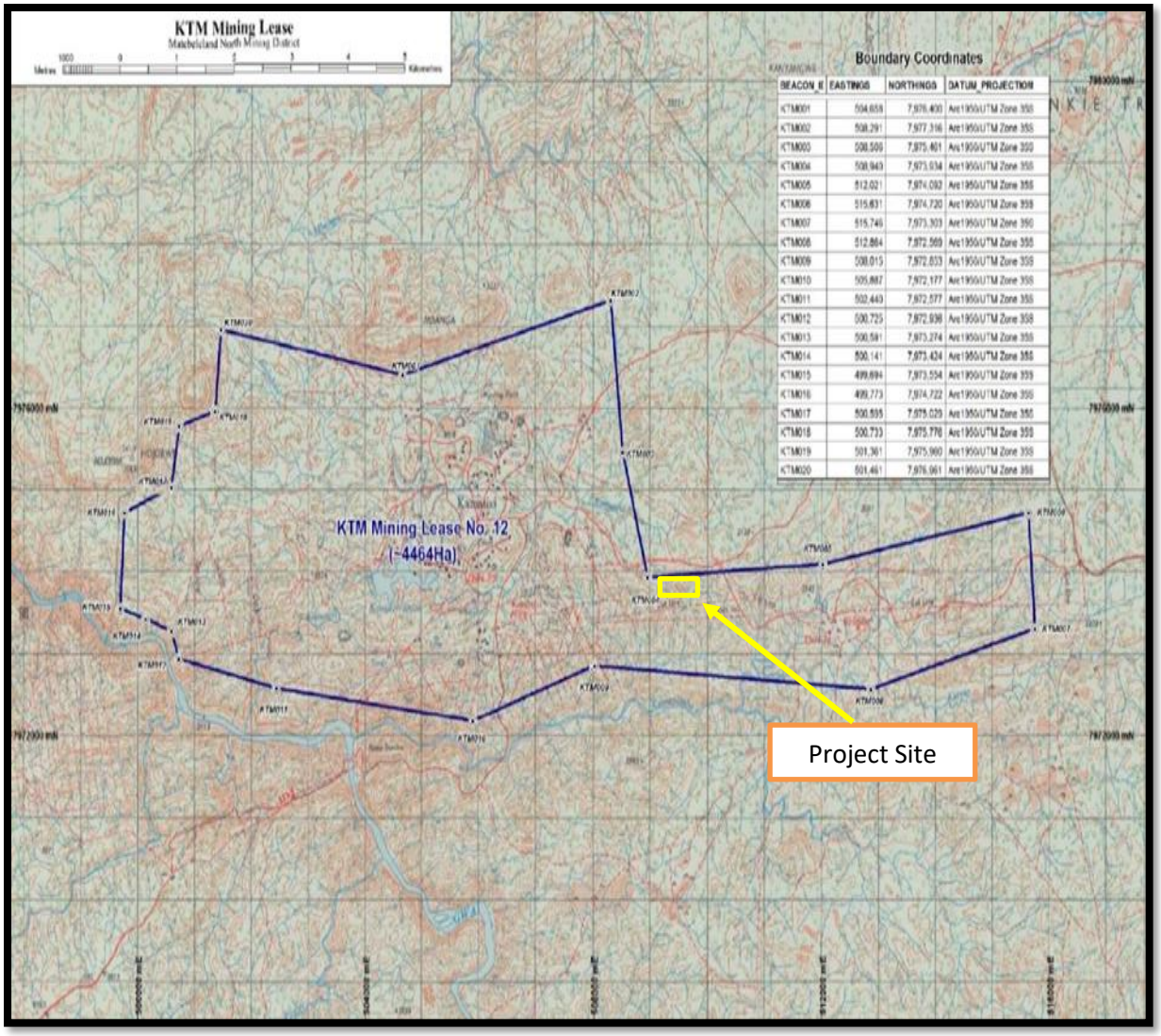


Figure 2.1: Showing KMC Boundaries and the Project Site

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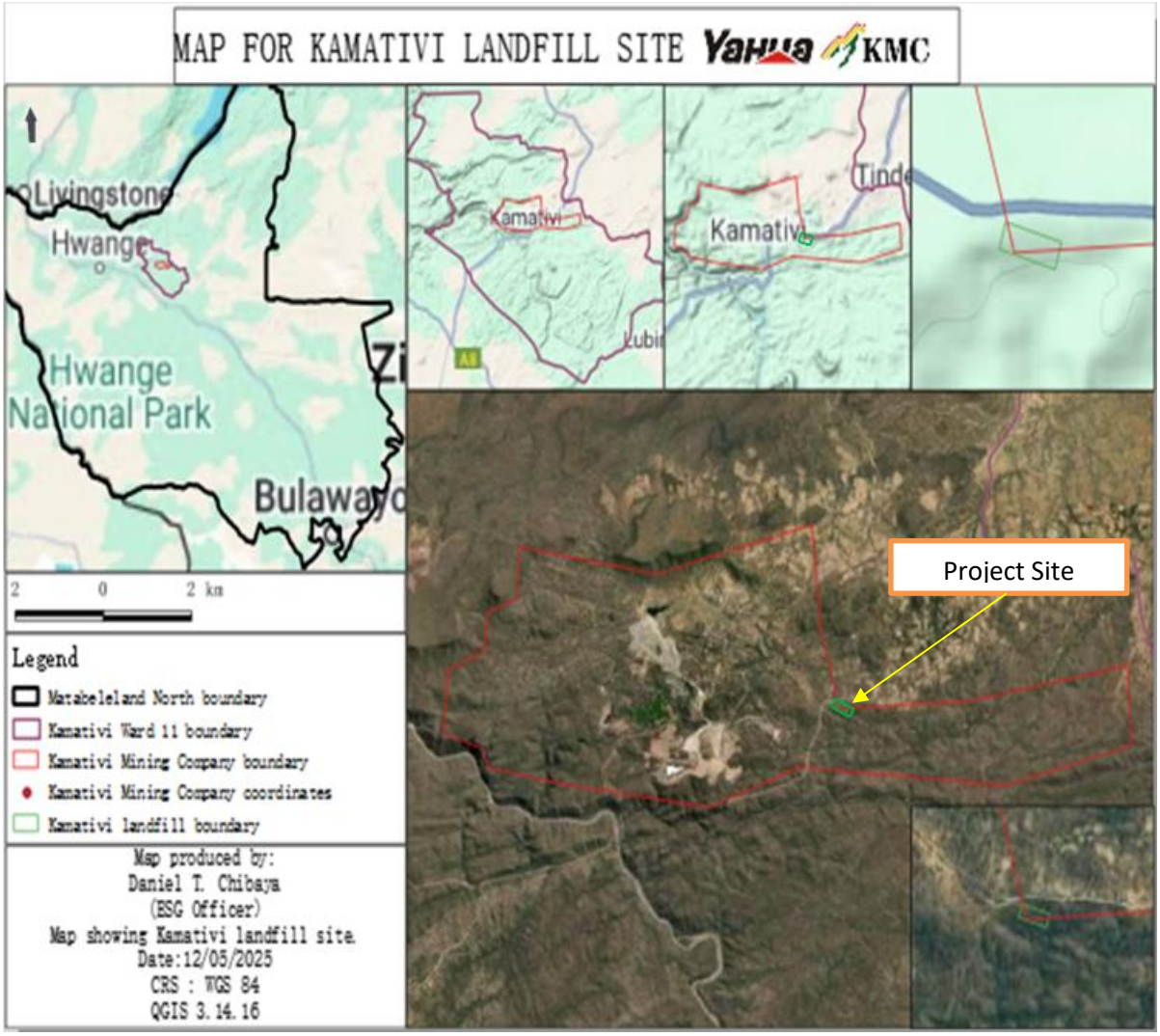


Figure 2.2: Showing KMC Boundaries and the Project Site on Google Earth Map

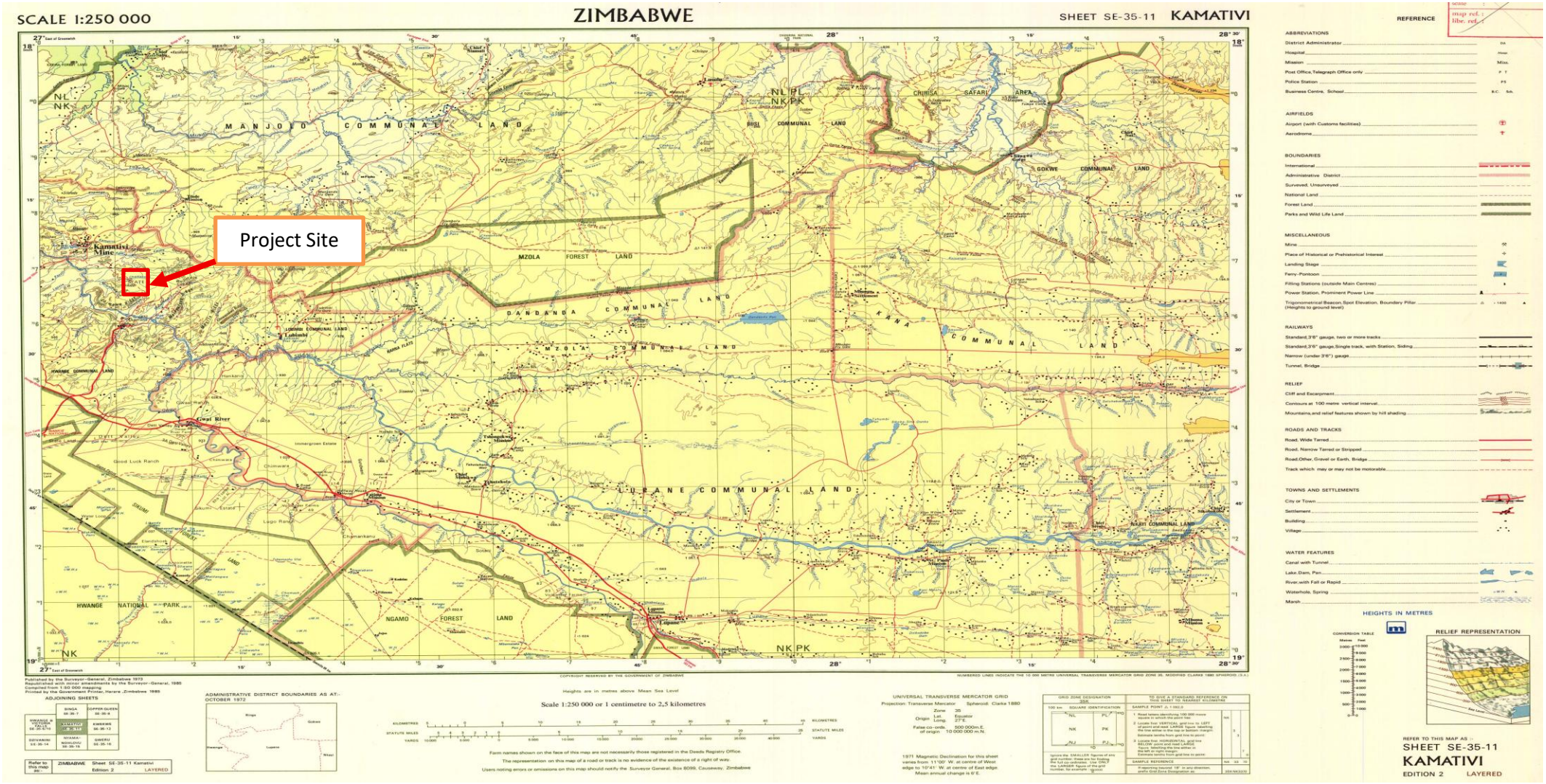


Figure 2.3: Showing 1:25 000 Map showing the Project Site

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2.3. PROJECT SCOPE

The project description deals with various aspects of the project in detail to shed more light on what the project is all about. It also assists us to point out areas that will cause environmental degradation and areas where sustainability can be realised. The project is still in its early implementation phase. The client is planning to formalize the waste generation at Kamativi Mining Company as well as within Hwange District by developing a Sanitary landfill site. Apart from the physical design of the waste site, waste management and logistics would need to be planned in detail. The actual waste site design through Engineering Drawings and the waste collection and disposal plan will need to be sustainable in the long term and anything less would mean seriously negative impacts on the natural environment and people from that area. Therefore, the waste management plan needs to be sound and will require commitment from RDC to be implemented thoroughly and also the landfill design needs to comply with zero pollution standards in order for this project to be a success. The project scope is divided into the following aspects;

- Site Clearing and Preparation
- Excavation and construction of access roads
- Lining and Compaction
- Construction Activities, Facilities and Resources
- Engineering Drawings
- Commissioning of the project

Currently, the project is not yet at its implementation stage. However, there are structures at the project site which can be used for housing workers and equipment to be used during construction period, and a toilet for ablution facilities.

2.3.1 Site Clearing and Preparation

The site preparation phase will be executed through a precision-engineered approach to land clearing and biomass removal, strictly delineated to establish logistical access corridors and facilitate the mobilization of heavy machinery for bulk earthworks. Vegetation stripping will be confined exclusively to the critical infrastructure footprints specifically the primary landfill cell, the leachate collection and treatment pond (LCTP), and the designated refuse discharge terminal to minimize unnecessary habitat fragmentation and maintain the surrounding ecological connectivity. To preserve the pedological integrity of the site, topsoil horizons will be systematically excavated and stockpiled using established soil conservation protocols; these stockpiles will serve as a vital environmental management resource for intermediate cover and final landfill capping, a process essential for mitigating vector attraction, suppressing aeolian dust emissions, and reducing the hydraulic load on the containment system by curbing storm-water infiltration. Through this integration of geotechnical engineering and resource conservation, the project ensures that site development remains strictly compliant with best management practices (BMPs), thereby safeguarding the local hydrogeological regime from potential contamination while maintaining long-term slope stability and soil health.

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2.3.2 Excavation and construction of access roads

The subsurface engineering phase will be executed through a precision-controlled excavation program, employing a systematic combination of mechanical earth-moving equipment and manual finishing to achieve a design depth of 3-5m. The primary landfill cell, designed with a footprint of 40m by 108m, will feature invert levels strategically determined by the lithological bedrock interface to optimize structural integrity and prevent hydraulic connectivity with underlying aquifers. This process involves the controlled removal of overburden to establish a stable, compacted foundation subgrade capable of supporting the engineered lining system. Furthermore, specialized sub-base trenching will be integrated into the cell floor to house the leachate collection and conveyance system (LCCS); this network of perforated drainage piping is engineered to facilitate consistent gravitational flow of hazardous liquid effluents toward the collection point. Concurrently, a leachate attenuation pond will be excavated with a 40m times 40m surface area and a depth of 3-5m, providing the necessary hydraulic retention time required for the effective equalization and pre-treatment of concentrated leachate streams, thereby ensuring rigorous compliance with environmental containment standards and the protection of the surrounding hydrogeological regime.

2.3.3 Lining and Compaction

- The structural integrity and hydraulic conductivity of the containment system are detailed in the engineering schematics provided in Section 2.8. The design utilizes a multi-barrier approach, optimized for the site's climatological water balance and projected leachate generation rates. To prevent contaminant migration and ensure aquifer protection, the following stratigraphic layers will be engineered:
- Subgrade Stabilization (In-situ Layer): Following the initial excavation to design invert levels, the native subgrade will undergo mechanical stabilization. This in-situ material shall be compacted to a minimum density of 98% MOD AASHTO to provide a firm, low-permeability foundation.
- Protection Layer (Non-woven Geotextile): A high-mass, 800 gsm non-woven geotextile will be deployed across the entire footprint. This layer functions as a mechanical buffer to protect the overlying geomembrane from punctures and localized tensile stress from the subgrade.
- Primary Hydraulic Barrier (HDPE Geomembrane): A 1.5 mm High-Density Polyethylene (HDPE) geomembrane will serve as the principal impermeable barrier. This liner is selected for its superior chemical resistance and mechanical properties:

Table 2.2 Showing Lining and Compaction results

Physical Property	**Technical Specification**	**Mechanical Property**	**Technical Specification**
Thickness	1.5 mm	Yield Elongation	12%
Density	0.94 g/cc	Tear Resistance	187 N
Breaking Strength	40 kN/m	Puncture Resistance	480 N

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Physical Property	Technical Specification	Mechanical Property	Technical Specification
Yield Strength	22 kN/m	Stress Crack Resistance	500 hrs
Break Elongation	700%	Carbon Black Content	2.0% – 3.0%

- Leachate Collection Media (Gravel Layer): To facilitate efficient primary drainage, suitable sub-base gravel will be utilized as a high-permeability medium. This material will be strategically placed within the collection trenches surrounding the perforated HDPE drainage pipes to optimize the hydraulic transmissivity of the leachate to the treatment pond.

2.3.4 Construction Activities, Facilities & Resources

The construction phase necessitates the deployment of both transient and permanent auxiliary infrastructure, engineered to support site operations while minimizing the environmental footprint. These facilities will be sited within a designated disturbed zone to prevent unnecessary habitat fragmentation and will include:

- Contractor's Administrative Compound & Laydown Areas: Dedicated zones for the logistical management of the project and the systematic inventorying of construction materials to prevent soil contamination.

- Hydrocarbon Management & Power Systems: Specialized fuel handling and storage areas equipped with secondary containment (bunding) to mitigate risk of soil and groundwater infiltration. Temporary power will be decentralized via high-efficiency diesel generators featuring acoustic enclosures for noise attenuation.

- Ablution & Wastewater Management: On-site sanitation facilities will be managed through sealed conservancy tanks or chemical systems to ensure compliance with effluent discharge standards and public health mandates.

- Decontamination Wash Bays: Engineered zones for vehicle and equipment maintenance, incorporating oil-water separators and silt traps to prevent the discharge of hydrocarbons and suspended solids into the local drainage network.

At the cessation of the construction lifecycle, these temporary structures will undergo decommissioning and site remediation, though select units may be repurposed as administrative offices or security outposts to optimize resource efficiency. The procurement strategy prioritizes a sustainable supply chain, sourcing raw materials nationally or through international channels, while maximizing social equity by recruiting the majority of the labor force from the surrounding Kamativi and Hwange RDC communities. To meet the volumetric water demand for dust suppression, concrete

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batching, and potable requirements, water will be sourced and managed through an integrated supply system designed to prevent the depletion of local groundwater reserves.

2.3.5 Engineering designs and calculations for the landfill site

2.3.5.1 Landfill designs

Since all the waste generated by the business centre will be disposed of at the project site, the design will need to cater for any harmful substances that could be part of the waste matter. The basic design of the landfill site will be compacted cells whereby a cell consists of the waste generated on a daily or weekly basis depending on the volumes at the time. The cell is then covered with soil and compacted ready for the formation of the next cell. The initial landfill construction will consist of the following:

- Excavation of primary pit to approximately 2m depth, according to production of waste forecasts for filling over a certain time period;
- Layering of a clay material base as a natural impermeable and foundational layer;
- Layers of 3mm geo-membrane lining on-top of the clay to prevent seepage into natural environment;
- Placement of perforated plastic pipes for underground leachate collection in sandy layer;
- Layering of sand on drainage pipes to form a thick sandy layer that will easily divert water into the perforated pipes;
- Stony gravel layer for easy drainage of leachate into the sand;
- Soil layer to form base of the first landfill cells;
- Leachate containment pond and pumping system for monitoring and removal of leachate from the landfill site.

2.3.5.2 Engineering Calculations

Current population (P): 6211 people

Waste Per Capita (W): 0.3kg/m³

Waste Density :250 kg/m³

Annual Population Growth Rate (r): 2%

1. Daily Waste Generation Calculation

Daily Waste (kg)= $P \times W = 6211 \times 0.3 = 1863.3 \ kg \ /day$

Daily Waste (tonnes)= $\frac{1863.3}{1000} = 1.86 \ tonnes \ /day$

2. Daily Waste Volume (m^3)

Volume (m^3/day)= $\frac{Daily\ Waste\ (kg)}{Density\ (\frac{kg}{m^3})}$= $\frac{1863.3}{250}$=7.45m³/day

r =0.02

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Future Waste= $Current\ Waste\ \times (1+r)^n$

N=numbers of years

Annual Waste Calculations

Year 1

Annual Waste (kg)=1863.3×365 *=680104.5kg/year*

≈680.1tonnes/year

Annual Volume (m³)=$\frac{680104.5}{250}$ *=2720.4m³/year*

Year 5 (with 2% Growth)

Waste in year 5 =$1863.3 \times (1+0.02)^5$ *=2057.2kg/day*

Annual Waste (kg)=2057.2×365 *=750878kg/day*

≈750.9tonnes/year

Annual Volume (m³)=$\frac{750878}{250}$ *=3003.5m³/year*

Table 2.3 Showing Waste Generated in Kamativi

Year	Daily Waste(kg)	Daily Volume (m³)	Annual Tonnes	Annual Volume (m³)
1	1863.3	7.45	680.1	2719.25
2	1938.6	7.75	707.6	2828.75
3	1977.3	7.91	721.7	2887.15
4	2016.9	8.07	736.2	2945.55
5	2057.2	8.23	750.9	3003.95

2.3.5.3 WEATHER DATA FOR LEACHATE ESTIMATION.

Table 2.4 Showing Zimbabwe Meteorological services, World bank Climate data

Location	Mean rainfall(mm/yr)	Mean temperature (°C)	Evaporation	Type of climate
Binga	~600-700	24-28	2200	Semi-Arid
Dete	~650-750	22-26	2000	Savanna/Woodland
Vic Falls	~700-800	24-30	2400	Hot Arid Area

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Hwange	~550-650	23-28	2300	Dry Savanna
Kamativi (EST)	~650-750	23-27	2200	Semi-Arid

2.3.5.4 LEACHATE GENERATION ESTIMATE USING WATER BALANCE METHOD FOR LANDFILLS

Leachate = Rainfall + Waste Moisture- Evaporation – Runoff – Storage in Waste.

- Rainfall(P) =700mm/year (0.7m)
- Landfill Area= 4320m²
- Runoff Coefficient (C) = 0.2 (Semi-covered landfill)
- Field Capacity of Waste : 30 % moisture retention
- Evaporation (E) : 2200mm/yr (but only 30% effective over landfill)

Calculations

Rainfall Infiltration

$$Q_{rain} = (P \times A) \times (1 - C) = (0.7 \times 4320) \times 0.8 = 2419.2 m^3/year$$

Evaporation Loss

$$Q_{exap} = (E \times A) \times (0.66 \times 4320) = 2851.2 m^3/year$$

Net Leachate From Rainfall

$$Q_{net\ rain} = Q_{rain} - Q_{exap} = 2419.2 - 2851.2 = -432 m^3/year$$

NB: Negative Value means evaporation exceeds rainfall infiltration no net leachate from rainfall under these conditions)

2.3.5.5 LEACHATE FROM WASTE DECOMPOSITION.

-Waste Generation : 680tonnes/year

-Moisture release: 20% : 136m³/year

Total Leachate (Worst-Case Scenario- No Evaporation)

If we assume no evaporation

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$Q_{total} = Q_{rain} + Q_{waste} = 2419.2 + 136 = 2555.2\ m^3/year\ (7m^3/day)$

Best case-scenario (with evaporation)

$Q_{total} = Max(0, Q_{netrain}) + Q_{waste} = 0 + 136 = 136m^3/year\ (0.37m^3/day)$

2.3.5.6 PIPE SIZING FOR TRANSPORTATION OF LEACHATE FROM LANDFILL TO THE LEACHATE POND

CONSIDERATIONS NEEDED:

1. Leachate flow rate (based on waste- case scenario generation)
2. Pipe material and hydraulic design (Gravity flow)
3. Slope and Velocity requirement (to avoid clogging)

1. LEACHATE FLOW RATE CALCULATIONS

-Worst case leachate generation- 7m³/day (0.000081m³/s)

-Peak Flow(During heavy Rain): Up to 20m³/day (0.00023m³/s)

Design Flow(Q)

$$Q = \frac{Peak\ Daily\ Leachate\ (m^3/day)}{Seconds\ per\ day(86400s)} = 0.00023m^3/s\ (20m^3/day)$$

2. PIPE SIZING BASED ON GRAVITY FLOW

Using Manning Equation for Open Channel or Partially full pipes.

$$Q = \frac{1}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

Where:

Q= Flow Rate (m³/s)

n= Manning roughness coefficient

HDPE n=0.009

PVC n=0.013

A= Cross-sectional Area (m²)

R= Hydraulic Radius(m)= $\frac{A}{P}$

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P= Wetted Perimeter (m)

S= Slope(m/m)

Target Velocity

- Minimum: 0.6m/s (To avoid sedimentation)
- Maximum: 2.5m/s (To prevent erosion)

3. PIPE DIAMETER CALCULATION

OPTION 1: HDPE PIPE

- Assumed slope (S): 1%(0.01m/m) for Gravity flow.
- Trial Diameter :100mm (0.1m)

CALCULATIONS

1. Cross-sectional Area(A)

$A = \frac{\pi D^2}{4} = \frac{\pi(0.1)^2}{4}$=0.00785m²

2. Wetted Perimeter (P)

$P = \pi \mathrm{D} = \pi \times 0.1$ =0.314m

3. Flow Capacity

$$Q = \frac{1}{0{,}009} \times 0.0078 \times 0.025^{\frac{2}{3}} \times 0.01^{\frac{1}{2}} = 0.00038 m^3/s\ (33 m^3/day)$$

Therefore, more than sufficient for 20m³/day

Actual Velocity (V)

$$V = \frac{Q}{A} = \frac{0.00023}{0.00785} = 0.029 m/s$$

Problem: Velocity <0.6 m/s therefore risk clogging.

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Revised Design: Smaller Pipe (50mm) With steeper slope

Diameter(D): 50mm (0.05m)

Slope (S): 2%(0.2m/m)

1: A= 0.00196m² P=0.157m R=0.0125m

2: Q= 0.00012m³/s (10.4m³/day) Conclusion: Insufficient

Another Solution: Use 75mm HDPE Pipe 1.5 %slope

D=75mm (0.075m), S=1.5% (0.015m/m)

A= 0.00442m², P=0.236m R=0.0187m

Q= 0.00028m³/s (24m³/day)

V= 0.063m/s (slow)

Conclusion

Recommendation:

- To use 100mm Perforated HDPE Pipe with slope ≥2% for primary collections.
- Transfer pipe to the pond to use HDPE (150-200mm)

Landfill and Leachate Pond Dimensions

Shape: Truncated Triangular Pyramid

$$V = \frac{1}{3}h(A1 + A2 + \sqrt{A1 \times A2}$$

Top Area :108m ×40m

Bottom Area: 93m×10m

H=3m

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$$V = \frac{1}{3}.3((108 \times 40) + (93 \times 10) + \sqrt{(108 \times 40) \times (93 \times 10)}$$

$$V = ((4320) + (930) + \sqrt{(4320) \times (930)}$$

$$V = 7255.5m^3$$

AREA CALCULATIONS

Long side: 108m (top) & 93m (bottom)

Short Side: 40m (top) & 10m (bottom)

Trapezoid = $A = \frac{1}{2}(a + b)h$

$h = height(distance\ between\ the\ parallel\ side)$

$A - long = \frac{1}{2}(108 + 93)(\sqrt{3^2} + \left(\frac{108-93}{2}\right)^2 = 812.04m^2$(one long side)

NB: There are 2 sides 2×812.04m=1624.08m²

$A - short = \frac{1}{2}(40 + 10)(\sqrt{3^2} + \left(\frac{40-10}{2}\right)^2 = 382.5m^2$(one short side)

NB: There are 2 side 2×382.5m²=765m²

Total Surface Area (for lining Calculation) = Bottom Total Long Side Area+ Total Short Side

=930+1624.08+765=3319.08m²

Leachate Pond

$$V = \frac{1}{3}h(A1 + A2 + \sqrt{A1 \times A2}$$

A1= 40m×40m

A2= 30m×30m

V= 3700m³

A= 1716.2m²

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The calculations show that there will be more evaporation due to the high Temperature a leachate pond shall be constructed to prevent runoff and pollution by leachate in the event of heavy rainfall. The leachate pond shall also assist in holding leachate as the rate of flow of leachate in the impervious pipes will be higher that the rate of evaporation.

2.3.6 Engineering drawings

The drawing below shows the design of the sanitary landfill that shall be constructed in Kamativi. The design of the landfill shall be take the shape of a truncated rectangular prism as shown in the drawings below. The plan also shows the location of a manhole between the landfill and the leachet pond on cases of future expansion.

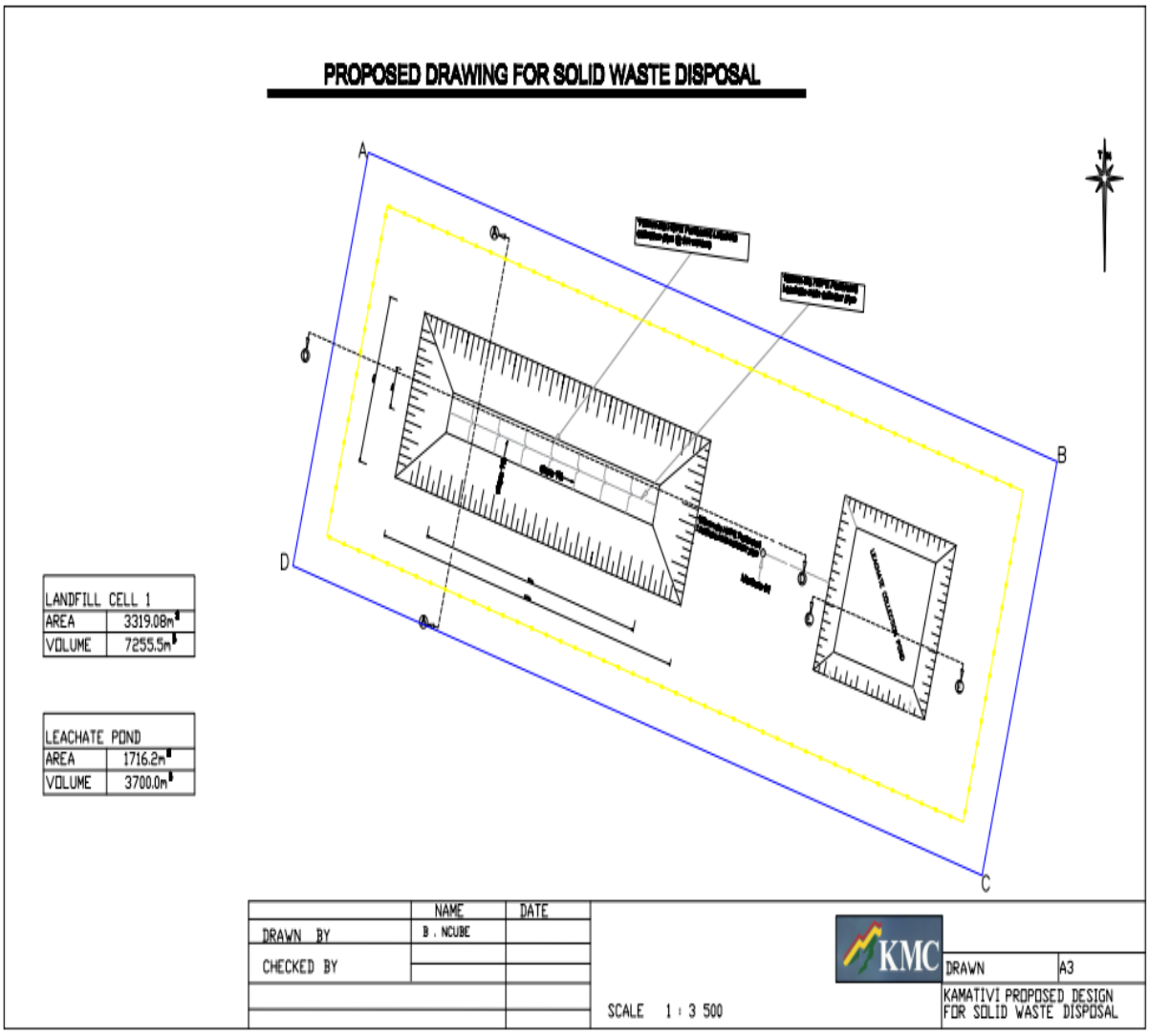


Figure 2.4: landfill and leachate pond drawing

The plan below shows the cross section of the landfill. This crossection contains all th layers that are going to make bases of the landfill and the conpactions that shall be done on the layers to ensure that there is no sepapage that may occur from the landfill and pollute the environment.

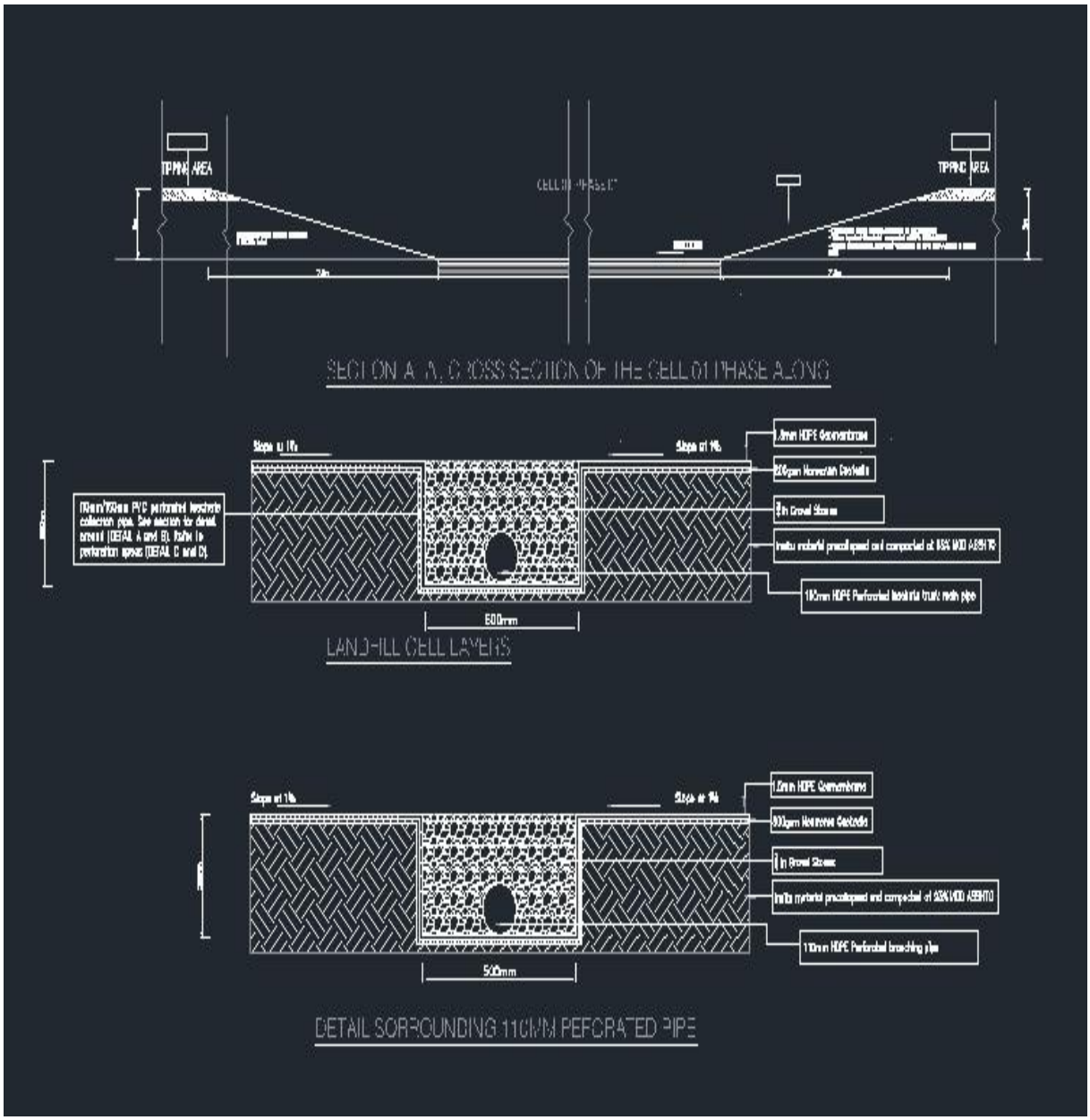


Figure 2.5: Cross Section of the landfill

The plan below shows the cross section of the leachate pond which shall also take the shape of a truncated rectangular prism like the landfill. The cross section also shows the compaction and all the layers that shall be put on the landfill to make it impermeable as explained above in subsection 2.5.

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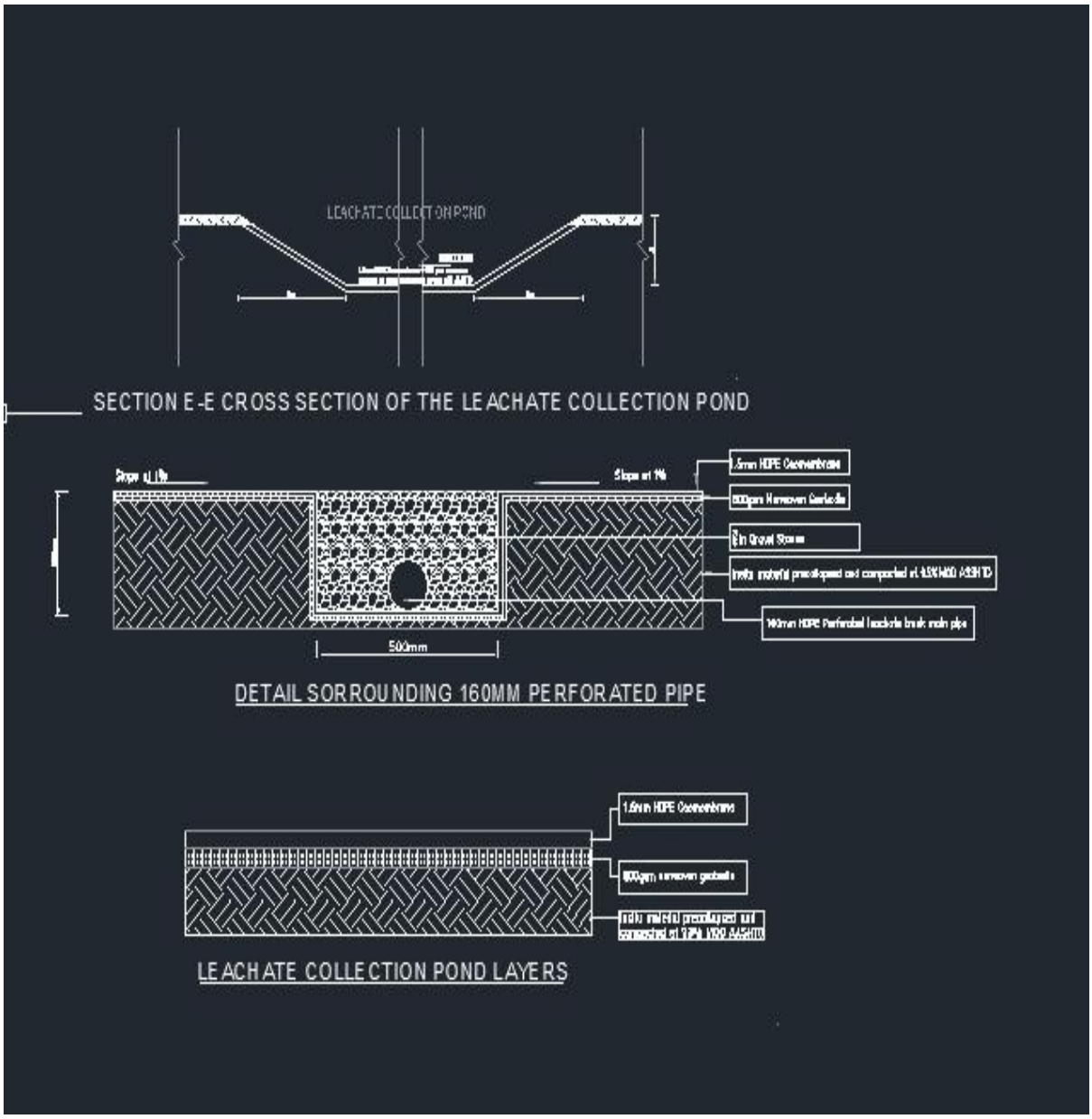


Figure 2.6: Cross Section of the leachate pond

2.5. WATER AND SANITATION

To support the logistical demands of the Kamativi Sanitary Landfill, the project incorporates a comprehensive Water and Sanitation Management Plan designed to optimize resource efficiency while strictly adhering to public health and environmental protection standards. The primary water supply for the construction phase will be derived from a dedicated, on-site borehole. This groundwater source will be developed in accordance with local hydrogeological regulations to ensure sustainable abstraction rates that do not adversely impact the regional water table or local ecosystem services. During the construction of the landfill cells, leachate collection systems, and site infrastructure, this water will be utilized for dust suppression essential for mitigating atmospheric particulate matter as well as for site preparation, compaction of engineered soil liners, and general construction utility. Rigorous water quality monitoring protocols will be established to ensure the borehole supply meets all project-specific requirements, with potential pre-treatment systems implemented if parameters fall outside of desired operational ranges.

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Sanitation for the site's workforce will be managed through the installation of strategically sited, permanent ablution facilities designed to uphold high standards of hygiene and minimize the risk of waterborne disease. These facilities will be integrated with a decentralized, engineered sewage treatment system, featuring a robust septic tank and associated soakaway or secondary treatment unit. The system is designed to provide primary treatment for domestic wastewater, effectively facilitating the settling of solids and the anaerobic decomposition of organic matter. The siting of these facilities is critical; they will be located at a significant, regulatory-compliant distance from both the proposed borehole and the landfill's leachate collection and treatment pond (LCTP). This spatial separation is a fundamental environmental safeguard, intended to prevent the lateral migration of effluent and ensure that no cross-contamination occurs between sewage waste streams and groundwater resources. By professionalizing the site's sanitation, the project fulfills its occupational health and safety obligations while ensuring that the broader human-ecological landscape is shielded from the hazards of poorly managed human waste.

2.5.1. SOURCE OF ENERGY

The energy procurement strategy for the proposed Kamativi Sanitary Landfill project is designed to balance immediate site development needs with long-term operational sustainability. By transitioning from localized, temporary power generation to a stable grid connection, the project aligns with best practices for minimizing environmental impact and carbon footprint.

During the construction phase, the site will rely on diesel-powered generators to supply electricity for heavy machinery, site lighting, and temporary administrative facilities. Recognizing that these units are sources of atmospheric emissions and noise pollution, KMC will manage these impacts through a rigorous compliance framework. Each generator will be operated under a valid emission license issued by the Environmental Management Agency (EMA). To maintain adherence to the Environmental Management (Atmospheric Pollution Control) Regulations, the project will implement a strict preventive maintenance schedule, utilize high-quality fuel, and position the generators in areas that minimize noise propagation toward sensitive ecological or residential receptors.

Once the construction phase is complete, the project will transition to a permanent electricity supply by connecting to the existing 33 kV power line situated in close proximity to the site. This grid connection is a central feature of the project's infrastructure design and serves as a sustainable alternative to long-term onsite fossil fuel reliance. Utilizing the national grid significantly reduces the project's Scope 1 greenhouse gas emissions and ensures a reliable power supply for critical environmental infrastructure, such as leachate collection and treatment systems, which must operate continuously to prevent groundwater contamination.

The integration into the local grid also offers future potential for sustainable energy management. By locating the project near an existing high-voltage line, KMC creates an opportunity for future landfill gas-to-energy (LFGTE) initiatives, where methane captured from the landfill could potentially be converted into electricity and fed back into the local grid. This approach demonstrates a commitment to circular economy principles and integrated environmental management throughout the life cycle of the landfill.

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2.5.3 CONSTRUCTION OF ROADS

The proposed access road to the Kamativi Sanitary Landfill is a critical piece of infrastructure, extending approximately 500 meters from its intersection with Binga Road. Engineered to accommodate the bidirectional flow of heavy-duty waste management vehicles, the road is designed to meet national construction standards, ensuring that it can withstand high axle loads while minimizing structural fatigue. By providing a reliable conduit for site traffic, this access route ensures the operational continuity of the facility while channelling transit away from unplanned or informal tracks that could otherwise lead to environmental degradation.

The construction methodology follows a systematic approach designed to mitigate land disturbance. The process begins with the removal of topsoil which will be preserved for future land rehabilitation and the subsequent excavation of the subsoil. Because this phase temporarily compromises the soil's natural structure, KMC will employ rigorous mechanical stabilization techniques. Specifically, graders and bulldozers will clear the path, followed by the use of rammers for compaction. The application of water during this phase is a technical requirement to optimize the moisture content of the soil, ensuring maximum particle cohesion and a sturdy, load-bearing base that resists future subsidence.

Once the sub-base is stabilized, a layer of graded quarry stones will be applied to provide structural reinforcement, followed by the final application of a bitumen (tar) surface. This paved finish serves as a vital environmental control mechanism. By creating an impervious surface, the design eliminates the vulnerability of the soil to water-induced erosion and prevents the formation of sediment-laden runoff during the rainy season. This effectively protects the surrounding topography from siltation and the loss of natural soil integrity.

Finally, the project prioritizes worker safety and regulatory compliance throughout the construction lifecycle. All road-building activities are integrated into the facility’s Environmental and Social Management Plan (ESMP), with specific provisions to ensure alignment with the National Social Security Authority (NSSA) regulations. This includes the implementation of rigorous Occupational Health and Safety (OHS) protocols for machinery operation and material handling, ensuring that the infrastructure is developed within a framework of professional safety standards and environmental accountability.

2.5 WASTE MANAGEMENT

Waste management at the Kamativi Sanitary Landfill project site will be governed by a rigorous Integrated Waste Management Plan (IWMP), specifically designed to mitigate site-generated impacts during the construction, development, and commissioning phases. As project activities commence—beginning with land clearing and progressing through infrastructure assembly—the site will generate a diverse waste stream, including organic vegetation, packaging materials (plastics and paper), chemical containers, and construction offcuts. To prevent the uncontrolled accumulation of these materials and minimize the project's ecological footprint, KMC will implement a hierarchical approach focused on waste avoidance, reduction, and source segregation.

Central to this strategy is the mandatory on-site implementation of a color-coded waste segregation system. Bins will be strategically positioned across the site, clearly demarcated to ensure that waste streams are separated at the point of generation. For example, designated bins will be used for

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recyclable plastics, paper and cardboard, and non-recyclable solid waste. This segregation is critical to maintaining the purity of recyclable material streams, preventing cross contamination, and ensuring that hazardous materials such as oily rags or chemical residue containers are isolated and handled according to the Environmental Management (Hazardous Waste Management) Regulations.

KMC will further adopt circular economy principles by prioritizing the reuse and recycling of construction-related consumables. Cement sacks, plastic containers, and metal scrap will be diverted from the landfilling stream and channelled toward approved secondary uses or authorized recycling facilities. By repurposing high-volume items like cement bags and containers, the project significantly reduces the total volume of waste requiring final disposal. This practice not only conserves resources but also aligns the project with the sustainability mandates required under the Environmental Management Act [Chapter 20:27].

Finally, all waste that cannot be reclaimed or recycled will be subjected to professional disposal protocols. The project will maintain a formal Waste Tracking Manifest to monitor the life cycle of every waste unit generated on site, ensuring that disposal occurs only at licensed facilities. During the commissioning stage, this vigilance intensifies as the site shifts from a construction zone to an operational waste containment facility. Through these systemic management practices, KMC ensures that the project site remains free of refuse, preventing potential soil and water contamination while upholding the highest standards of environmental cleanliness.

2.3.7 Commission of the project

The commissioning stage serves as the definitive transition from site development to full scale operational status, marking the point at which the landfill's engineered containment systems are subjected to rigorous performance verification. This phase is critical to ensuring that the facility's structural and hydraulic defenses are fully functional before the commencement of waste deposition. Central to this process is the integrity testing of the High Density Polyethylene (HDPE) geomembrane liner; utilizing sophisticated non destructive methods such as vacuum box or spark testing, the project team ensures that the primary hydraulic barrier is free of micro-perforations or mechanical breaches, thereby neutralizing the risk of leachate migration into the vadose zone.

Beyond liner validation, the commissioning phase encompasses the functional assessment of the leachate collection and conveyance network. This involves verifying that the pipe network maintains the specified gradients required to facilitate gravitational flow toward the leachate attenuation pond. Concurrent with this, engineers conduct detailed as built topographical surveys to confirm that the cell geometry, slopes, and embankments align with the approved civil designs. These surveys are essential for verifying the efficacy of the site's stormwater diversion infrastructure, which prevents the ingress of clean run-off into the waste mass a core strategy for minimizing leachate generation volumes and managing moisture infiltration across the active disposal areas.

Upon successful validation, the project undergoes a comprehensive compliance audit to ensure that all infrastructure meets the statutory requirements of the Environmental Management Act [Chapter 20:27] and the commitments outlined in the approved Environmental and Social Impact Assessment (ESIA). Once deemed compliant, the facility is formally institutionalized under the governance of the Hwange Rural District Council (RDC). This handover protocol mandates the seamless transfer of long-term environmental monitoring responsibilities, including the maintenance of groundwater quality

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monitoring boreholes, landfill gas (LFG) migration sensors, and post-closure maintenance schedules. This transition establishes a robust management framework, ensuring that the facility remains a secure, environmentally compliant asset dedicated to the protection of public health and the surrounding ecological landscape throughout its operational lifecycle and beyond.

2.6 ALTERNATIVES

2.6.1 NO GO OPTION

The "No-Go" option contemplates a scenario where the proposed sanitary landfill at Kamativi is not constructed. Under this alternative, the identified environmental and social impacts both adverse and beneficial would not occur, and the current site conditions would remain unchanged. Choosing this path implies that the Kamativi Mining Company would maintain its existing waste management practices, essentially preserving the status quo of the project area.

However, selecting this option requires a rigorous comparative analysis. We must weigh the avoided environmental costs against the significant social and economic benefits the landfill represents. This includes evaluating the substantial capital investment already injected by KMC into the project's planning and infrastructure. Furthermore, the "No-Go" option must be assessed against the potential risks of failing to provide a modern, engineered waste containment solution, which could lead to greater long-term environmental degradation than the controlled impacts of the proposed facility.

2.6.2 ALTERNATIVE PROJECT SITE

The assessment of alternative locations for the proposed sanitary landfill concluded that no other viable sites exist within the Kamativi Mining Company’s jurisdiction. The primary constraint governing this selection is the underlying geology of the region. Extensive geological surveys indicate that the surrounding land parcels are rich in lithium mineralized pegmatites. Establishing a permanent waste disposal facility over these areas would lead to the "sterilization" of valuable mineral resources, permanently obstructing the company’s core mining objectives and the national economic interest.

Consequently, the proposed site represents the only technically and economically feasible location, as it is situated on "barren" ground devoid of significant mineral potential. By utilizing this specific area, KMC ensures that waste management infrastructure does not conflict with future mining expansions. This site-specific approach balances the immediate need for a modern, engineered waste containment system with the long-term sustainability of the mine’s primary extraction operations.

2.7 THE PROJECT COST

The project is expected to incur the costs summed up in the table below. The table merges costs that shall be incurred in equipment and materials for constructing a Sanitary Landfill. It is estimated that the project will cost +/- US $70,966.50. The breakdown for the costs is listed in the table below.

Table 2.6: Shows the project cost

1. Preliminary and General (P&G) Costs

Item	Description	Quantity	Unit	Rate	Amount ($)
1.1	Site Establishment (Sheds, Signage, Fencing)	1	Sum	3,500.00	3,500.00
1.2	Insurance, Bonds, and Health & Safety Compliance	1	Sum	2,256.00	2,256.00
1.3	Mobilization and De-mobilization of Plant	1	Sum	2,500.00	2,500.00
1.4	Environmental Monitoring Setup (Initial Water Testing)	1	Sum	1,000.00	1,000.00

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Item	Description	Quantity	Unit	Rate	Amount ($)
Total					**$9,256.00**

2. Material Costs

Item	Description	Quantity	Unit	Rate	Amount ($)
2.1	HDPE Geomembrane Liner (1.5mm thickness)	2,000	m²	8.50	17,000.00
2.2	Geotextile Cushion Layer (Protection Fabric)	2,000	m²	3.20	6,400.00
2.3	Perforated Leachate Collection Pipes (160mm HDPE)	150	m	28.00	4,200.00
2.4	Bentonite Clay (for GCL or soil enhancement)	12	Tonne	350.00	4,200.00
2.5	Sand/Fine Aggregate for Pipe Bedding	80	m³	21.85	1,748.00
Total					**$33,548.00**

3. Construction Costs

Item	Description	Quantity	Unit	Rate	Amount ($)
3.1	Site Clearing and Grubbing	0.5	Ha	3,500.00	1,750.00
3.2	Excavation of Cell (Bulk Earthworks)	3,500	m³	3.50	12,250.00
3.3	Compaction of Sub-grade (Rolling and Levelling)	2,000	m²	2.50	5,000.00
3.4	Installation of Liners and Geotextiles (Labor)	2,000	m²	2.00	4,000.00
3.5	Construction of Leachate Collection Sump/Pit	1	Sum	5,162.00	5,162.00
Total					**$28,162.00**

Summary Table

Category	Allocated Amount
Section 1: Preliminary & General	$9,256.00
Section 2: Material Costs	$33,548.00
Section 3: Construction Costs	$28,162.00
GRAND TOTAL	**$70,966.00**

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CHAPTER 3: ENVIRONMENTAL AND SOCIO-ECONOMIC SETTING

This chapter provides a comprehensive baseline characterization of the Kamativi project area, detailing the biophysical and socio-economic environments as observed and verified by the specialist team during the ESIA process. By establishing the current "status quo" of the Kamativi Mining Company (KMC) concession, this section identifies existing ecological trends, anticipated environmental conditions, and any sensitive areas of unique scientific, cultural, or socio-economic value that may be influenced by the proposed sanitary landfill. The depth of information provided ensures that reviewers can clearly contextualize the potential impacts against the site's current state, while also providing a technical benchmark for monitoring environmental performance throughout the landfill's construction, operational, and eventual decommissioning phases.

3.1 TOPOGRAPHY

The Kamativi area is characterized by a rugged and highly dissected terrain, typical of the Zambezi Escarpment's crystalline basement complex. The regional geomorphology is defined by undulating hills and deeply incised valleys, creating a complex drainage network. For the proposed Kamativi Mining Company (KMC) sanitary landfill, the micro-topography of the specific site exhibits an uneven, asymmetrical profile. The site is situated on a moderate incline, featuring a distinct catena where the gradient slopes progressively from the eastern boundary toward the western flank.

This socio-environmental setting is technically significant as it dictates the hydraulic gradient of the site. The eastward-to-westward sloping relief implies that any surface analytical runoff or potential sub-surface seepage will naturally migrate toward the lower-lying western catchment. Consequently, the project design must incorporate sophisticated civil engineering interventions, such as terracing and perimeter interceptor drains, to manage the velocity of stormwater runoff and prevent siltation of the surrounding environment. The uneven nature of the land further necessitates a cut-and-fill balancing approach during the construction phase to achieve the required basal grades for the landfill's liner system.

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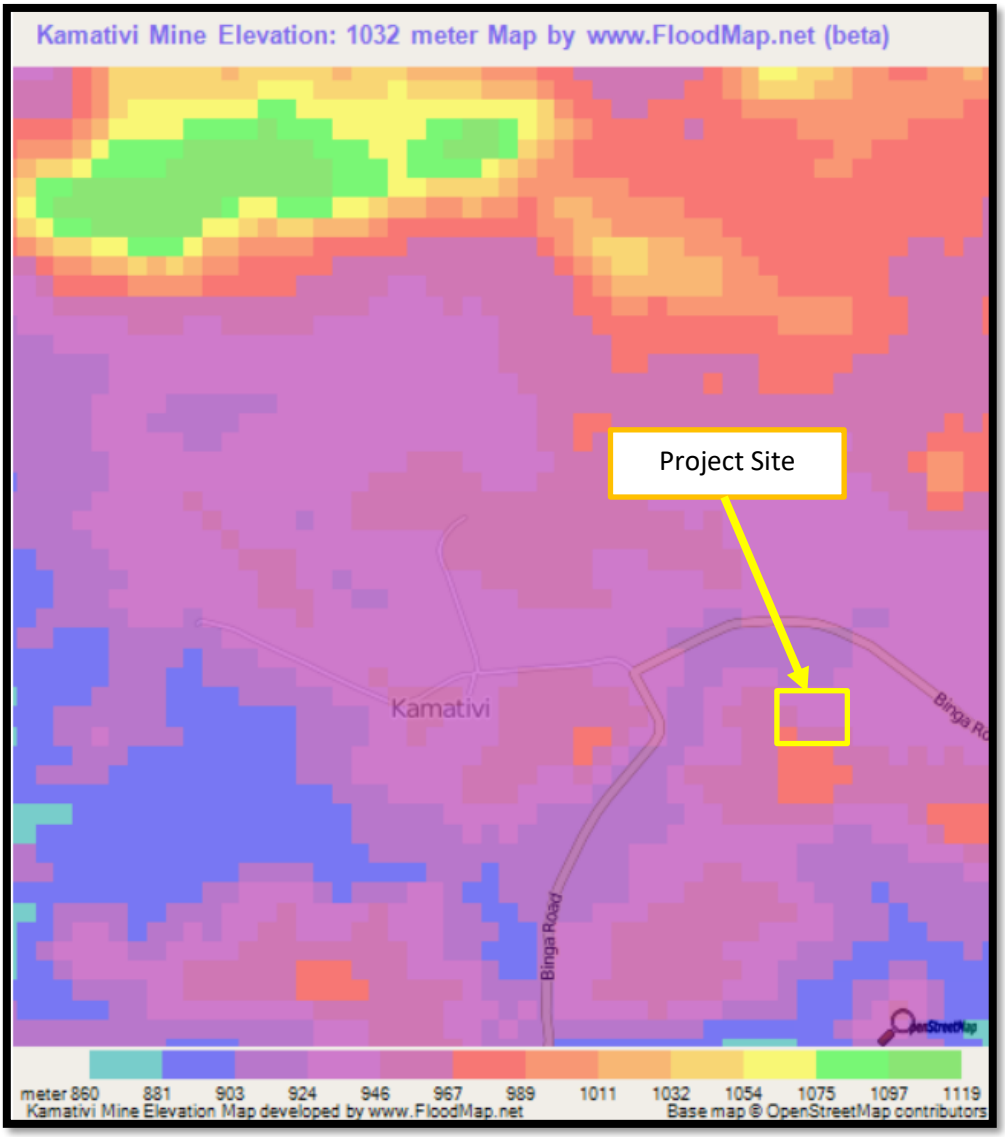


Figure 3.1: Shows the topography of the project site

3.2 CLIMATOLOGY

3.2.1 Climate in Kamativi

The Kamativi region experiences a distinct tropical continental climate characterized by two primary seasons: a hot, humid, and overcast wet season, followed by a warm, dry, and clear-sky period. Annual temperature profiles are generally temperate, typically ranging between 8.8˚C and 33.3˚C (approximately 48˚F to 92˚F), with historical extremes rarely falling below 5.5˚C or exceeding 36.6˚C. These thermal conditions are a vital consideration for the landfill's design, as ambient temperature significantly influences the rate of biological decomposition of organic waste and the subsequent rate of landfill gas production.

From an environmental management perspective, the distinct seasonality requires a robust approach to water balance modelling. The wet season, characterized by increased humidity and heavy precipitation, poses the greatest risk for rapid leachate accumulation and potential overflow of the landfill's containment systems. Conversely, the prolonged dry season may increase dust generation

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during site operations and vehicle movement. To ensure the integrity of the proposed sanitary landfill, project engineers must design for the seasonal peak in rainfall to prevent environmental contamination, ensuring that the facility remains stable and operational throughout both the intense precipitation cycles and the arid, high-evaporation periods.

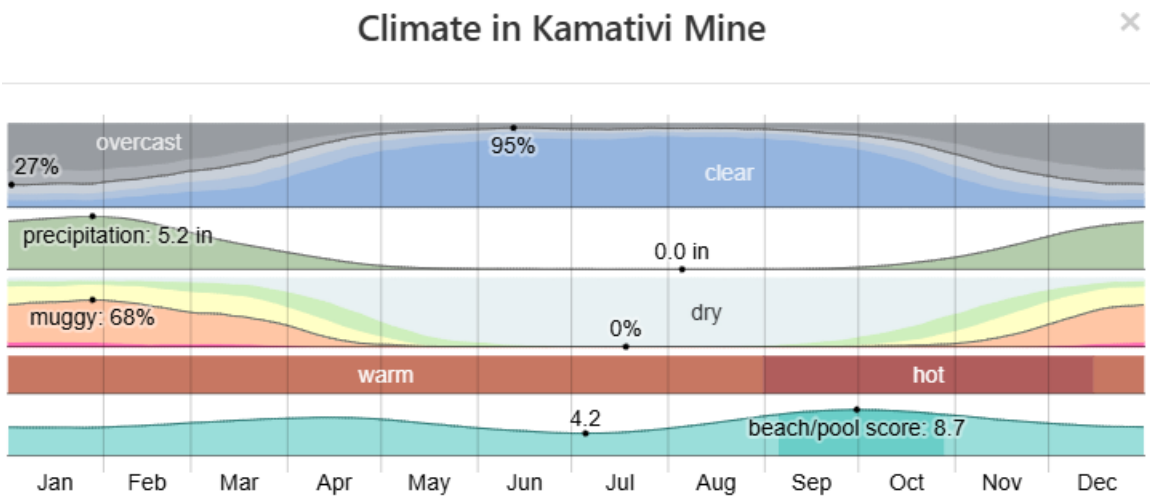


Figure 3.2: Showing Climate in Kamativi Mine

3.2.2 Average Temperature in Kamativi Mine

The thermal profile of the Kamativi region is defined by distinct seasonal fluctuations that directly influence the operational requirements of the proposed sanitary landfill. The hot season typically spans a 2.2-month period from mid-September to late November, with peak daily temperatures consistently exceeding 31.1˚C (88˚F). October serves as the warmest month, recording average daily highs of approximately 32.8˚C (91˚F) and lows of 20˚C (68˚F). During this high-thermal period, the accelerated rate of organic waste decomposition can lead to increased methane production and landfill gas (LFG) generation, necessitating efficient LFG management systems to mitigate potential safety and environmental risks.

Conversely, the cooler season persists for roughly 2.1 months, from late May to early August, characterized by more moderate daily highs generally falling below 26.1˚C (79˚F). July represents the coldest period of the year, with mean temperatures ranging from a high of 25˚C (77˚F) to a low of 9.4˚C (49˚F). While these lower temperatures may slow biological activity within the landfill, the associated reduction in evaporation rates during the cooler months must be factored into the site's water balance calculations. Understanding these temperature extremes allows for a design that ensures the integrity of liners and cover systems, as well as the optimization of leachate management strategies throughout the facility's lifecycle.

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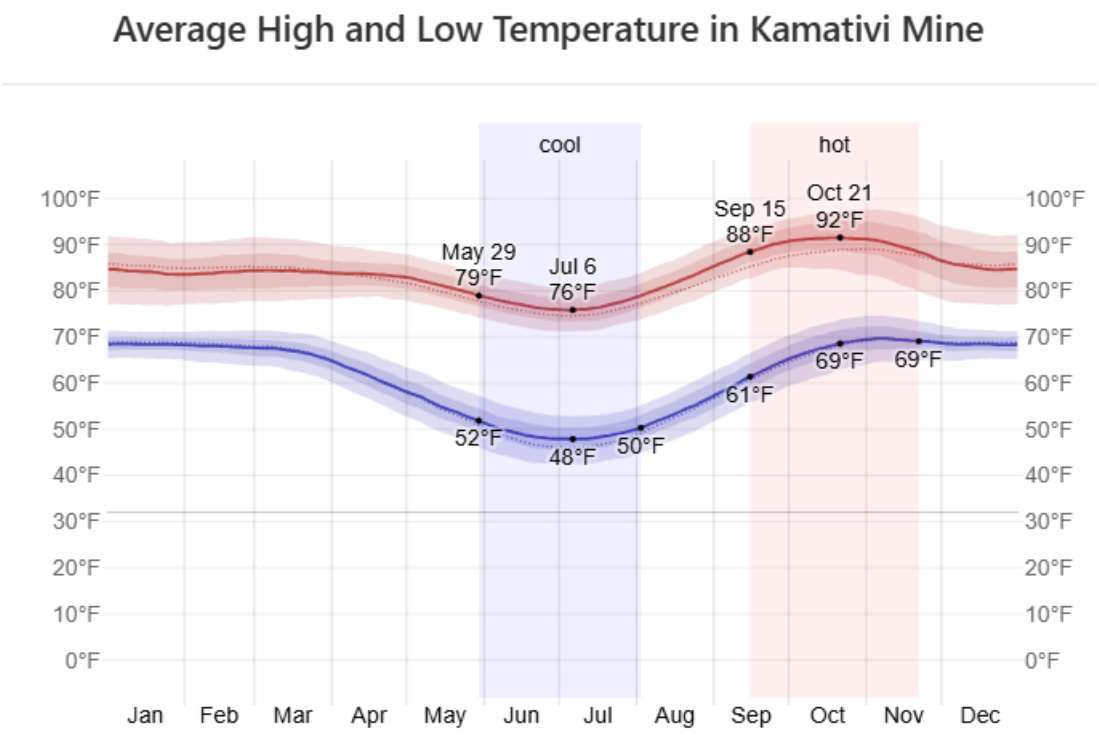


Figure 3.3: Showing Average High and Low Temperatures in Kamativi Mine

3.2.3 Precipitation

The hydrological regime in the Kamativi area is characterized by high seasonal variability, which is a critical determinant for the design and management of the proposed sanitary landfill. The wet season, extending for approximately 4.4 months from November 15 to March 29, exhibits a significant intensity of precipitation, with a probability of wet days exceeding 31%. January represents the peak of the hydrological cycle, averaging 18.3 wet days per month. These sustained precipitation events necessitate robust surface water management systems, including high-capacity storm drains and sediment traps, to prevent the inundation of active waste cells and to minimize the risk of leachate overflow, which would pose a significant environmental hazard to the surrounding area.

Conversely, the drier season spans the remaining 7.6 months of the year, from March 29 to November 15, with August experiencing virtually no measurable precipitation. Throughout the year, precipitation is exclusively in the form of rainfall, with "rain alone" peaking in probability at 61% around January 29. While the extended dry season offers stable conditions for operational waste placement, it introduces challenges related to fugitive dust emissions and the potential for spontaneous combustion of waste due to extreme desiccation. Therefore, the landfill's operational plan must account for this extreme rainfall seasonality by implementing a dynamic water balance strategy that ensures containment integrity during the wet months while effectively managing dust and fire risks during the prolonged arid period.

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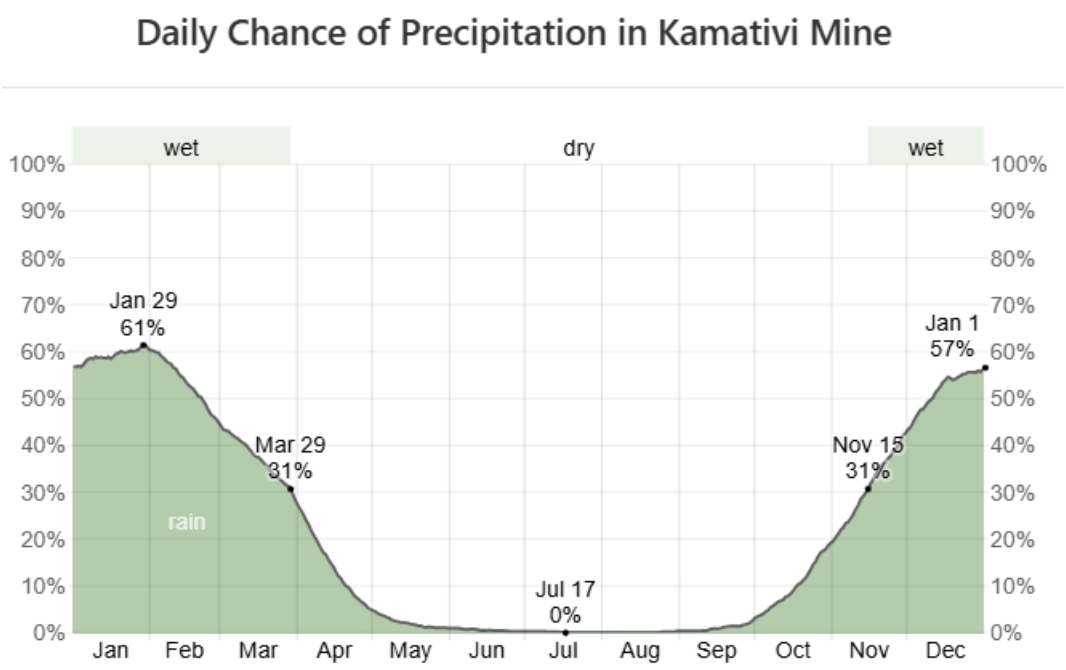


Figure 3.4: Showing a diagram of Daily Chance of precipitation in Kamativi Mine

3.2.4 Rainfall

To ensure robust environmental engineering for the proposed Kamativi Sanitary Landfill, it is essential to analyze rainfall not merely through aggregate monthly totals, but through sliding 31-day accumulation periods. This methodology reveals extreme seasonal volatility in the Kamativi area, which is a critical design parameter for the landfill's containment and drainage infrastructure. The active rainy season persists for approximately 6.4 months, spanning from mid-October to late April, during which consistent precipitation exceeds 0.5 inches over any sliding 31-day window. Peak hydraulic loading occurs in January, which records the highest average monthly accumulation of 5.1 inches.

Conversely, the region experiences a distinct rainless period lasting 5.6 months, from late April to mid-October, with August representing a period of zero average precipitation. This stark contrast between high-intensity recharge during the summer months and prolonged moisture deficit during the winter creates significant challenges for site management. From an Environmental and Social Impact Assessment (ESIA) perspective, this necessitates a design that can safely manage high-volume, concentrated stormwater runoff during the wet months while simultaneously addressing the susceptibility of the waste mass to desiccation and fugitive dust emissions during the dry season. Failure to account for these hydrological extremes could compromise the leachate management system's integrity or lead to the degradation of the landfill's final cover vegetation.

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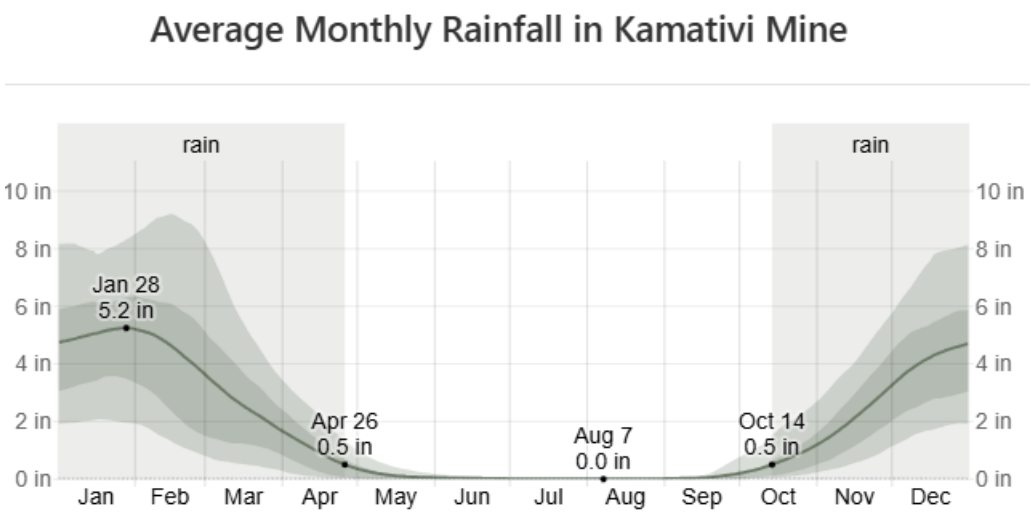


Figure 3.5: Showing a diagram Average Monthly Rainfall in Kamativi Mine

3.2.5 Sun experienced in Kamativi

The photoperiod in the Kamativi region exhibits predictable annual fluctuations that influence both the operational schedule and the environmental dynamics of the proposed sanitary landfill. In 2026, the length of the day varies from a minimum of 11 hours and 2 minutes on the winter solstice (June 21) to a maximum of 13 hours and 14 minutes on the summer solstice (December 21). From an operational standpoint, this variation necessitates a flexible approach to site management, particularly regarding health and safety protocols for personnel. During the shorter daylight periods of the cooler winter months, lighting infrastructure must be sufficient to ensure safe waste placement and traffic management for heavy machinery during early morning and late afternoon hours.

Furthermore, these shifts in solar exposure significantly impact the landfill's micro-climate. The increased solar radiation during the summer months, characterized by the longest days and higher sun angles, intensifies thermal loading on the landfill's cap and cover materials. This increased exposure promotes higher rates of evapotranspiration and contributes to the rapid drying of surface soils, which, while beneficial for reducing saturated runoff, exacerbates the risk of fugitive dust generation. Conversely, during the winter solstice, the reduced solar intensity impacts the microbial metabolic rates within the waste mass. Integrating these variations into the Environmental and Social Impact Assessment (ESIA) is essential for developing a comprehensive management plan that accounts for seasonal shifts in operational efficiency, landfill gas generation, and overall site stability.

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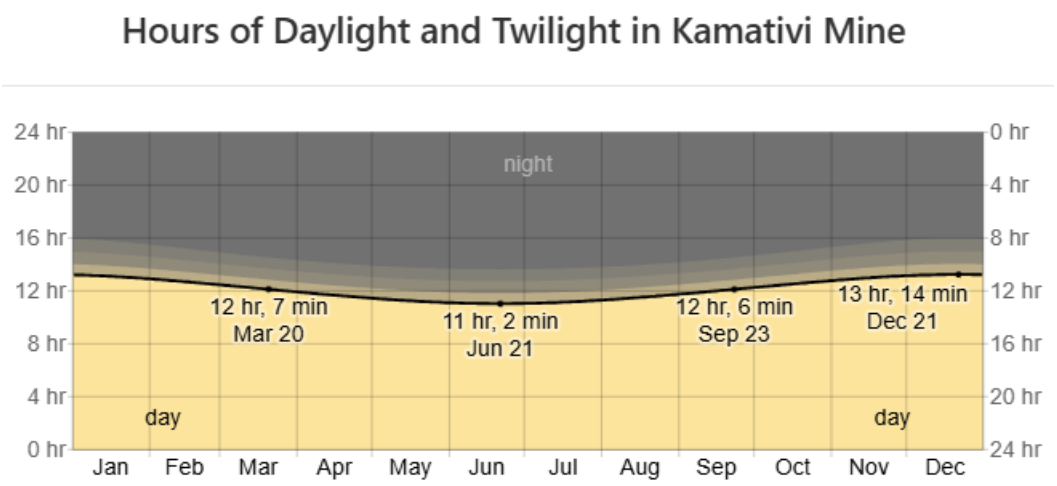


Figure 3.6: Showing a diagram of hours of daylight and Twilight in Kamativi Mine

3.3 SOIL

The pedological framework of the Kamativi project site is defined by the advanced chemical and physical weathering of the underlying crystalline basement complex, which comprises granite, gneiss, and mineralized pegmatites. The soil profile is predominantly coarse-grained and sandy, reflecting its derivation from these felsic parent materials. From an environmental management perspective, the mineralogy is highly significant; the soil matrix is rich in quartz, albite, and mica, directly mirroring the complex LCT (Lithium Cesium Tantalum) pegmatite geology characteristic of this mining district.

The site's geochemistry is marked by significant anomalies, with verified concentrations of lithium exceeding 1,000 ppm in both surface and subsurface horizons. For the proposed sanitary landfill, these geological features present two primary technical constraints. First, the presence of these high-value mineral anomalies necessitates careful site sterilization planning to ensure that the landfill footprint does not inadvertently cover economically recoverable lithium resources. Second, the soil structure characterized by varying clay content—dictates the suitability of in-situ materials for engineering works. While the sand-dominated profiles may offer adequate load-bearing capacity, they possess high hydraulic conductivity.

Furthermore, the local hydro-pedology is influenced by the region's high evaporative demand and localized geomorphology. In lower-lying landscape positions or areas with poor drainage, the soil profiles often exhibit gleying and mottling, indicative of fluctuating water tables. These soil conditions are a critical factor in the design of the landfill's basal liner system, as they will dictate the depth of excavation and the potential for sub-surface leachate migration. The design must therefore incorporate engineered clay liners or high-density polyethylene (HDPE) membranes to prevent the attenuation of contaminants into the underlying mineralized basement rock.

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Figure 3.7: Showing Kamativi Soils

3.4 HYDRO-GEOLOGY

3.4.1 HYDROLOGY

The Kamativi mining concession is situated within the Gwayi Catchment, a critical drainage basin in Matabeleland North. Hydrologically, the area is characterized by a dendritic drainage pattern, where ephemeral streams—heavily influenced by the undulating topography and the resistant Proterozoic metamorphic basement—convey surface runoff toward the Gwayi River. These drainage lines are highly seasonal, experiencing high-velocity flash flows during the peak of the wet season and remaining arid throughout the prolonged dry months. The presence of *Colophospermum mopane* (Mopane) woodlands exerts a significant biological control on the local drainage system; these trees influence soil infiltration rates and stabilize the riverbanks, effectively shaping the morphology of the stream channels and modulating the baseflow delivery to downstream water bodies, including the Kamativi Dam.

From an environmental engineering perspective, the interaction between mining activities and the drainage network is significant. Historical and contemporary extraction processes, including tailings deposition, have altered the natural flow pathways and localized sedimentation patterns, causing potential disruptions to stream continuity and tributary storage. The site's elevated position within the landscape creates a hydraulic gradient that directs runoff toward the local water bodies, raising concerns regarding potential plume migration from waste sites. The landfill project is specifically designed to mitigate these risks by integrating stormwater management infrastructure such as cut-off drains and silt traps to decouple the facility from the natural ephemeral drainage network.

Furthermore, the site-specific hydrology is governed by the hot, semi-arid climate (Köppen BSh), which results in high potential evapotranspiration (PET) rates. This extreme evaporative demand is a critical factor for the landfill's water balance; the seasonal desiccation of the waste mass during the arid months reduces the volume of leachate generation. However, this also increases the risk of fugitive

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dust and fire hazards. The interplay between the Mopane-dominated vegetation and the catchment's drainage ensures that while surface runoff is rapid during storm events, the sub-surface moisture is often limited, necessitating a design that prioritizes leachate containment during the wet season to protect the downstream water quality of the Gwayi River and the associated artisanal and community water supply dams.

Drainage Network

The drainage network within the Kamativi Mining Company (KMC) concession is classified as a high-density, ephemeral system governed by the structural grain of the Proterozoic crystalline basement. The area displays a distinct dendritic drainage pattern, where localized sub-catchments coalesce into higher-order ephemeral streams that discharge into the broader Gwayi River system. This network is highly responsive to high-intensity, short-duration convective rainfall events typical of the region's semi-arid (Köppen BSh) climate. Due to the area's rugged, undulating topography and low soil infiltration capacity—largely influenced by the underlying granitic and gneissose lithology—these streams exhibit rapid "flashy" hydrographs, characterized by sudden peaks in discharge followed by swift recession as flow ceases during the extended dry season.

From a hydrological engineering perspective for the proposed sanitary landfill, this drainage network acts as the primary vector for potential contaminant transport. The project site is situated on an elevated ridge, functioning as a localized drainage divide. Consequently, any unmanaged surface runoff from the landfill platform poses a risk to downstream ephemeral channels that eventually feed the Kamativi Dam and the Gwayi catchment. The presence of *Colophospermum mopane* woodland throughout the district plays a crucial role in regulating this drainage system; these trees enhance hydraulic roughness and stabilize the channel banks, thereby mitigating the energy of surface runoff and reducing sediment yields. However, the landfill's construction—which involves extensive earthworks and the clearing of vegetation—will disrupt this natural regulatory mechanism, increasing the risk of accelerated erosion and sediment loading into downstream channels.

To ensure the integrity of the Kamativi District's water security, the landfill design incorporates a sophisticated stormwater management strategy. This includes the construction of cut-off interceptor drains up-gradient to divert clean "run-on" water away from the landfill cell, effectively reducing the hydraulic head on the liner system and minimizing leachate generation. Down-gradient, the system utilizes a series of sediment retention ponds and armored energy dissipation structures at discharge points to mitigate the erosive velocity of site runoff. By strictly adhering to these hydrological design parameters, the KMC project aims to maintain the natural flow regime of the local stream channels, ensuring that the landfill footprint remains isolated from the catchment's drainage lines and prevents any potential degradation of the Gwayi catchment's water quality.

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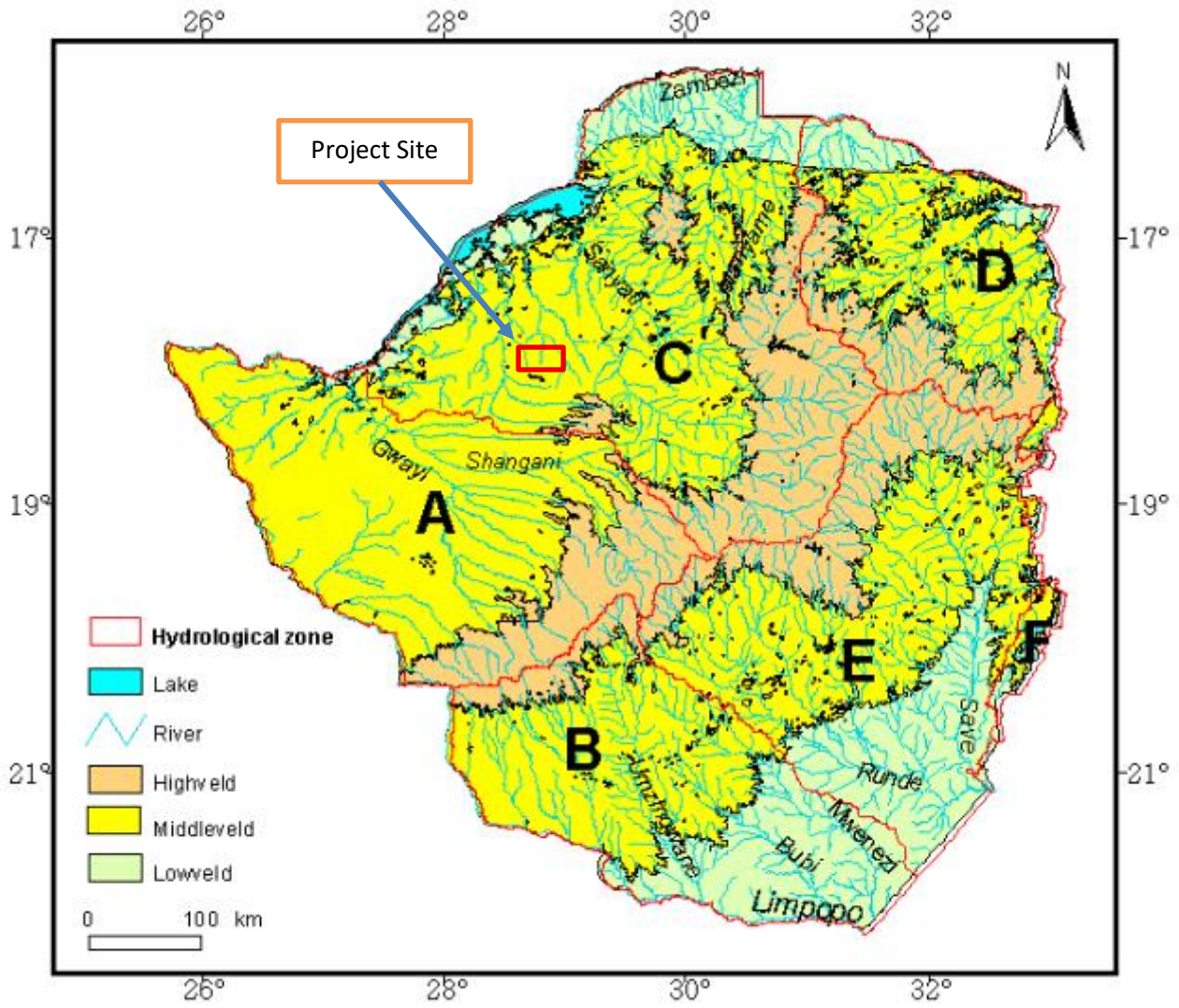


Figure 3.8: Showing the Hydrological Map

3.4.2 GEOLOGY

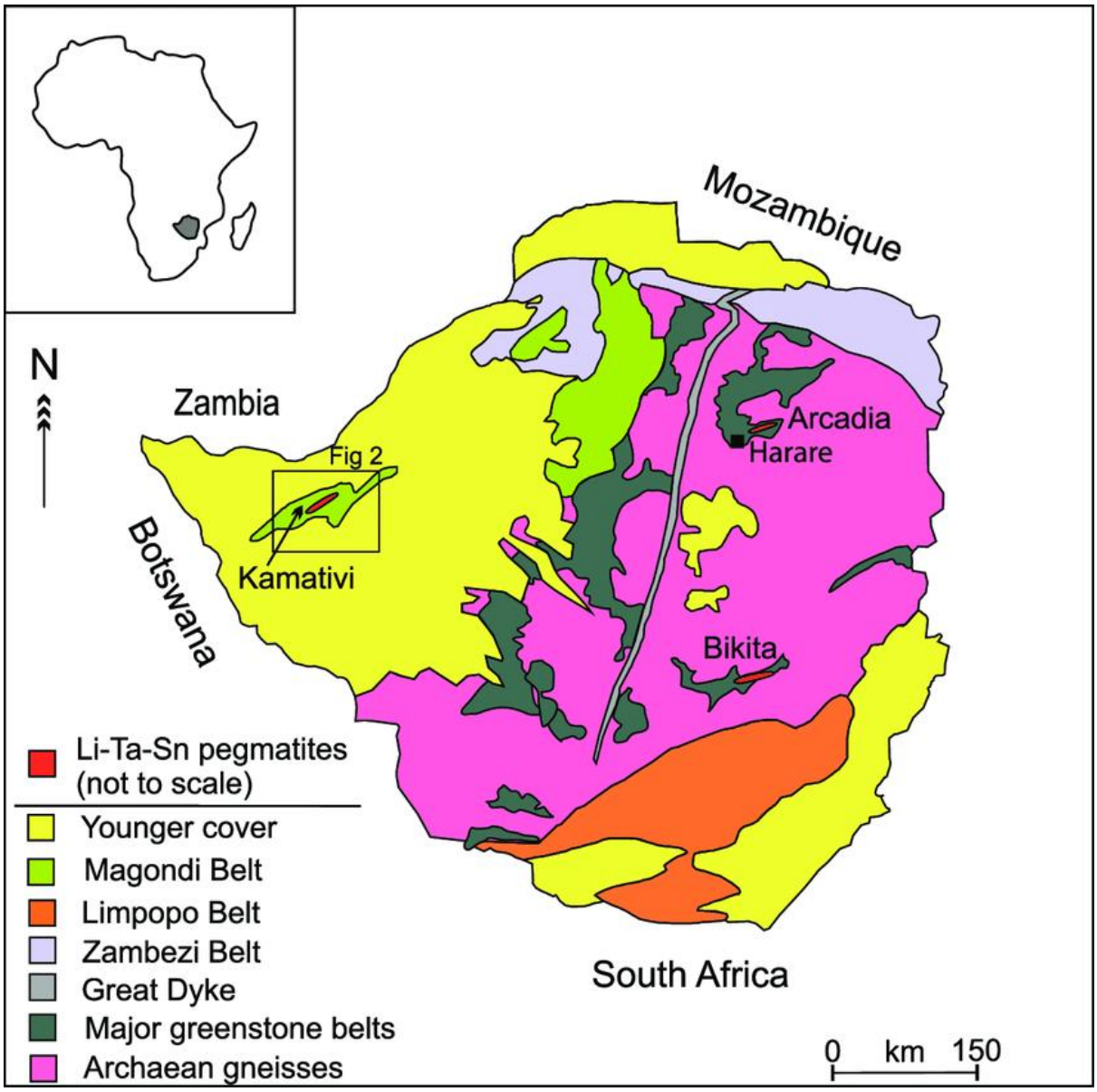


Figure 3.9: Showing the Geological map

The Kamativi Mining Company (KMC) concession is situated within the Dete-Kamativi Inlier, a distinctive tectonic window exposing Proterozoic-age metamorphic basement rocks surrounded by younger Karoo Supergroup sedimentary sequences. The regional geology is dominated by the Kamativi Schist Belt, a package of highly deformed, metamorphosed pelitic and psammitic rocks, including mica schists, gneisses, and amphibolites. These basement rocks have been intruded by extensive swarms of stanniferous (tin-bearing) and lithium-caesium-tantalum (LCT) pegmatites. These pegmatites, which are the primary focus of current and historical mining, are tabular-to-lenticular bodies that demonstrate strong structural control, typically following the foliation planes of the host schists.

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From a geomechanical perspective, the site's suitability for a sanitary landfill is dictated by these lithological characteristics. The basement rocks are generally competent but exhibit significant secondary porosity due to tectonic fracturing and deep-seated chemical weathering. The presence of these structural discontinuities creates potential preferential flow paths for leachate migration if the landfill's containment system were to fail. Furthermore, the mineralogy of the host schists often rich in mica and quartz contributes to the development of highly variable, often coarse-grained, residual soils. These soils, while providing reasonable load-bearing capacity for infrastructure, possess varying hydraulic conductivities that must be carefully managed to ensure the integrity of the landfill's basal liner.

The interaction between the landfill project and the local geology necessitates a rigorous site-sterilization assessment. Given that the Kamativi District is a known metallogenic province, the proposed landfill footprint must be verified as "barren" of economically viable mineralized pegmatites to prevent the sterilization of future resources. Furthermore, the landfill design must address the hydrogeological risk posed by the fractured bedrock; the base of the facility must be engineered with a composite liner system—incorporating both a low-permeability clay liner and a high-density polyethylene (HDPE) geomembrane—to decouple the waste mass from the fractured schist aquifer. This geological approach ensures that the facility complies with national environmental protection standards while mitigating the risks associated with the region's complex, mineral-rich structural environment.

3.6 ECOLOGICAL ASSESSMENT

The Kamativi Mining Company (KMC) concession and its immediate surroundings are characterized by a semi-arid, deciduous *Colophospermum mopane* (Mopane) woodland ecosystem. This vegetative community is structurally defined by a discontinuous canopy of mature *C. mopane* trees interspersed with a dense shrub layer, which serves as a critical refuge for local biota. Our site assessment confirmed that the proposed sanitary landfill footprint is dominated by this *Mopane*-dominant floral assemblage, which plays a vital role in soil stabilization and nutrient cycling. The herbaceous layer remains seasonally dynamic, reflecting the rainfall-dependent pulse of the Zambezian biome.

During the field verification process, the consultant documented significant faunal activity that highlights the site's role as a transit and foraging area. We observed a diverse array of Lepidoptera (butterflies) and various insect taxa, including hymenopterans, which act as crucial pollinators for the surrounding shrubland. Furthermore, the presence of localized *Bos taurus* (domestic cattle) fecal matter (cow dung) within the proposed footprint provides clear evidence that the site is integrated into the communal grazing patterns of the local district. This domestic livestock activity is a key ecological driver in seed dispersal and nutrient redistribution, albeit one that introduces anthropogenic pressure to the local vegetation.

From the perspective of the proposed sanitary landfill, the ecological impacts must be evaluated through the lens of habitat displacement and environmental contamination. The conversion of this 5-hectare plot—which currently supports a functional trophic network—into a waste management facility will result in the loss of local grazing access and a shift in faunal composition. The presence of domestic livestock underscores the necessity for rigorous perimeter fencing to prevent animals from entering the site and consuming waste, which could lead to bioaccumulation of toxins in the local food chain. Furthermore, the landfill's design must prioritize the preservation of the surrounding *Mopane*

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stands, which act as a natural vegetative buffer, filtering runoff and maintaining the local microclimate.

To ensure long-term ecological compliance, the project must implement a strict "No-Go" zone for the riparian vegetation bordering the site to protect the integrity of the drainage network. Post-operational rehabilitation efforts must prioritize the re-establishment of the indigenous *C. mopane* community to restore the site's ecological function. By integrating these ecological safeguards, the KMC project aims to mitigate the disruption to the district's biodiversity and prevent the landfill from becoming an ecological sink, ensuring that the surrounding woodland remains a viable habitat for both wild and domestic species throughout the facility's operational life.

3.7 ARCHEOLOGICAL ASSESSMENT

The Archaeological Assessment for the proposed sanitary landfill at Kamativi Mining Company (KMC) was conducted to identify and preserve any heritage resources or cultural artifacts within the project's area of influence, in accordance with national heritage legislation. This assessment was executed as part of a broader, comprehensive Archaeological Survey that encompassed the entirety of the KMC boundary, providing a holistic understanding of the site's historical significance. The findings and methodological rigor of this study are further validated in official correspondence from GreenCloud Environmental Consultancy to the Environmental Management Agency (EMA), which formally references the Archaeological Assessment Report as a primary component of the project's environmental compliance framework.

3.7.1 THE ARCHEOLOGICAL ASSESSEMENT LETTER

GreenCloud SHEQ Consultancy

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Date: March 24, 2026

The Provincial Manager Environmental Management Agency (EMA)

Matabeleland North Province

Zimbabwe

RE: CLARIFICATION ON ARCHAEOLOGICAL SURVEY STATUS FOR THE PROPOSED SANITARY LANDFILL PROJECT – KAMATIVI MINING COMPANY (KMC)

Dear Sir/Madam,

GreenCloud SHEQ Consultancy, acting as the lead environmental consultant for Kamativi Mining Company (KMC), is currently finalizing the Environmental Impact Assessment (EIA) for the proposed construction and operation of a Sanitary Landfill.

We recognize the critical importance of archaeological and cultural heritage surveys, particularly when project sites are located in relatively undisturbed "bushy" areas. Such surveys are essential to ensuring that development does not inadvertently destroy irreplaceable national heritage or artifacts of historical significance.

However, we wish to provide the Agency with a formal justification regarding the archaeological status of the specific site selected for this landfill. Please consider the following points:

- *Existing Comprehensive EIA Coverage: A full-scale EIA was previously conducted covering the entire Kamativi Mining Company concession. Following a rigorous review process, the Agency awarded an EIA Certificate for the entire KMC operational area.*
- *Prior Specialist Archaeological Surveys: As part of the baseline studies for the overarching KMC EIA, professional archaeological surveys were conducted across the entire concession. These surveys specifically included the area currently designated for the construction of the Sanitary Landfill.*
- *Verification of Non-Significance: The results of the previous surveys confirmed that the proposed landfill area does not contain any archaeological architecture, ruins, or sites of cultural importance. Our recent site reconnaissance has confirmed that there have been no changes to the physical status of the area that would suggest the presence of newly exposed cultural remains.*
- *Documentary Evidence: For your reference and to maintain administrative consistency, we have included the awarded EIA Certificate for the entire KMC concession within the current EIA report under Appendix C.*

Given that the archaeological baseline for this specific plot has already been established and vetted by the relevant authorities, GreenCloud SHEQ Consultancy proposes that the existing archaeological data be accepted as sufficient for this project. This prevents the unnecessary duplication of specialist studies for an area already certified by the Agency.

To ensure total compliance and risk management, we have incorporated a "Chance Find Procedure" into the Environmental Management Plan (EMP). This will guide the developer on the immediate steps to take should any unexpected features be uncovered during the excavation and construction phases.

We trust this clarification meets your requirements and look forward to the successful registration and review of this project.

Yours Faithfully,



***Claden Mkahlela** Managing Director / SHEQ Manager*

GreenCloud SHEQ Consultancy

3.7 SOCIO-ECONOMIC ENVIRONMENT

The socio-economic landscape of the Kamativi District is intrinsically linked to its industrial heritage, specifically the legacy of the Kamativi Tin Mine, which operated from 1936 until its abrupt closure in 1994. For over half a century, the mine was the primary economic engine for the Hwange District, fostering a specialized urban-industrial settlement characterized by company-provided housing,

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healthcare, and infrastructure. The 1994 closure resulted in a prolonged period of economic stagnation, turning the once-thriving town into a "ghost town" where residents transitioned to subsistence activities and artisanal mining. This historical trauma has deeply shaped the local psyche, creating a community that is both highly resilient and expectant of industrial revitalization. The recent entry of the Kamativi Mining Company (KMC) for lithium extraction is viewed as a critical socio-economic rebirth, promising a return to formal employment and modernized infrastructure.

Currently, the socio-economic environment of Kamativi is a hybrid of reviving industrial activity and rural communal livelihoods. While KMC has begun restoring essential services—such as water supply and road networks—the community still faces challenges related to inadequate waste management and public health infrastructure. The proposed sanitary landfill project is a direct response to this need. Historically, waste disposal in Kamativi has been informal and disorganized; therefore, the construction of a modern, engineered landfill represents a significant upgrade in communal living standards. From an ESIA perspective, this project is not merely a technical requirement for the mine but a vital piece of social infrastructure that will mitigate the health risks associated with open dumping and groundwater contamination, thereby protecting the vulnerable socio-economic capital of the local population.

The integration of the landfill within the KMC site also carries significant implications for local employment and entrepreneurship. During the construction and operational phases, the project will provide direct labor opportunities for the Kamativi community, particularly for the youth who have long been sidelined by the lack of formal industry. Furthermore, the landfill offers a platform for small-scale circular economy initiatives, such as waste picking and recycling cooperatives, which can diversify local income streams. However, the project must also navigate the social sensitivities of land use; as noted in previous sections, the evidence of domestic livestock grazing on the site underscores the need for KMC to engage in transparent stakeholder consultation to ensure that the loss of grazing land is compensated by the broader public health and economic benefits of a cleaner environment.

3.7.1 ADMINISTRATIVE STRUCTURES

The administrative landscape of Kamativi is defined by a tripartite governance structure comprising local government, traditional leadership, and corporate management. At the statutory level, the Hwange Rural District Council (HRDC) serves as the local planning authority. Under the Rural District Councils Act, the HRDC is responsible for land-use planning, the provision of social services, and the regulation of developmental projects within the district. For the proposed sanitary landfill, the HRDC plays a pivotal role in ensuring the facility aligns with regional master plans and public health by-laws. Their oversight ensures that the project's infrastructure is integrated into the broader Hwange waste management strategy, providing a legal and regulatory anchor for the facility's operations.

Parallel to the state-led administration is the Traditional Leadership, spearheaded by the local Chief and supported by Village Heads (*Sabhukus*). The Chief acts as the custodian of the land and the primary mediator for community interests, cultural heritage, and social cohesion. In the context of this ESIA, the Chief's involvement is critical for securing the "Social License to Operate." Given that the proposed site shows evidence of communal grazing, the traditional leadership serves as the vital link for negotiating land-use transitions and ensuring that the project does not infringe upon the community's cultural or spiritual values. Their endorsement is essential for maintaining social stability and ensuring

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that the benefits of the project—such as employment and improved sanitation—are equitably distributed among the local inhabitants.

Finally, the Kamativi Mining Company (KMC) functions as a central administrative entity within its lease area, operating as a quasi-municipal authority for its workforce and the immediate mining town. KMC is responsible for the technical implementation, capital investment, and long-term environmental management of the proposed sanitary landfill. The company must navigate a complex interface between its corporate objectives and its obligations to both the HRDC and the Traditional Authority. For the landfill project to be successful, KMC must maintain a collaborative relationship with these stakeholders, using a "Joint Management" approach to address environmental risks like leachate migration or odor control. This integrated administrative synergy ensures that the landfill is not seen merely as a mining asset, but as a shared success for the Hwange District's environmental and social development.

3.7.2 POPULATION CHARACTERISTICS

The demographic composition of Kamativi is a reflection of its historical transition from a premier tin-mining hub to a period of economic dormancy, and finally to its current status as a reviving lithium-mining district. According to the 2012 National Census data for the Kamativi urban locality, the population was recorded at approximately 2,752 residents. This population was characterized by a relatively balanced gender distribution, comprising 1,348 males and 1,404 females. This marginal female majority (approximately 51%) is typical of mining towns in "care and maintenance" phases, where males often migrate to other regions in search of active employment, leaving behind female-headed households. However, with the recent commencement of the Kamativi Mining Company (KMC) operations, this baseline is undergoing a rapid shift. The influx of a predominantly male workforce and technical contractors is expected to have altered the current sex ratio toward a male majority, while simultaneously increasing the total population density within the mining concession.

This population structure is a critical determinant for the design and scale of the proposed sanitary landfill. In environmental management, waste generation is directly proportional to population size and socio-economic activity. The historical 2012 figures provided a baseline, but the current expansion means the landfill must be engineered to handle a significantly higher "per capita" waste output than previously recorded. As KMC restores the town's functionality, the increased presence of both males in the industrial sector and females in the informal and service sectors will lead to a more diverse waste stream, including both domestic organic waste and industrial non-hazardous materials. The landfill project is strategically essential to protect this growing population; without a centralized, engineered disposal site, the high density of residents in the old mine compounds would face severe public health risks from unmanaged waste accumulation.

Furthermore, the socio-economic characteristics of this population largely comprised of former mine workers, their descendants, and new KMC employees create a unique stakeholder environment. The female population, often being the primary managers of household sanitation, stands to benefit most from the formalized waste collection services that the new landfill will facilitate. From an ESIA perspective, the landfill is not just a mining requirement but a social safeguard. It addresses the "carrying capacity" of the Kamativi District by ensuring that the environmental infrastructure keeps pace with the demographic growth triggered by the lithium project. By providing local employment

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during the construction phase, the project also aims to alleviate the high dependency ratios often found in these communities, fostering a more resilient socio-economic environment for both genders.

3.7.3 ECONOMIC ACTIVITIES

The economic identity of the Kamativi District has historically been monolithic, defined almost entirely by large-scale extractive industry. From the mid-1930s until 1994, the region was a global player in the tin market under the Kamativi Tin Mine. The cessation of operations in the 1990s due to plummeting international tin prices caused a total economic collapse, forcing the local population to pivot toward marginal activities. For over two decades, the primary economic drivers were limited to informal artisanal mining, small-scale livestock rearing (primarily cattle and goats), and subsistence cross-border trading. This period of "economic hibernation" left a legacy of underutilized industrial infrastructure and a workforce with specialized, though dormant, technical skills.

The current economic revival is driven by the Kamativi Mining Company (KMC), which has transitioned the district's focus from tin to high-value lithium extraction. This shift has reintegrated Kamativi into the global "green energy" value chain, attracting significant foreign direct investment and stimulating a secondary service economy. Local businesses, ranging from transport and logistics to retail and food services, have re-emerged to support the growing workforce. This renewed industrial vigor, however, generates a diverse and high-volume waste stream that the district's dilapidated infrastructure cannot support. The proposed sanitary landfill is therefore an essential economic enabler; by providing a regulated waste disposal solution, it ensures that KMC complies with international environmental standards required by global lithium buyers, thereby securing the mine's long-term commercial viability.

From a local perspective, the construction and operation of the sanitary landfill represent a diversification of the district's economic base. Unlike the boom-and-bust cycles of mineral extraction, environmental management infrastructure provides stable, long-term employment in specialized roles such as landfill technics, environmental monitoring, and machinery operation. Furthermore, the facility creates a platform for a formalized circular economy. By segregating recyclable materials at the landfill site, KMC can foster local entrepreneurship in waste recovery and processing, turning a liability (waste) into a secondary source of income for the community. In this context, the landfill is not merely a "dump" but a strategic investment that protects the district's natural capital while supporting its industrial and social resurgence.

3.7.8 NEWS & INFORMATION

The Kamativi District is currently undergoing a radical socio-economic metamorphosis, driven by the Kamativi Mining Company (KMC) and its ambitious "Project Phoenix," which seeks to revive historical tin mining infrastructure for modern lithium extraction. Historically, Kamativi was a classic "company town," established in the 1930s to serve the Kamativi Tin Mine, which functioned until its closure in 1994. The town suffered decades of institutional decay, loss of formal employment, and severe degradation of public infrastructure—most notably in water and sanitation—following the mine's shutdown. Today, news surrounding the district is dominated by this industrial resuscitation, with KMC investing heavily in modernizing processing facilities and restoring essential services like solar-powered boreholes and electricity grids.

Despite the economic optimism, the district faces significant operational and environmental headwinds. Current issues include pressure on the regional water supply, concerns regarding the

legacy of chemical tailings, and the management of waste generated by a rapidly increasing workforce. The media and local stakeholders have frequently voiced concerns about the environmental footprint of large-scale mining on the Dete-Kamativi Inlier, particularly the potential for groundwater contamination and the degradation of the Gwayi Catchment. It is within this volatile and high-scrutiny landscape that the Proposed Sanitary Landfill is positioned. The facility is not just an operational necessity for KMC; it is a critical instrument of reputation management, designed to demonstrate the company's adherence to Environmental, Social, and Governance (ESG) standards.

The landfill project specifically addresses the current "sanitation deficit" in the district. By establishing an engineered, sanitary site, KMC moves away from the informal and environmentally hazardous disposal practices that have plagued the town since the 1990s. The news of this project has been positively received by local authorities—including the Hwange Rural District Council—as it signals a move toward sustainable urban management rather than purely extractive exploitation. By integrating the landfill into the KMC site, the company is effectively closing the loop on its waste stream while simultaneously providing the community with a secure disposal solution that mitigates risks of leachate migration and disease outbreaks. This transition from a "legacy mining environment" to a "modern sustainable operation" is the core narrative of the landfill project.

3.7.9 TRANSPORT

The transportation network within the Kamativi District is currently undergoing a significant transition, driven by the resurgence of the Kamativi Mining Company (KMC) and its lithium extraction operations. Historically, the area relied on a transport framework designed for tin mining, which suffered decades of neglect following the 1994 closure. Today, the logistics landscape is defined by a critical need to move large volumes of mineral concentrates (spodumene) from the mine site to international markets. KMC has taken a proactive role in rehabilitating this infrastructure, resurfacing key access roads, constructing new internal networks, and upgrading the link to the Cross Dete-Binga Road. This initiative is vital not only for industrial efficiency but also for reintegrating Kamativi into the national supply chain.

The logistics of lithium production involve the heavy use of high-capacity haulage trucks, which transport concentrate from the processing plant toward export hubs. This heavy vehicle traffic, while essential for economic output, poses significant challenges to the district's road network, which was not originally engineered for such high axle loads. Accelerated pavement deterioration is a primary concern, necessitating continuous maintenance and the structural upgrading of the main arterial routes. In parallel, the local community remains dependent on a diverse public transport ecosystem. This includes formal services like CAG Tours and ZUPCO buses, which connect Kamativi to major urban centers like Bulawayo and Victoria Falls, and a resilient, if informal, network of *Mushika-shika* (unregulated commuter taxis). These informal vehicles fill the service gap left by formal transport, providing essential connectivity to residents, though they introduce challenges regarding safety and regulatory compliance.

The Cross Dete railway line remains a critical strategic asset for the district's long-term logistics. While road transport currently dominates the movement of lithium concentrate, the potential to leverage the rail head at Dete is a focal point for future bulk freight strategies. By transitioning bulk haulage to rail, the mining sector could significantly reduce the wear and tear on the road pavement, lower logistics costs, and improve the environmental profile of the mine's supply chain. In the context of the

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proposed sanitary landfill, this transportation infrastructure is paramount. The landfill site must be strategically located to ensure heavy vehicles can access it without disrupting the community's primary transit corridors. Furthermore, the landfill project itself will require a logistics plan to manage the transport of waste management equipment and, potentially, the removal of recyclable fractions from the site, ensuring that the project benefits from and contributes to the ongoing revitalization of Kamativi's transport network.

3.7.11 HISTORICAL AND CULTURAL SITES

The Kamativi District is situated within a landscape of significant geological and historical interest, primarily shaped by its Proterozoic metamorphic history and a century of intensive mining activity. From an archaeological perspective, the region is characterized by extensive evidence of both pre-colonial and colonial-era mineral exploitation. While the Dete-Kamativi Inlier is noted for ancient workings, these are predominantly associated with surface-level cassiterite (tin) and tantalum extraction sites that have been significantly altered by 20th-century large-scale industrial operations (1936–1994). The intense surface disturbance caused by the historical Kamativi Mine including tailings deposition, open-cast excavations, and infrastructure development has effectively re-engineered the topographic surface, rendering the area a "post-industrial landscape" where primary archaeological deposits are either heavily impacted or entirely absent within the core concession.

Regarding the specific footprint of the proposed sanitary landfill, comprehensive site surveys confirm that the area is devoid of known archaeological sites, stone-built monuments, or historical burial grounds. The proposed landfill site occupies a portion of the KMC lease area that has been previously disturbed by industrial activity, ensuring that the project development poses no risk to tangible cultural heritage resources. Furthermore, while the district contains sites of historical mining significance, there are no documented graves or ceremonial sites in the immediate vicinity of the proposed landfill development. The site is geographically and culturally segregated from any traditional ancestral burial grounds, and the development is designed to maintain this exclusion to respect both the legal requirements of the National Museums and Monuments of Zimbabwe (NMMZ) and the sensitivities of the local community.

In the context of the project's handover to the Hwange Rural District Council (HRDC), the development incorporates a "Cultural Heritage Management Plan" (CHMP) to ensure long-term preservation. Even though the current footprint is free of cultural constraints, the plan includes a "chance-find procedure" a standardized archaeological protocol to be followed by contractors during the earthworks phase. Should any unforeseen historical artifacts or cultural materials be unearthed during excavation, work will be immediately suspended to allow for an NMMZ inspection. This proactive approach ensures that the project aligns with the highest standards of cultural heritage stewardship, turning the landfill development into a benchmark for modern, responsible infrastructure delivery that respects the district's complex historical identity while safeguarding its future.

3.7.12 SAFETY HEALTH ENVIRONMENT AND QUALITY ASSURANCE

At the Kamativi Mining Company (KMC), the SHEQ management framework is not merely a bureaucratic requirement but the operational bedrock of its revival strategy. The company operates under an Integrated Management System (IMS), which seamlessly consolidates three international standards: ISO 14001 (Environmental Management), ISO 45001 (Occupational Health and Safety), and

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ISO 9001 (Quality Management). This integration ensures that safety and environmental protection are not treated as peripheral tasks but are embedded into every stage of lithium extraction and processing. Furthermore, KMC is actively pursuing certification under the Initiative for Responsible Mining Assurance (IRMA). This commitment underscores the company's intent to move beyond baseline compliance, opting for a rigorous, independently verified standard that mandates high performance in environmental stewardship, human rights, and business integrity.

The proposed sanitary landfill project serves as a physical manifestation of this SHEQ-driven corporate philosophy. By designing and constructing a facility that meets modern engineering specifications including advanced liner systems for leachate management and gas monitoring KMC is applying its ISO-certified quality protocols to a long-term community asset. The decision to hand over this facility to the Hwange Rural District Council (HRDC) upon commissioning is a strategic exercise in sustainable community development. It ensures that the environmental gains of the project are not temporary but are institutionalized under local government management. This handover process includes comprehensive technical training for HRDC staff and the establishment of an ongoing monitoring regime, ensuring that the facility maintains its performance integrity long after the initial construction phase is complete.

Beyond the project site, KMC has systematically expanded its SHEQ reach into the local Kamativi community. Recognizing that an industrial operation is only as healthy as its surroundings, the company conducts regular environmental monitoring (including air quality, soil integrity, and water chemistry in the Gwayi Catchment) to track the cumulative impact of mining and infrastructure development. These initiatives are supplemented by robust community engagement programs, including health and safety awareness campaigns and targeted Corporate Social Responsibility (CSR) projects. Whether through donations to local schools, water infrastructure upgrades, or health clinic support, KMC’s approach to community engagement is data-driven and proactive. By embedding these practices, KMC minimizes its social risk, strengthens its "Social License to Operate," and reinforces the district’s resilience as it transitions back into a productive, modern mining hub.

3.7.13 COPORATE SOCIAL RESPONSIBILITY (CSR)

Corporate Social Responsibility (CSR) at the Kamativi Mining Company (KMC) is a strategic pillar designed to transcend simple regulatory compliance, fostering a long-term "Social License to Operate." KMC’s approach is deeply embedded in the revitalization of the Kamativi District, aiming to transition the community from a state of industrial dependency to one of self-sustaining resilience. This is achieved through a multi-faceted CSR portfolio that includes critical infrastructure development, local economic empowerment, and public health support. By prioritizing projects that address the district’s most pressing needs such as road connectivity, healthcare access, and utility provision KMC positions itself as an active partner in the region’s socio-economic recovery.

The proposed sanitary landfill is a flagship CSR initiative within this framework. Recognizing that the district lacks an engineered waste disposal solution, KMC has committed to financing the design and construction of a modern landfill facility. This project is specifically designed to be handed over to the Hwange Rural District Council (HRDC) upon commissioning. By transferring the facility to the local authority, KMC ensures that waste management becomes a public good, sustainably integrated into the district's long-term urban planning. This handover model is a core tenet of KMC's CSR strategy, moving away from "enclave" infrastructure toward shared-use assets that benefit both the mining

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operation and the broader community, thereby mitigating health risks associated with informal dumping and improving overall hygiene.

KMC's commitment to the district is further evidenced by tangible investments in public amenities and social safety nets. This includes the resurfacing and ongoing maintenance of the vital Cross Dete-to-KMC access road, which serves as a lifeline for local commerce and transport. The company has also installed solar-powered street lighting in residential areas to enhance public safety, supported the local clinic with medical supplies, and initiated ongoing public health awareness campaigns targeting STIs and HIV/AIDS prevention. Moreover, KMC promotes local economic inclusion by awarding contracts for non-core services, such as site maintenance and painting, to local business entities. These initiatives demonstrate a holistic CSR philosophy where the company's success is measured not only by lithium output but by the measurable improvement in the quality of life for all residents of the Kamativi District.

3.7.14 EMPLOYEE WELFARE

At the Kamativi Mining Company (KMC), employee welfare is managed through a holistic approach that integrates international best practices in industrial relations with a commitment to the "Safety, Health, Environment, and Quality" (SHEQ) framework. Central to this strategy is the provision of comprehensive Personal Protective Equipment (PPE) and Protective Clothing (PPC), which serve as the first line of defense against the inherent hazards of a mining environment. KMC's dedication to safety goes beyond mere equipment provision; it is institutionalized through continuous training programs. These sessions focus on both technical skill development ensuring employees are proficient with modern lithium extraction technologies and rigorous SHEQ awareness, which fosters a proactive safety culture where every worker is empowered to identify and mitigate risks. By promoting a "safety-first" mentality, the company significantly reduces workplace incidents and enhances overall operational stability.

Beyond the workplace, KMC recognizes that employee well-being is inextricably linked to quality of life. To support a stable and productive workforce, the company provides subsidized accommodation, ensuring that staff have access to safe, dignified, and comfortable living conditions within proximity to the mine. This is complemented by modern financial and healthcare integration; KMC facilitates secure, efficient salary disbursements through direct transfers into local bank accounts, promoting financial inclusion and stability. Furthermore, the company maintains a dedicated local clinic equipped to provide primary healthcare services to its workforce and their dependents. This facility is vital in a remote area like Kamativi, providing immediate medical attention and acting as a cornerstone of the company's health management system.

The ongoing refinement of these welfare initiatives is a hallmark of KMC's Integrated Management System (ISO 9001, ISO 14001, and ISO 45001). These standards ensure that KMC's welfare management is not stagnant but evolves through regular audits, feedback loops, and a commitment to continuous improvement. By providing a structured, secure, and supportive work environment, KMC not only attracts and retains the specialized talent required for its complex lithium operations but also fosters a culture of loyalty and high performance. The company's focus on the "human element" demonstrates that its industrial success is fundamentally built upon a well-supported, healthy, and highly skilled workforce, ensuring that the socio-economic benefits of the lithium boom are equitably shared with the people who make it possible.

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CHAPTER 4: LEGAL AND POLICY REVIEW SETTING

This chapter provides a comprehensive examination of the multifaceted legal, regulatory, and policy framework governing the development and operation of the proposed sanitary landfill at Kamativi. It details the applicable Zimbabwean legislations most notably the Environmental Management Act [Chapter 20:27], which dictates the standards for solid waste management, environmental impact assessments (EIA), and pollution control, alongside critical occupational safety frameworks such as the Factories and Works Act [Chapter 14:08] and the National Social Security Authority (NSSA) Act [Chapter 17:04]. These acts collectively ensure that construction and operational phases prioritize workforce protection, machinery safety, and structural integrity. Beyond national statutes, the review incorporates critical international protocols and conventions ratified by Zimbabwe—such as the Basel Convention on the control of transboundary movements of hazardous wastes—and integrates the company's internal ISO Integrated Management System (ISO 14001, ISO 45001, and ISO 9001). The objective of this section is to ensure that the project not only maintains strict compliance with domestic requirements but also aligns with global environmental best practices and organizational performance benchmarks. By utilizing a structured legal register, the proponent ensures that every phase of the project—from site preparation to the eventual handover to the Hwange Rural District Council (HRDC) remains fully accountable and legally defensible within the existing administrative and governance architecture.

4.1 NATIONAL MUSEUMS AND MONUMENTS ACT Chapter 25:11

The National Museums and Monuments Act [Chapter 25:11] is a critical piece of legislation for the proposed sanitary landfill project at the Kamativi Mining Company (KMC) site. Its primary purpose is to ensure that development projects do not inadvertently destroy Zimbabwe's cultural, archaeological, or historical heritage.

For a large-scale infrastructure project like a sanitary landfill, which involves significant earthmoving and ground disturbance, the following regulatory requirements under this Act are essential:

4.1.1 The Requirement for an Archaeological Impact Assessment (AIA)

While the Environmental Management Act [Chapter 20:27] mandates an Environmental Impact Assessment (EIA), the National Museums and Monuments Act (supported by Statutory Instrument 143 of 2011) specifically requires an Archaeological Impact Assessment (AIA).

- **Purpose**: To identify any "ancient monuments" (pre-1890 structures), "ancient workings" (old mining shafts), "relics" (fossils, tools, or rock paintings), or "national monuments" within the KMC project footprint.
- **Process**: A qualified archaeologist must survey the site to ensure the landfill's construction—specifically the excavation for leachate ponds and waste cells—does not disturb buried heritage.

4.1.2 Protection of "Ancient Workings" and "Relics"

Since Kamativi has a long history of mining activity, the Act's definitions are particularly relevant:

- Ancient Workings: Any shaft, cutting, or tunnel made for mining purposes before January 1, 1890, is legally protected.
- Relics: This includes any objects of historical, archaeological, or scientific value.

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- Mandate: Under Section 24, no person may excavate, damage, or remove such items without the written consent of the Executive Director of the National Museums and Monuments of Zimbabwe (NMMZ).

4.1.3 "Chance Find" Procedures (Section 21)

During the construction phase of the landfill, the project must adhere to the Notification of Discovery clause. If any archaeological remains, fossils, or old structures are uncovered during excavation:

- Stop Work: Construction in that specific area must cease immediately.
- Notification: The discovery must be reported to the NMMZ or the nearest police station as soon as possible (usually within 7 days).
- Protection: The site must be left undisturbed until an official assessment is conducted by the NMMZ.

4**. Mitigation and Preservation**

If the AIA or a "chance find" identifies a significant site within the proposed landfill area, the NMMZ may require:

- Avoidance/Redesign: Shifting the landfill boundaries to preserve the site in situ.
- Rescue Archaeology: Systematically excavating and documenting the site before construction continues.
- Documentation: Detailed mapping and photography of any historical features that cannot be saved.

4.2 THE ENVIRONMENTAL MANAGEMENT ACT (CAP 20:27)

The Environmental Management (EMA) Act

The Environmental Management Act [Chapter 20:27] is the primary legislative instrument regulating the proposed sanitary landfill at the Kamativi Mining Company (KMC) site. This Act establishes the Environmental Management Agency (EMA) as the regulatory body responsible for sustainable management of natural resources and protection of the environment. For a project of this nature, the Act mandates a transition from traditional open dumping to engineered waste disposal solutions that minimize ecological footprints. The project's alignment with this Act ensures that the landfill's development is legally grounded, environmentally sound, and socially responsible, providing a clear roadmap for compliance from construction through to the eventual handover to the Hwange Rural District Council (HRDC).

The interaction between the proposed project and the EMA Act is governed by several critical provisions:

- Section 97 and the First Schedule (EIA Requirements): Under the First Schedule of the Act, "Waste treatment and disposal" facilities—specifically municipal solid waste landfill facilities—are classified as prescribed activities. This makes it a mandatory legal requirement for KMC to conduct a full Environmental Impact Assessment (EIA) and obtain a certificate from the Director-General before any ground is broken. This process ensures that potential impacts on the Mopane woodlands and local hydrology are identified and mitigated upfront.

- Statutory Instrument (SI) 7 of 2007 (EIA and Ecosystems Protection): These regulations operationalize the EIA process. They require KMC to submit a prospectus and a

comprehensive EIA report that includes a detailed Environmental Management Plan (EMP). This SI also mandates quarterly environmental audits and the protection of sensitive ecosystems, ensuring that the landfill does not negatively impact the surrounding Dete-Kamativi area.

- Statutory Instrument (SI) 6 of 2007 (Effluent and Solid Waste Disposal): This regulation is central to the landfill's technical design. It prohibits the disposal of waste in a manner that causes pollution or ill health. It requires the landfill to be "engineered," meaning it must include specialized liners (like HDPE) and leachate collection systems to prevent groundwater contamination. KMC will be required to apply for a Solid Waste Disposal Licence, which EMA classifies into Blue, Green, Yellow, or Red tiers based on the environmental risk; the goal for this sanitary project is to maintain a "Blue" or "Green" status through high-quality engineering.

- Section 83 (Prohibition of Littering and Illegal Dumping): By constructing this facility, KMC is helping the district comply with Section 83, which empowers local authorities to maintain a clean environment. The landfill provides a legal, designated site for waste, thereby eliminating the need for the informal dumping that has historically affected the Kamativi community.

4.3 FOREST ACT [CHAPTER 19:05]

The Forest Act [Chapter 19:05] of Zimbabwe is a critical regulatory pillar for any large-scale infrastructure project, especially one situated within a mining concession like the Kamativi Mining Company (KMC). While the Environmental Management Act (EMA) provides the broad framework for your EIA, the Forest Act offers specific legal mandates regarding the vegetation you encounter during construction.

4.3.1 Protection of Indigenous Vegetation

The primary relevance of the Forest Act to the KMC landfill project is the protection of private and indigenous forests.

- Vegetation Clearing: Construction of a landfill requires significant land clearing for the cells, access roads, and administrative blocks. Under the Forest Act, any clearing of indigenous timber or protected species requires specific permits from the Forestry Commission.

- EIA Integration: Your EIA must include a detailed Flora and Fauna baseline study. If the proposed landfill site contains "Reserved Trees" (as listed in the Act), you must identify them and propose a layout that minimizes their destruction or apply for a permit to fell them.

4.3.2 Mining Timber Rights & Constraints

Since KMC is a mining entity, the relationship between mining and forestry is governed by Part V of the Forest Act (Control of Mining Timber Rights).

- Mining Timber Permit Board: This board regulates the cutting of timber for mining purposes. While a landfill is an environmental project, because it is on a mining lease, you must ensure that the clearing of trees does not violate the timber rights established for the mine.

- Permit Requirements: If the timber cleared during landfill construction is to be used (e.g., for fencing or site offices), a Mining Timber Permit may be required under Section 45.

4.3.3 Fire Management and Prevention

Landfills are high-risk areas for fires due to methane generation and the presence of combustible waste. Part VIII (Control of Fires and Burning of Vegetation) of the Act is highly relevant:

- Fireguards: The Act mandates the construction of fireguards. Your EIA and subsequent Environmental Management Plan (EMP) must specify the maintenance of standard fireguards (usually 9 meters wide) around the landfill perimeter to prevent fires from spreading into the surrounding bushveld or vice versa.
- Liability: Under the Act, if a fire starts within the landfill site and spreads to adjacent forest land due to negligence, the developer (KMC) is legally liable for the damages.

4.3.4 Reforestation and Rehabilitation

The Forest Act emphasizes the conservation of timber resources.

- Offset Programs: If the landfill construction results in the loss of a significant number of indigenous trees, the Forestry Commission may require a "re-vegetation" or "offset" plan.
- Closure Phase: In your EIA proposal, the Decommissioning and Rehabilitation section should align with the Forest Act by outlining how the final landfill cap will be re-vegetated using indigenous species to restore the local ecosystem.

4.4 WATER ACT (CAP 20:24)

The Water Act [Chapter 20:24] is perhaps the most critical piece of secondary legislation for a sanitary landfill project, as the primary environmental risk of such a facility is the contamination of water resources through leachate (the liquid that drains from a landfill).

4.4.1 Protection of Water Resources (Section 68)

The core of the Water Act is to prevent the pollution of both surface water (rivers, streams) and groundwater (boreholes, aquifers).

- Leachate Management: Your EIA must demonstrate that the landfill design includes a composite liner system (such as HDPE liners and compacted clay) to prevent "polluting substances" from entering the water table.
- Proximity to Water Bodies: The Act, read together with SI 6 of 2007 (EIA and Ecosystems Protection), generally prohibits major developments within 30 meters of a high-water mark. Your proposal must verify the distance of the KMC landfill from any nearby streams or drainage lines.

4.4.2 Water Use and Permits (Section 34)

Construction and operation of a landfill require significant water for dust suppression, cell compaction, and staff hygiene.

- Surface/Groundwater Rights: If KMC intends to sink a borehole for the landfill or divert water from a nearby stream, a permit from the Zimbabwe National Water Authority (ZINWA) or the relevant Catchment Council (likely the Gwayi Catchment for Kamativi) is required.

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- Existing Rights: Your EIA must ensure that the landfill does not interfere with the water rights of existing users in the Kamativi district.

4.4.3 Control of Water Pollution (Part VI)

This part of the Act deals specifically with the discharge of waste into water resources.

- Discharge Permits: Even with a liner, landfills often produce excess leachate that may need treatment. If any treated effluent is to be discharged into the environment, you must apply for a Discharge Permit under the Water Act.

- Water Quality Monitoring: To comply with the Act, your EIA's Environmental Management Plan (EMP) must include a mandatory groundwater monitoring program. This involves drilling upstream and downstream monitoring boreholes to regularly test for heavy metals, nitrates, and TDS (Total Dissolved Solids).

4.4.4 The "Polluter Pays" Principle

The Water Act reinforces the principle that any entity causing water pollution is liable for the costs of cleanup and restoration.

- Liability for Contamination: For the KMC project, the EIA must include a robust Emergency Response Plan for potential liner failure or "spillages" of leachate during heavy rainfall, as the Act provides for heavy penalties and even criminal charges for water pollution.

4.5 NATIONAL SOCIAL SECURITY AUTHORITY (S.I 68 OF 1990)

(ACCIDENT PREVENTION AND WORKER'S COMPENSATION SCHEME)

The National Social Security Authority (Accident Prevention and Workers' Compensation Scheme) Notice, Statutory Instrument 68 of 1990, is the legal backbone for occupational health and safety (OHS) in Zimbabwe. While the Environmental Management Act (EMA) focuses on the "external" environment (soil, air, water), S.I. 68 of 1990 focuses on the "internal" environment the safety and well-being of the workers constructing and operating the Kamativi Mining Company (KMC) landfill.

4.5.1 Registration and Assessment (Section 3 & 4)

Any employer conducting a project of this scale must be registered with NSSA.

- Risk Categorization: Landfill construction and waste management fall under high-risk industrial categories. Under S.I. 68, KMC (or the appointed contractor) must ensure all workers are covered by the Workers' Compensation Insurance Fund (WCIF).

- EIA Integration: Your proposal should include a commitment to using NSSA-registered contractors. This ensures that in the event of a workplace injury during the "excavation" or "lining" phases, workers are legally protected and compensated.

4.5.2 Mandatory Accident Reporting (Section 56)

A sanitary landfill project involves heavy machinery (bulldozers, excavators) and potential exposure to hazardous waste.

- Notification of Accidents: S.I. 68 mandates that any accident resulting in a fatality or an injury preventing a worker from earning full wages for more than three days must be reported to the NSSA Occupational Safety and Health (OSH) Department within 14 days.

- EIA Requirement: Your Environmental Management Plan (EMP) must include an Occupational Health and Safety (OHS) Policy that mirrors these reporting timelines.

4.5.3 Occupational Health Surveys & Monitoring

S.I. 68 empowers NSSA inspectors to demand health surveys and technical monitoring to prevent "Industrial Diseases."

- Hazardous Exposures: At the KMC landfill, workers may be exposed to noise (from heavy equipment), dust (silica during excavation), and biological hazards (pathogens in the waste).

- Technical Compliance: Since you perform technical monitoring, your EIA proposal should specify that regular Noise and Dust Surveys will be conducted to remain compliant with the standards enforced by NSSA inspectors under this SI.

4.5.4 Provision of Personal Protective Equipment (PPE)

The Act implicitly requires the employer to provide a safe working environment, which NSSA enforces through the provision of PPE.

- Site-Specific PPE: For a sanitary landfill, this includes high-visibility vests, safety boots with puncture-resistant soles (for the waste face), respiratory protection (for dust/fumes), and specialized gloves for handling leachate or hazardous materials.

- EMP Action: Your EIA must detail the PPE matrix for different stages of the landfill project (Construction vs. Operation).

4.6 PUBLIC HEALTH ACT (CAP 15:09 – REVISED 1996)

The Public Health Act [Chapter 15:09] is a foundational piece of legislation for any waste management project. While the Environmental Management Act (EMA) protects the ecosystem, the Public Health Act focuses on protecting the human population from "nuisances" and diseases that can arise from improper waste disposal.

4.6 1 Prevention of "Statutory Nuisances" (Part IX)

Sections 83 to 86 of the Act deal with the prevention and suppression of nuisances. A landfill is legally classified as a nuisance if it is constructed or managed in a way that is "offensive" or "injurious to health."

- Odour and Dust Control: If the KMC landfill produces foul smells or excessive dust that reaches nearby settlements, it violates the Act. Your EIA must include mitigation measures like daily soil cover and odour neutralizers.
- Litter Management: Wind-blown litter is considered a public nuisance. The proposal should include perimeter fencing and litter traps to comply with the cleanliness standards of the local health authority.

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4.6.2 Vector Control and Disease Prevention (Part IV)

Landfills are potential breeding grounds for "vectors"—organisms that carry disease, such as rats, flies, and mosquitoes.

- Pest Management: Under the Public Health Act, the operator must take "all reasonable measures" to prevent the breeding of flies and rodents. Your EIA must outline a Vector Control Plan, which typically includes compaction and the use of insecticides or rodenticides where necessary.
- Waterborne Diseases: By preventing leachate from entering communal water sources, the project complies with the Act's mandate to prevent outbreaks of diseases like cholera and dysentery.

4.6.3 Protection of Water Supplies (Section 114)

This section specifically prohibits the pollution of water used by the public for drinking or domestic purposes.

- Human Consumption Safety: If the KMC landfill is located near boreholes used by the community, the Public Health Act gives health officers the power to shut down the project if they find the water is "polluted so as to be a danger to health."
- EIA Requirement: Your proposal must demonstrate that the Hydrological Study has accounted for the "Cone of Depression" and groundwater flow directions relative to human settlements.

4.6.4 Sanitation and Waste Management (Part XI)

The Act empowers local authorities and health inspectors to ensure that refuse is disposed of in a manner that prevents "accumulation of filth."

- Modern Sanitary Standards: By proposing a *sanitary* landfill rather than an open dump, KMC is proactively complying with the Public Health Act's goal of moving away from hazardous, unsanitary waste disposal methods.

4.7 PNEUMOCONIOSIS ACT (CHAPTER15:08)

The Pneumoconiosis Act [Chapter 15:08] is a specialized piece of legislation in Zimbabwe designed to prevent, manage, and compensate for occupational lung diseases caused by the inhalation of mineral dust. Because the Kamativi Mining Company (KMC**)** project involves significant earthworks, excavation into mineral-bearing rock (potentially containing silica or lithium-related dust), and is located within a mining lease, this Act is a critical component of your EIA's Occupational Health and Safety section.

4.7.1 Definition of "Dusty Occupations"

The Act applies specifically to workers in "dusty occupations," which traditionally include mining and any surface works where mineral dust is generated.

- Excavation & Construction: The process of constructing a sanitary landfill involves heavy excavation, blasting (if required), and the crushing of rock for drainage layers. These activities generate respirable crystalline silica dust.
- EIA Application: Your EIA must categorize landfill construction and certain operational roles as "dusty occupations" under the Act. This triggers the legal requirement for workers to hold a First-Stage Pneumoconiosis Certificate before they begin work on-site.

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4.7.2 Mandatory Medical Examinations (Part IV)

The Act mandates that no person shall be employed in a dusty occupation unless they have been certified fit by the Medical Bureau.

- Initial & Periodical Exams: Workers at the KMC landfill must undergo pre-employment chest X-rays and lung function tests. While on the project, they must undergo periodic reviews (usually every 12 to 24 months) to detect early signs of pneumoconiosis.
- EMP Action: In your Environmental Management Plan (EMP), you must include a "Medical Surveillance Program" that specifically cites compliance with Chapter 15:08 for all heavy equipment operators and ground workers.

4.7.3 Dust Control and Monitoring (Part VI)

The Act empowers inspectors to ensure that dust levels are kept within safe limits to prevent the onset of disease.

- Engineering Controls: To comply with the Act, the KMC landfill project must implement dust suppression techniques, such as water carts for access roads and dust extraction systems if any stone crushing is done on-site.
- Technical Monitoring: As an expert in technical monitoring, your EIA should propose regular Respirable Dust Sampling. This involves workers wearing personal dust samplers to ensure their exposure remains below the Occupational Exposure Limits (OEL) recognized by the Pneumoconiosis Board.

4.7.4 Compensation and Liability

The Act provides the framework for compensating workers who contract lung diseases (like silicosis or asbestosis) due to their employment.

- Employer Responsibility: KMC and its contractors are liable for ensuring that the work environment does not lead to permanent lung damage. Failure to provide adequate respiratory protection (PPE) or dust suppression can lead to heavy penalties and compensation claims under this Act.

4.8 IRMA

The Initiative for Responsible Mining Assurance (IRMA) Standard is a rigorous, voluntary international framework used to assess the environmental and social performance of industrial-scale mine sites. Unlike the local legislation previously discussed (which establishes mandatory minimums), IRMA represents international best practice. While IRMA is designed for the mine site as a whole, it treats on-site facilities—such as waste management systems as critical components of the operation's environmental footprint. Its application to your landfill project is structured around four core principles:

4.8.1 Environmental Responsibility (Chapter 4.1: Waste Management)

IRMA is particularly strict regarding waste. For a sanitary landfill, this means:

- Waste Characterization: You must systematically identify and categorize every waste stream (hazardous vs. non-hazardous) entering the landfill.

- Hazard Containment: The landfill design must meet international engineering standards to prevent leakage, regardless of what the local minimum requirement might be.

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- Lifecycle Approach: IRMA requires that you not only manage the landfill during operation but also plan for its reclamation, closure, and post-closure to ensure it does not become a future environmental liability.

4.8.2 Planning for Positive Legacies (Chapter 2.1 & 2.6)

IRMA mandates that environmental impacts are managed through an Environmental and Social Management System (ESMS).

- Impact Assessment: Your EIA needs to be "living." If monitoring shows that the landfill is affecting groundwater or air quality more than expected, IRMA requires adaptive management—meaning you must pivot your design or operations to address the new data.

- Financial Surety: You must demonstrate that funds are set aside (a financial bond or trust) to cover the costs of closing the landfill and monitoring it for years after it stops accepting waste, so the community does not bear that burden.

4.8.3 Social Responsibility (Chapter 3.3: Community Health & Safety)

A sanitary landfill is often a flashpoint for community concerns (odour, pests, noise, dust).

- Meaningful Engagement: IRMA goes far beyond standard "public meetings." It requires a documented, two-way dialogue where community concerns are recorded, addressed, and tracked until resolved.

- Grievance Mechanism: You must establish a transparent, accessible way for local residents to register complaints about the landfill, with a clear promise of remedy.

4.9 ISO STANDARDS

The International Organization for Standardization (ISO) provides globally recognized voluntary standards. Unlike the statutory instruments we have discussed previously, ISO standards are not legally mandatory in Zimbabwe; however, they are essential for demonstrating best-in-class management, operational transparency, and a commitment to continuous improvement in your Environmental Impact Assessment (EIA) for the Kamativi Mining Company (KMC) landfill.

4.9.1 ISO 14001: Environmental Management Systems (EMS)

This is the "gold standard" for managing environmental impacts.

- The Plan-Do-Check-Act (PDCA) Cycle: These standard forces your landfill operation to move beyond static planning. It requires you to *Plan* (set targets for leachate reduction), *Do* (operate the landfill), *Check* (monitor groundwater quality), and *Act* (make improvements if contamination is detected).

- Relevance to EIA: Including an ISO 14001-compliant EMS in your proposal shows the regulator that you have a self-correcting system to handle operational challenges without needing constant government intervention.

4.9.2 ISO 45001: Occupational Health and Safety

Landfills are inherently high-risk environments involving heavy machinery, biohazards, and potentially volatile gases.

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- Systematic Hazard Management: ISO 45001 shifts safety from reactive (treating accidents) to proactive (identifying risks *before* they manifest).
- Relevance to EIA: It provides a framework for managing the safety of workers constructing the liner and operating the waste face, which directly supports compliance with the Pneumoconiosis Act and NSSA regulations.

4.9.3 ISO 31000: Risk Management

Landfills face significant operational risks—such as liner failure, fire, or groundwater contamination.

- Structure: ISO 31000 provides a principles-based approach to identifying, assessing, and treating risks.
- Relevance to EIA: It allows you to present a robust Risk Mitigation Matrix in your proposal, proving that KMC has anticipated "worst-case scenarios" and has plans to contain them.

4.10 CONCLUSION

The construction of a sanitary landfill at the Kamativi Mining Company (KMC) necessitates a comprehensive integration of Zimbabwe's robust legal framework including the Environmental Management Act, the Forest Act, the Water Act, the Pneumoconiosis Act, and NSSA safety regulations—with globally recognized benchmarks like the IRMA Standard and ISO certifications. By strictly adhering to these national laws, KMC ensures its legal license to operate and mitigates direct environmental and health risks to the local community, while the voluntary adoption of international standards serves as a strategic commitment to operational excellence, sustainable resource management, and continuous improvement. Ultimately, this dual-layered approach transforms the EIA proposal from a mere compliance document into a sophisticated management tool that not only protects the surrounding ecosystems and human health but also secures long-term institutional credibility, reduces environmental liability, and establishes KMC as a responsible leader in the regional mining and waste management sector.

CHAPTER 5: STAKEHOLDER CONSULTATION

5.1 INTRODUCTION

For the purpose of this Environmental Impact Assessment (EIA), a "stakeholder" is defined as any individual, group, or institution from local Kamativi residents and mining employees to regulatory bodies who possesses a vested interest in the natural resources of the project area or stands to be directly or indirectly impacted by the construction and operation of the proposed sanitary landfill at the Kamativi Mining Company (KMC). Given that the success of this infrastructure project relies on community trust and environmental stewardship, stakeholder analysis was conducted to map the complex human and institutional landscape, identifying both primary and secondary participants whose support is vital to mitigating operational risks and achieving sustainable waste management goals. By systematically analyzing the relationships between these diverse groups and their specific concerns, this engagement process serves to align the project's objectives with the socio-economic and environmental needs of the surrounding community, as detailed in the following presentation on our consultation strategy.

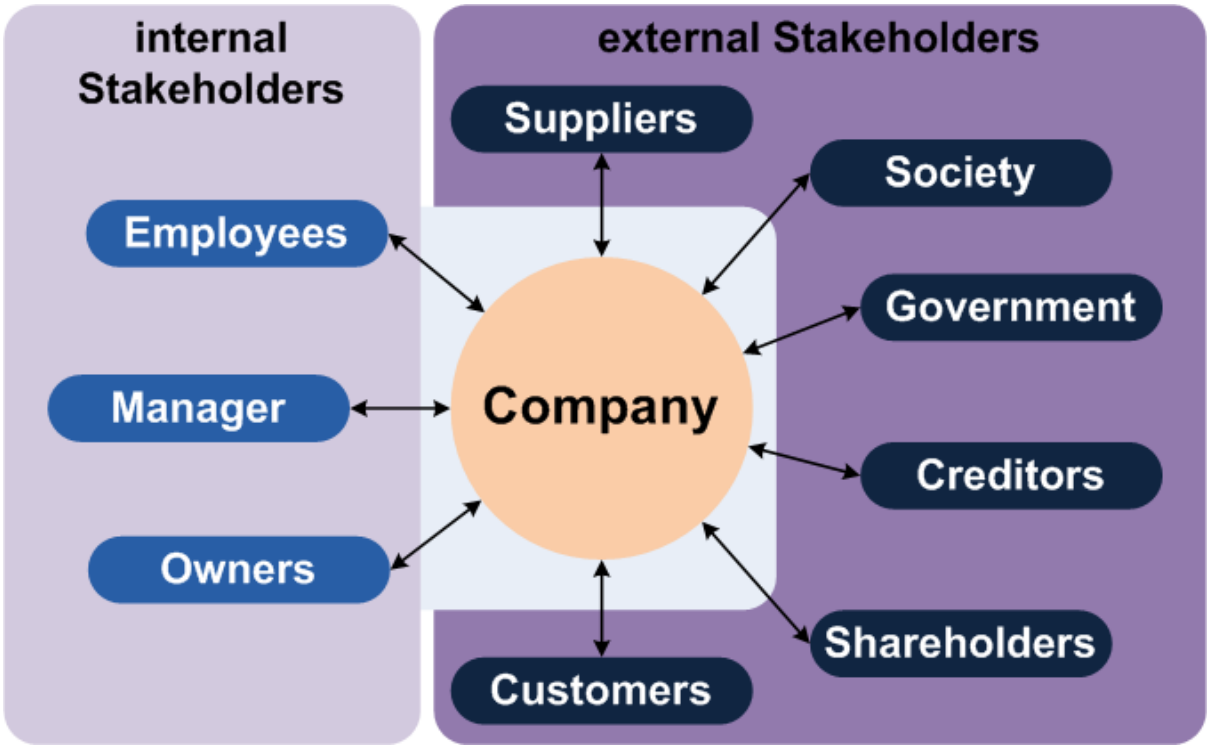


Figure 5.1: Shows classes of stakeholder.

5.2 WHY STAKEHOLDER CONSULTATION WAS CONDUCTED

- To identify the interests of all stakeholders who may affect or be affected by the programme/project;
- To identify potential conflicts or risks that could jeopardize the initiative;
- To identify opportunities and relationships that can be built on during implementation;
- To identify groups that should be encouraged to participate in different stages of the project;
- To identify appropriate strategies and approaches for stakeholder engagement; and
- To identify ways to reduce negative impacts on vulnerable and disadvantaged groups.

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The full participation of stakeholders in both project design and implementation of the project was key to – but not a guarantee of – success. Stakeholder participation:

- Gave people some say over how projects or policies may affect their lives;
- It Is essential for sustainability;
- Generated a sense of ownership if initiated early in the development process;
- Provided opportunities for learning for both the project team and stakeholders themselves; and
- Builds capacity and enhanced responsibility.

Stakeholder consultation process is a cycle that should involve consultation of the public while at the same time showing a move towards continued stakeholder involvement after the initial engagement.

5.3 METHODOLOGY OF THE STAKEHOLDERS CONSULTATION

To capture the diverse perspectives of interested and affected parties for the proposed KMC sanitary landfill, a multifaceted consultation methodology was employed. Engagement with local leadership and the broader community was facilitated through public meetings, supplemented by the distribution of structured questionnaires to gather detailed feedback. Furthermore, the local traditional authority was engaged directly via a formal questionnaire, while government departments were consulted through a combination of direct interviews and the electronic transmission of project prospectuses and engineering drawings. While consultations with certain government agencies were occasionally hindered by the unavailability of key personnel due to official duty calls, the overall response from stakeholders was overwhelmingly positive. Most participants viewed the landfill project as a vital intervention for local employment creation and a significant contributor to both micro and macro-economic development. The consultant engaged the following stakeholders throughout this assessment process:

- Hwange Rural District Council
- Chief
- Community Leaders
- Surrounding residents
- NSSA
- Forestry
- ZETDC
- ZINWA
- District Health Officer
- ZRP

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Table 5.1 Summary of stakeholder concerns.

STAKEHOLDERS	POSITIVE COMMENTS	NEGATIVE COMMENTS	MITIGATION MEASURES
Hwange Rural District Office +263 715626062	Key developments towards solid waste management within the district Best practice in the modern ECA of waste management Creation of a waste recycle management site, good for economic livelihoods for the locals	Initial removal of tress and land degradation and biodiversity loss If not managed properly solid waste management can be a nuisance and pose threat Locaz environmentalist and inhabitants of kamativi Methane and other green house gases should be properly managed	Stakeholder engagement participation during first phase of implementation Be guided by EMA ACT and ACC statutes to do with environmental management Propose to facilitate recycle organisations to partner with activities at the sanitary landfill
Ministry of Lands 0772785503	Very effective in disposing environmental litter Will provide a duplicate facility that can be copied by other institutions Create employment	No possible negative impacts of significance	Adhere to approved design
Chief 0772338247	The project is an advantage to the community as well as KMC mining company This landfill will be used by the community for proper waste disposal Creation of employment	Dust generation during construction Unauthorised access to the landfill site if not managed	Dust suppression during construction Fencing of landfill site parameter
ZETDC	Employment Creation	Risk of Electrocution and Fatal Accidents	The project proponent should comply with the provisions of the Electricity Act (CAP 13:19) as read with its requisite

0774491/9, 0774508/35, 0772393350		Damage to Underground and Overhead Electrical Infrastructure Power Supply Interruptions Fire and Explosion Hazards Encroachment on Wayleave Areas Public Safety Risks	ancillary legislation, Electricity (Public Safety) Regulations, SI 177 of 2018. The proponent should ascertain the location, depth and keep an up to date series of maps for all cable trench networks and ZETDC property and equipment before digging, boring, trenching, grading, excavating or breaking ground with tools, mechanical equipment or explosives The proponent should adhere ti wayleave restrictions of any existing and proposed electricity transmission and distribution lines which state that the proponent should not place any object or carry on any business or activity, farm or erect a structure within the prescribed wayleave clearance distances from either side of the outermost conductor.
Local Chief 0777704900	The project will help reduce waste The project will bring employment to the community	Diseases	The waste must be burnt
ZINWA 0774674277	Install monitoring boreholes upstream and downstream of		All mining activities should be at least 200m from Gwayi river tributaries high flood levels.

	mining operations with quarterly monitoring Establish surface water quality monitoring points and carry out quarterly monitoring		
Z.R.P Kamativi 0773819392	If properly designed landfills will reduce pollution of the environment. Landfill construction creates employment and economic benefit. Landfills can capture methane gas for use	The construction of landfills can lead to the disruption of natural ecosystems and can cause pollution if not properly done.	Implementing good engineering designs, regular monitoring, engagement with communities. Use no methane as an alternative source of energy
Councillor 0776475771	Waste management through fixed place for all waste. Creation of employment	Downstream management affect the waste through leakages from beneath	Buy periodically water quality management
Ministry of Health & Child Warfare 0788045093	Introduction of properly engineered sanitary pollution will replace open dumping, reducing environmental pollution. Reduction in air pollution. Improved public health, reduces exposure to disease vectors, improved sanitation leads to fewer disease outbreaks. Reduced land degradation.	Failure of leachate management system may contaminate ground surface water. Odour and visual intrusion may reduce community comfort and wildlife habitats	Conduct routine groundwater surface monitoring. Install landfill gas collection and flouring system
Brighton Zimba (Chairperson C.B-Section Community Member) 79 – 117011 A 79	Environmental benefit. Proper waste disposal reduces litter, pollution Social benefits. Job creation during construction and	Environmental concerns. Land degradation and habitat destruction during construction	Environmental. Engage with local communities and address concerns Economic. Apply a fence for boundary

	operation supports local community Biophysical benefits. Proper waste disposal minimises disease vectors	Social Impacts. Noise dust and odour nuisance during operation Economic or biophysical. Loss of biodiversity due to habitat destruction and attract pests and disease vectors	Biophysical. Monitor and manage pest control
Irene Meki (V.C-Section Community Member) 79 – 038656 G 79	We're proposing for a better location e.g that side of Gwayi will be suitable its away from the community Job creation	Residents may face increased risk of respiratory problems, skin disease or other health concerns due to poor waste management	Proper siting. Locate landfills far from residential areas and water sources Community engagement. Involve locals in planning and monitoring landfill operations
Margaret Mukombwa (V.C-Section 6 Community Member) 0777734354	Prevent diseases, clean and hygiene	Cause disease, dirt and unhealthy	Running water and bin
Thembi Ngwenya (Community Member) 0783779047/ 0777817044	Waste containment. Prevent waste from entering the environment reducing litter and pollution in water ways and oceans Disease control prevent spread of disease Modern landfills can capture methane Provide employment	Produce methane which has a greenhouse effect contributing to eliminate change. Waste can contaminate groundwater and surface water Attract pests and formation of odours Require large areas of land creating conflict with other land uses like agriculture	Recycling and composting to reduce waste sent to landfills Using technology for collecting systems and methane capture systems Monitoring and regulating landfill operations Rehabilitating landfill sites after closure to create new ecosystems
Precious Masauso (D-Section Leader,	Keeps clean the place and it will benefit local	Can be dangerous to poultry	The bin should be fenced

Community Member) 0784310473	community by creating jobs		
Ebson Ncube (B - Section Leader, Community Member) 73 – 0325340 V06	Prevent diseases, waste in the location will be reduced as it will be collected to one place	Wind can carry light waste away to other places, running water can carry the waste to rivers and dams Livestock can get contaminated; people will be prone to other diseases.	The area must be away from river banks, streams and villages. Fencing or barricade the area Burn the waste Assign people who will be facilitating the clean-up process to avoid environmental social economic or biophysical negative impacts
Timothy Mvula, Resident Chairperson (Community Member) 79 – 050702 79	The project can bring employment and will reduce waste in our location	When burning the air can cause diseases and livestock Health concerns due to poor waste management	The area must be fenced. Waste must be burned
Phanuel Milazi (Community Member) 0778104983	The project will bring employment to community and will reduce dirty waste	Can cause diseases	Waste must be properly burnt and control the pollution
NASSA 029271013-4, 78904-6	Recognition of the need for a structured Occupational Safety and health system. Emphasis on vision zero safety principles. Provision for PPE usage and enforcement. Acknowledgment of dust control measures during civil works	Possible disturbance or harm to wildlife. Potential hazards from improper scaffolding erection/ dismantling. Risk of inadequate first aid preparedness on site. General risk of environmental degradation in wildlife areas	Barricade the site and restrict unauthorised access. Provide and enforce proper PPE usage. Implement dust suppression methods
Forestry Commission 077741007	Employment creation. Improved public health. Infrastructure development	Deforestation	Replace all destroyed trees, plant trees that are adaptive. Take note of protected tree species and only cut when

			necessary. For list of reserved needs refer to the schedule in land forest produce act chapter 19:04 and SI 116 of 2012

5.3 SUMMARY OF CONCERNS

GreenCloud SHEQ Consultancy conducted a comprehensive stakeholder engagement process for the proposed Kamativi Mining Company (KMC) sanitary landfill, facilitating a transparent dialogue between government departments, local leadership, and the community regarding the project's eventual transition to the Hwange Rural District Council (HRDC). While stakeholders recognized the significant socio-economic catalysts—including localized job creation, a reduction in illegal waste littering, and general infrastructure development—they raised valid environmental concerns regarding land degradation from excavations, ecosystem fragmentation, deforestation, and localized noise and dust pollution. To address these impacts, a collaborative mitigation framework was established, incorporating proactive solutions such as indigenous reforestation programs, rigorous occupational risk assessments, and robust social awareness campaigns to prevent the spread of communicable diseases. By integrating these stakeholder-led interventions into the final Environmental Management Plan (EMP), the project ensures that the landfill serves as a sustainable developmental asset that balances modern waste utility with the ecological and public health priorities of the Kamativi community.

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CHAPTER 6: ASSESSMENT EVALUATION OF IMPACTS

The process of impact assessment has two major components namely impact analysis and impact evaluation. Each of the components is discussed in this chapter. Impact assessment and evaluation form the basis of environment management by ranking various impacts and thus, apply various measures to mitigate the impacts. Mitigation is meant for significant impacts that are further discussed in the EMP chapter of this EIA report.

6.1 IMPACT ANALYSIS

Following identification of the various potential social, health and environmental impacts through public consultation (chapter five) and literature review an impact analysis and evaluation framework is established. The framework looks at the impacts under the following aspects;

a) **Nature of the impact:** This dimension reveals if the impact is direct or indirect, cumulative or instantaneous and whether the impact is positive or negative.
b) **Magnitude:** This parameter discusses the intensity of the impact, whether it is low, moderate or high intensity.
c) **Extent / Scale:** The extent gives the quantitative aspects of the impact and the spatial distribution of the impact.
d) **Timing:** This shows when the impact would occur in terms of the project life cycle.
e) **Duration:** The parameter reveals whether the impact is short term or long term, intermittent or continuous.
f) **Permanence:** This tells whether the impact in question is reversible or irreversible. In the table to follow permanence is categorised into three classes namely, permanent, semi-permanent and temporal.
g) **Likelihood:** This tells us the probability of the impact occurring.
h) **Significance:** This quantifies the overall value of the impact after Extent **(E)**, Duration **(D)**, Probability **(P)**, Severity **(S)**, Acceptability **(A)** and Mitigatory potential **(M)** of the impact is considered. There is a numerical value calculated by the equation below.
i) **Residual Impact:** This is a general measure of effectiveness of mitigation exercise. Residual impacts are those that remain after the mitigation process has been administered to the impact.

The analysis of the environmental impacts is focusing on the entire project life; from planning to decommissioning phase.

6.2 IMPACT ASSESSMENT

Following the identification and analysis of potential environmental impacts, this section focuses on the evaluation of the significance of the identified impacts and the impact of the potential remedial action or enhancement measures. As indicated in the impact analysis, this evaluation only focuses on the impacts arising from the planning, construction, operation and decommissioning phases of the project. A systematic process was followed in evaluating significance, distinguishing between 'as predicted' and 'residual' impacts.

1) This first step involved evaluating the significance of 'as predicted' impacts to define the requirements for mitigation and other remedial actions.

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2) The second step involves evaluating the significance of the 'residual' impacts, i.e. after mitigation measures are taken into account. This test is the critical measure of whether or not a proposal is likely to cause significant impacts. It is determined by the joint consideration of its characteristics (magnitude, extent, duration etc.), that is intensity and the importance (or value) that is attached to the resource losses, environmental deterioration or alternative uses which are foregone.

Firstly, a technical objective judgment was made to measure the extent to which mitigation will reduce 'as predicted' impacts. Secondly, a subjective value was placed on the significance of residual impacts, using criteria and tests described in the table below. Assessed significance is found as a product of intensity and importance as given below by the mathematical equation below;

Extent + Duration + Probability + Severity + Importance = Significance

In the above equation, intensity refers to the quantitative characteristics (magnitude, frequency of occurrence, duration) of the impact while the importance is based on value that the affected stakeholders place on the impact. Intensity is based on facts on the impact while the attached importance is quite subjective and is so much influenced by the perceived value. The following key will be used in the allocation of significance and importance to each and every impact.

Table 6.1 Key for impact intensity, importance and significance

ASSESSMENT CRITERIA	Rating	INTERPRETATION OF RATING	CODE
1 Extent/Scale	Low	Impact will be limited to the site	1
	Medium	Impact will be felt on the region	3
	High	Impact will be felt on the provincial, national and international regions	5
2 Duration	Short term	Lifespan of impact: less than a month	1
	Medium term	Lifespan of impact: between a month and 6monts	3
	Long term	Lifespan of impact: more than 6months	5
3 Probability	Improbable	Likely to occur once per year due to history and design	1
	Probable	Likely to occur monthly	3
	Highly probable	Likely to occur weekly or more - continuous	5
4	Low	Minimum effect on the environment	1

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ASSESSMENT CRITERIA	Rating	INTERPRETATION OF RATING	CODE
Severity	Medium	Medium effect to the environment	3
	High	The impact is highly severe to the host environment	5
5 Importance	Low	People do not value the impact so much	1
	Medium	The local stakeholders slightly value the impact	3
	High	The community is highly affected by the impact and it values such that its presents is easily felt	5
6 Mitigatory potential	Low	No or little measures in place to mitigate impact e.g. Housekeeping	1
	Medium	Potential to mitigate negative impacts. However, the implementation of mitigation measures may still not prevent negative impacts	5
	High	High potential to mitigate impacts to the level of insignificant effect	10
7 Enhancement potential	Low	No or little measures in place to enhance the positive impact e.g. Housekeeping	1
	Medium	Potential to enhance positive impact. However, the implementation of enhancement measures may still not raise the significance to a significant level	3
	High	High potential to significantly enhance positive impact to very high level.	5
8 Significance	Low	5-12	
	Medium	13-19	
	High	20+	
9 Residual impact	Low	5-12	
	Medium	13-19	
	High	20+	

The conventional classification was applied for both the positive and negative impacts with the only difference being that, when considering positive impact, enhancement measures will be applicable while mitigation was applied to negative impacts. The “as predicted significance” pertains to unmitigated negative impacts and also level of positive benefit had before the enhancement measures. The residual significance refers to the magnitude of negative impacts that remain even after mitigation and also refers to the level of positive benefit after the enhancement measures are implemented in this project.

As aforementioned, this aspect is calculated from Predicted significance and available practical mitigation plan. For negative impacts the residual impact is computed by the formula below. If mitigation is significantly high, it can reduce the overall significance to acceptable levels. It should be noted that for positive impacts yellow and red colours are the most favoured however, for negative impacts green colour is the most favourable for it shows the lowest level of negativity of the impact.

Predicted significance (S) – Mitigation (M)= Residual impact

In the case of positive impacts we don't talk of mitigation, rather, we talk of enhancement measures aiming to improve the positive impacts. If the enhancement value is big enough, it can ensure a significant increase in the predicted significance of the positive impact. The equation below models how residual impact under these circumstances can be calculated. It should be noted that for positive impacts yellow and red colours are the most favoured.

Predicted significance (S) + Enhancement (En) =Residual impact

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Table 6.2 Positive Impacts analysis and evaluation

IMPACT		BACKGROUND	TIMING	ENHANCEMENT REQUIRED	PREDICTED SIGNIFICANCE						RESIDUAL IMPACT	
					EXTENT	DURATION	PROBABILITY	SEVERITY	IMPORTANCE	SIGNIFICANCE	ENHANCEMENT	SIGNFICANCE
1.	Employment Creation	Development of the landfill requires both semi-skilled and unskilled labour for construction and ongoing waste management operations.	Construction and Operational Phases	Prioritize hiring from the local Kamativi community and provide certified vocational training.	4	5	5	4	4	20	25	
2.	Improved Waste Management	Current ad-hoc dumping poses environmental risks; a sanitary landfill centralizes and contains waste, preventing soil and water contamination.	Operational Phase (Ongoing)	Implement strict waste sorting at the source and periodic audits to ensure operational efficiency.	5	5	5	5	5	25	25	

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IMPACT		BACKGROUND	TIMING	ENHANCEMENT REQUIRED	PREDICTED SIGNIFICANCE						RESIDUAL IMPACT	
					EXTENT	DURATION	PROBABILITY	SEVERITY	IMPORTANCE	SIGNIFICANCE	ENHANCEMENT	SIGNFICANCE
3.	Local Economic Stimulus	The project provides a market for local suppliers of construction materials, fencing, and safety equipment.	Construction Phase	Establish local procurement policies to ensure businesses in the immediate vicinity are preferred vendors.	3	3	4	4	4	18	2	20
4.	Public Health Benefits	Proper containment of waste reduces the prevalence of disease vectors (rats, flies) and limits air pollution from burning dumps.	Post-Commissioning (Ongoing)	Maintain a robust monitoring program for pests and leachate to ensure long-term public health security.	4	4	5	4	4	21	4	25
5.	Capacity Building	Introduction of modern engineering and health/safety standards (ISO/IRMA) upgrades local skills	All Phases	Partner with local technical colleges to offer internships related to environmental management and civil engineering.	3	3	3	3	3	15	2	17

IMPACT		BACKGROUND	TIMING	ENHANCEMENT REQUIRED	PREDICTED SIGNIFICANCE						RESIDUAL IMPACT	
					EXTENT	DURATION	PROBABILITY	SEVERITY	IMPORTANCE	SIGNIFICANCE	ENHANCEMENT	SIGNFICANCE
		and institutional knowledge.										
6.	Environmental Remediation	The project replaces existing uncontrolled dump sites, allowing for the rehabilitation and restoration of degraded land within the concession.	Post-Construction	Develop a formal closure plan for historical dumpsites once the new facility is operational.	4	4	5	4	5	22	2	24
7.	Improved Infrastructure	Construction of access roads to the landfill benefits local connectivity and movement for surrounding communities.	Construction Phase	Design road upgrades to be dual-purpose for both landfill logistics and local community access.	3	3	4	3	4	17	3	20
8.	Formalization of Waste Sector	Transitioning from informal scavenging to an organized landfill allows for	Operational Phase	Facilitate formal cooperatives for waste pickers to ensure safe working conditions and fair income.	4	4	5	4	5	22	2	24

IMPACT		BACKGROUND	TIMING	ENHANCEMENT REQUIRED	PREDICTED SIGNIFICANCE						RESIDUAL IMPACT	
					EXTENT	DURATION	PROBABILITY	SEVERITY	IMPORTANCE	SIGNIFICANCE	ENHANCEMENT	SIGNFICANCE
		potential recycling initiatives and value-added recovery.										
9.	Groundwater Security	Modern engineering (liners/leachate collection) prevents the contamination of the regional water table, a vital asset for community boreholes.	Operational Phase	Establish a public water quality dashboard for transparency to build community trust in safety.	4	4	5	4	5	22	3	25
10	Knowledge Transfer	The adoption of ISO and IRMA standards introduces global best practices to local technical teams and government monitors.	All Phases	Host workshops with local regulatory officers to share technical findings and monitoring methodologies.	2	3	3	3	3	15	3	18

Table 6.3: Negative impacts analysis and evaluation

IMPACT		BACKGROUD	TIMING	MITIGATION REQUIRED	PREDICTED SIGNIFICANCE						RESIDUAL IMPACT	
					EXTENT	DURATION	PROBABILITY	SEVERITY	IMPORTANCE	SIGNIFICANCE	MITIGATION	SIGNFICANCE
1.	Groundwater Contamination	Risk of leachate escaping due to liner puncture or improper waste segregation.	Operational / Post-Closure	Install double-liner system; implement continuous downstream monitoring boreholes.	4	4	4	4	5	21	3	18
2.	Noise and Vibration	Heavy machinery during excavation and waste transport can disturb local wildlife and nearby settlements.	Construction / Operation	Restrict heavy machinery use to daylight hours; install acoustic barriers where necessary.	3	3	4	3	3	16	2	14
3.	Air Quality Degradation	Generation of methane gas and dust during site operations and vehicle movement.	Operational Phase	Implement daily soil covers; install gas venting/flaring systems to mitigate odors and emissions.	2	3	3	3	3	14	2	12
4.	Loss of Vegetation/Habitat	Clearing of land for landfill cells and access roads leads to localized biodiversity loss.	Pre-Construction	Conduct a pre-clearing flora survey to relocate protected species; implement a progressive re-vegetation plan.	5	5	5	5	5	25	4	21

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IMPACT		BACKGROUD	TIMING	MITIGATION REQUIRED	PREDICTED SIGNIFICANCE						RESIDUAL IMPACT	
					EXTENT	DURATION	PROBABILITY	SEVERITY	IMPORTANCE	SIGNIFICANCE	MITIGATION	SIGNFICANCE
5.	Soil Erosion	Removal of topsoil and vegetation destabilizes the site, risking sedimentation of nearby streams.	Construction Phase	Build storm-water diversion channels; install sediment traps to prevent runoff into watercourses.	3	3	3	3	3	15	3	12
6.	Visual Intrusion	The physical presence of a landfill alters the local landscape character and can be aesthetically unpleasing.	Construction / Operation	Maintain a vegetated "green buffer" zone around the perimeter to screen the site from view.	3	3	4	4	3	17	2	15
7.	Increased Traffic Hazards	Heavy waste collection vehicles increase road traffic, posing risks to local pedestrians and livestock.	Operational Phase	Implement mandatory traffic signage, designated haulage routes, and strict speed enforcement.	4	4	5	5	5	23	2	21
8.	Pest and Vector Proliferation	Organic waste attracts rodents, flies, and scavengers, potentially	Operational Phase	Apply consistent daily cover (soil or alternative); schedule regular pest control (fencing/baiting).	3	3	3	4	4	17	2	15

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IMPACT		BACKGROUD	TIMING	MITIGATION REQUIRED	PREDICTED SIGNIFICANCE						RESIDUAL IMPACT	
					EXTENT	DURATION	PROBABILITY	SEVERITY	IMPORTANCE	SIGNIFICANCE	MITIGATION	SIGNFICANCE
		spreading diseases to nearby communities.										
9.	Spontaneous Combustion	Accumulation of flammable materials and methane generation can trigger landfill fires if not managed.	Operational Phase	Construct 9-meter-wide fireguards; implement a gas management and monitoring system.	3	3	3	4	4	17	3	14
10	Resource Competition	Construction/Operations may compete for local groundwater or power, potentially affecting neighboring users.	Construction / Operation	Use water-efficient equipment; install solar-powered systems to reduce reliance on local power grid.	3	3	3	4	3	16	2	14
11	Litter Dispersion	Lightweight plastic waste can be blown by strong winds into adjacent indigenous forests.	All Phases	Install high perimeter mesh fencing and maintain a "litter-pick" crew on a daily basis.	3	3	3	4	5	18	2	16

IMPACT		BACKGROUD	TIMING	MITIGATION REQUIRED	PREDICTED SIGNIFICANCE						RESIDUAL IMPACT	
					EXTENT	DURATION	PROBABILITY	SEVERITY	IMPORTANCE	SIGNIFICANCE	MITIGATION	SIGNFICANCE
12	Social Displacement	Land use change may restrict access to traditional foraging or grazing lands within the concession.	Pre-Construction	Engage in community resettlement or compensation agreements early in the planning process.	4	4	4	4	5	21	3	18

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CHAPTER 7: ENVIRONMENT MANAGEMENT PLAN (EMP)

7.1 ENVIRONMENT MANAGEMENT PLAN

The environment management plan (EMP) is an umbrella term that houses the environmental management and the environmental monitoring plan. It presents a summary of management initiatives that will be required to ensure that identified potential negative and positive impacts are mitigated and maximized respectively. However, this EMP will be focussing on negative impacts pointed out in chapter six of this EIA report. It also indicates who will be responsible for undertaking the management initiative. The monitoring and evaluation indicators are also tabled in this chapter. The EMP should not be used as a substitute to indigenous knowledge systems (IKS) but rather the two should complement each other for the best environmental protection.

The chapter also lays down the plan for monitoring the potential impacts during project implementation and decommissioning stages. The EMP is also aimed at ensuring continued compliance even after the duration of project. In some cases the implementing agencies would need the assistance of the consultant to adequately formulate local area and more specific implementation strategies. It is important that the proponent implements this EMP with reference to the impact analysis and evaluation chapters which have more detail on the impacts and the suggested mitigation measures. The EMP summarized the impacts and configured them into objectives that can be pursued sustainably for both the biophysical and the socio-economic impacts. The table 7.1 shows the environmental mile stones that should be achieved during implementation of this project.

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Table 7.1 Summary of the Environmental Management Milestones

ITEM	OBJECTIVE	SCOPE	CONTROL MEASURES
1. Soil Management	To preserve pedological integrity and prevent chemical contamination.	All disturbed footprints, material stockpiles, and hydrocarbon storage areas.	Implementation of Topsoil Stripping Protocols (max 2m height); use of HDPE geomembrane liners; secondary containment (bunding) for all fuel/oil storage.
2. Dust Management	To suppress Fugitive Dust Emissions and maintain ambient air quality.	Unpaved haul roads, excavation faces, and dry material handling zones.	Scheduled Hydraulic Suppression (water bowing); application of eco-friendly dust suppressants; enforcing a 40km/h site speed limit.
3. Noise Management	To mitigate acoustic pollution and maintain "Quiet Zones" for nearby receptors.	Heavy machinery operations and site preparation activities.	Deployment of low-noise equipment; scheduled maintenance to prevent "rattle"; restriction of high-decibel activities to Standard Working Hours.
4. Workers' Health & Safety	To maintain an Integrated Occupational Health & Safety (OHS) system.	All onsite contractors, mining personnel, and technical consultants.	Mandatory Full-Body PPE; establishment of a Site Safety Committee; conducting "Pre-Task Hazard Assessments" (PTHAs) and medical surveillance.
5. Employment Management	To optimize local "Social Value" and prevent influx-related conflicts.	Recruitment of the construction and operational workforce.	Implementation of a "Local First" Hiring Policy via Kamativi Community Liaison Officers; transparent skill-audit databases; strict adherence to national labour laws.
6. Community Health	To prevent morbidity associated with project-induced environmental changes.	Resident populations within the Kamativi Mine and surrounding hinterlands.	Community sensitization on Vector-Borne diseases; installation of perimeter fencing to prevent unauthorized access; traffic management plans to reduce road risks.
7. Waste Management	To apply the "Waste Hierarchy" (Reduce, Reuse, Recycle) to construction debris.	All non-hazardous and hazardous waste generated during the build phase.	Provision of color-coded separation bins; certified disposal of hazardous materials (oils/batteries); ban on open-pit burning or illegal dumping.

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8. Decommissioning Plan	To ensure a "Safe and Stable" site closure post-operational life.	The landfill cells, administrative buildings, and site infrastructure.	Progressive capping of cells; removal of non-essential structures; Post-Closure Monitoring (min. 20 years) for leachate and landfill gas.
9. Socio-economic Decommissioning	To mitigate negative economic shocks following project closure.	The local Kamativi workforce and community-based service providers.	Development of a Transitionary Skills Program; severance planning; repurposing of site infrastructure (e.g., offices) for community use.
10. Wetland Management	To protect hydrological functions and local biodiversity (Riparian zones).	Any identified seasonal seeps, dambos, or water bodies within the catchment.	Establishing a 30-meter Buffer Zone (no-go area); silt traps to prevent sedimentation; prohibition of water abstraction without ZINWA permits.

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7.3 ENVIRONMENTAL MONITORING PLAN

Monitoring of biophysical and social environmental indicators signal potential problems, facilitate timely implementation of effective remedial measures and allow for validation of assumptions and assessments made in the present study. The biophysical and social environmental monitoring plan will enable a proper assessment of any changes in baseline conditions as discussed earlier in this report. Monitoring will measure the effectiveness of proposed mitigation measures in minimizing and/or reducing potential environmental and social impacts. It allows the implementation of corrective actions or new adaptive management programs as required, should the proposed mitigation measures fail in reducing or eliminating potential negative impacts; and to meet the pre-determined levels of performance (i.e. local environmental standards/ thresholds). Monitoring allows for continual review of post-construction and operational activities based on performance data and consultation feedback.

Monitoring shall start as soon after an EIA certificate is issued. It shall be implemented throughout all project phases and managed by the proponent. The Management shall also be responsible for ensuring that the surrounding environment and social communities are protected throughout the life of the project. Table 7.2 below is a summary of the environmental monitoring plan (EMP).

The plan details the following

- **Objective:** This is the overall goal the proponent should aim to achieve. The object should be specific, measurable, achievable, and realistic and time bound (SMART).
- **Parameter**: This is an aspect that is measured to try to assess the level of achievement of the objectives.
- **Indicator:** It is a visual or scientific attribute that seeks to describe harm or corrective measure done to the environment by the project in question.
- **Monitoring Method:** This assesses method used to assess the impact or corrective action carried to the impact. Examples are visual and laboratory assessment.
- **Responsibility:** This looks into who shall be involved in carrying out the monitoring and corrective action. This is very important to ensure stakeholders to the project are conscientious of their roles for ease of implementation of the EMP.

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Table 7.2: Environment Monitoring Plan

ENVIRONMENTAL OBJECTIVE.	PARAMETER	INDICATORS	MONITORING METHOD	MONITORING FREQUENCY	RESPONSIBILITY.
Prevention of Water Pollution by Landfill Leachate a) Groundwater Integrity)	Heavy Metals & Metalloids (As, Cd, Cr, Pb, Hg, Ni).	Concentrations remain below WHO Drinking Water Guidelines and EMA standards.	Sampling from dedicated up-gradient and down-gradient monitoring boreholes; Laboratory ICP-MS analysis.	Quarterly (Standard); Monthly (if a trend is detected).	Environmental Consultant / Lab Tech
b) Liner Performance	Leachate Head (Liquid depth on the liner).	Maximum hydraulic head < 300mm at all times.	Automated pressure transducers and level sensors installed in the leachate collection sump.	Continuous (Real-time telemetry); Weekly manual verification.	Landfill Operations Manager
c)Sub-surface Seepage	Electrical Conductivity (EC) and Chloride (Cl-) levels.	Sudden spikes in EC (> 50% above baseline) in monitoring wells.	In-situ probe dipping (multi-parameter meter) in leak detection layers (secondary liner).	Fortnightly (Dry season); Weekly (Rainy season).	SHEQ Officer
Prevention of Soil Erosion (Surface Stability) a)Sediment Transport	Gullying and Rill formation.	Zero active rills > 10cm deep on embankments or cut slopes.	Systematic visual walkovers of all disturbed surfaces and perimeter berms.	Weekly; and within 24 hours of any rainfall > 15mm.	Site Engineer / SHEQ Officer

ENVIRONMENTAL OBJECTIVE.	PARAMETER	INDICATORS	MONITORING METHOD	MONITORING FREQUENCY	RESPONSIBILITY.
	Total Suspended Solids (TSS) in runoff.	Runoff clarity; TSS levels < 25 mg/L at the final silt trap discharge.	Imhoff cone settling tests and turbidity meter readings at siltation pond outlets.	Weekly during the rainy season; Monthly during the dry season.	Environmental Officer
b)Vegetative Cover	Percentage Ground Cover.	> 70% established indigenous grass/shrub cover on completed cell caps.	Quadrat sampling (1m x 1m) and photographic monitoring points.	Quarterly (following seasonal growth cycles).	Rehabilitation Specialist
c)Infrastructure Integrity	Siltation Depth in drains and traps.	Sediment accumulation < 30% of the total capacity of silt traps/diversion drains.	Manual depth gauging using marked staff gauges in all storm-water infrastructure.	Fortnightly during summer; Monthly during winter.	Maintenance Supervisor
d)Topsoil Preservation	Stockpile Stability and Height.	Stockpile slopes at 1:3 ratio; height < 2m; zero visible slope failure.	Physical measurement of stockpile dimensions and visual signs of "slumping."	Monthly.	Earthworks Foreman
Prevention of illegal dumping of solid and liquid waste by the residents	Incidence of unauthorized waste disposal sites.	Zero new informal dumpsites within a 5km radius of the KMC landfill; 100% waste delivery to the designated tipping face.	Surveillance patrols of community "hotspots"; Audit of landfill weighbridge/entry tickets against estimated community waste generation rates.	Weekly community boundary patrols; Monthly waste volume reconciliation.	Community Liaison Officer / Site Security Manager

ENVIRONMENTAL OBJECTIVE.	PARAMETER	INDICATORS	MONITORING METHOD	MONITORING FREQUENCY	RESPONSIBILITY.
Combating Air pollution from vehicle and back-up generator fumes	Concentration of NOx, SO2, and CO (Carbon Monoxide).	Emissions within EMA (Environmental Management Agency) "Green Class" limits; 100% compliance with vehicle fitness certification.	Flue gas analysis using portable gas analyzers on generators; Review of preventative maintenance logs and "Black Smoke" visual inspections (Ringelmann Chart).	Quarterly stack emission testing; Monthly fleet maintenance audits.	SHEQ Manager / Mechanical Foreman
Eliminate dust in work environment and community public places	Particulate Matter (PM10) and Dust Fallout Rates.	Dust fallout < 600 mg/m²/day (Residential Standard); Zero visible dust plumes crossing site boundaries.	Gravimetric dust bucket analysis (ASTM D1739); Handheld laser particle counters at community receptors; Visual opacity checks.	Continuous visual monitoring; Monthly laboratory fallout reports.	Environmental Officer / SHEQ Manager
Minimize land degradation	Total Disturbed Footprint (Hectares) and Alien Invasive Species (AIS) density.	Zero expansion of disturbed areas beyond the approved EIA boundary; Zero presence of Category 1 invasive plants (e.g., Lantana camara).	Aerial GIS mapping (Drone survey) to verify boundary compliance; Systematic botanical belt-transects for AIS detection.	Quarterly GIS audits; Monthly site-wide biological inspections.	Environmental Officer / GIS Specialist
Putting in place of an effective fire management system	Firebreak Width and Equipment Readiness.	Zero uncontrolled fire outbreaks; 100% serviceability of fire	Physical measurement of perimeter firebreaks; Pressure gauge checks on	Weekly firebreak inspections; Monthly equipment	SHEQ Manager / Site Fire Marshal

ENVIRONMENTAL OBJECTIVE.	PARAMETER	INDICATORS	MONITORING METHOD	MONITORING FREQUENCY	RESPONSIBILITY.
		extinguishers; 9m wide clear firebreaks.	suppression equipment; Internal "Red-Tag" audits of fire hydrants/water bowsers.	certification; Annual fire-drill simulations.	
Elimination of Occupational Health and Safety Hazards	Hazard Prevalence and Incident Rates (LTIFR).	Zero Fatalities; 100% Personal Protective Equipment (PPE) compliance; Completion of all "High Risk" Job Safety Analyses (JSAs).	Comprehensive SHEQ site audits; Review of accident/near-miss registers; Direct observation of work practices (Site Walkabouts).	Daily safety briefings (Toolbox Talks); Monthly internal audits; Annual external OHS certification.	SHEQ Manager / KMC Safety Officer
Emergency Preparedness: 1.Fires	Fire Suppression Readiness and Methane (CH_4) levels.	100% serviceability of extinguishers; Zero uncontrolled landfill/bushfire spread; Firebreaks maintained at 9m width.	Physical inspection of fire hydrant pressure and extinguisher tags; Monitoring of LFG (Landfill Gas) wells for thermal spikes; Fire-drill execution audits.	Monthly equipment audits; Weekly firebreak inspections; Annual full-scale fire simulation.	SHEQ Manager / Site Fire Marshal
2.Emergency Preparedness: Road Accidents	Vehicle Speed and Driver Compliance.	Zero project-related collisions on community roads; 100% adherence to the 40km/h village speed limit.	Review of GPS tracking data/speed logs; Random roadside speed checks; Analysis of vehicle maintenance and "Pre-Start" safety checklists.	Continuous GPS monitoring; Weekly log audits; Quarterly driver safety training.	Transport Officer / Site Security

ENVIRONMENTAL OBJECTIVE.	PARAMETER	INDICATORS	MONITORING METHOD	MONITORING FREQUENCY	RESPONSIBILITY.
3.**Emergency Preparedness: Communicable Diseases**	Epidemiological Trends and Sanitation Levels.	Zero outbreaks of water-borne (Cholera/Typhoid) or vector-borne (Malaria) diseases linked to the site.	Health surveillance at local Kamativi clinics; Inspection of onsite potable water and waste-trap hygiene; Monitoring of standing water for larvae.	Monthly health coordination meetings; Weekly site sanitation inspections.	Community Liaison / Occupational Health Nurse
Cooperate with local leadership and avoid conflict	Grievance Redressal and Community Consultation.	100% of grievances resolved within 14 days; Bi-monthly meetings with Kamativi Traditional Leadership/Council; Zero project-related work stoppages due to community unrest.	Audit of the Community Grievance Log; Minutes of meetings with local leaders; Socio-economic perception surveys within the Kamativi wards.	Monthly Grievance Log review; Bi-monthly leadership briefings; Annual Stakeholder Satisfaction Survey.	Community Liaison Officer (CLO) / Project Manager
Monitoring and Evaluation (M&E)	EMP Compliance and Performance Auditing.	100% completion of scheduled monitoring reports; Zero unresolved "Major Non-Conformances" from EMA; > 90% achievement of set environmental KPIs.	Independent Third-Party Environmental Audits; Internal SHEQ performance reviews; Verification of monitoring data against baseline EIA benchmarks.	Monthly internal reviews; Quarterly compliance reporting to EMA; Annual external audit.	SHEQ Manager / External Environmental Consultant

ENVIRONMENTAL OBJECTIVE.	PARAMETER	INDICATORS	MONITORING METHOD	MONITORING FREQUENCY	RESPONSIBILITY.
Regular environmental quality monitoring	Multi-media Environmental Compliance (Water, Air, Soil).	100% adherence to EMA (Environmental Management Agency) effluent and emission standards; Baseline stability across all environmental receptors.	Integrated Sampling Campaigns; Laboratory Analysis (Chemical/Biological); Automated In-situ sensor data logging (e.g., pH, Turbidity, PM10).	Monthly (Quarterly for deep-well analysis); Bi-annual comprehensive environmental audits.	SHEQ Manager / Accredited Third-Party Laboratory
Monitoring of the decommissioning plan	Capping Integrity, Gas Migration, and Vegetation Succession.	Slope Stability Factor > 1.5; Methane (CH4) concentration < 1% v/v at boundary; > 80% indigenous flora survival rate.	Geotechnical inclinometer readings; Portable Landfill Gas (LFG) surface emissions monitoring; Botanical quadrat sampling on final caps.	Quarterly for the first 5 years post-closure; Annually thereafter for 20 years.	Environmental Consultant / Civil Engineer

CHAPTER 8: CONCLUSIONS AND RECOMMENDATIONS

8.1 CONCLUSION

The proposed construction of a Sanitary Landfill at Kamativi Mining Company (KMC) represents a critical intervention in regional integrated waste management, designed to transition the Kamativi community from antiquated disposal practices to a technically robust, engineered containment system. By strictly adhering to the Environmental Management Act (Chapter 20:27) and its associated Statutory Instruments, particularly SI 37 of 2007 (EIA and Ecosystems Protection), the project establishes a framework for "Zero Harm" through high-density polyethylene (HDPE) liner systems and proactive leachate management. This EIA confirms that through the rigorous application of the outlined Environmental Management Plan (EMP), all localized residual impacts ranging from groundwater protection to air quality can be effectively mitigated to meet "Blue Class" environmental standards. Consequently, the project is deemed environmentally sustainable and socially beneficial; its eventual handover to the Hwange Rural District Council (HRDC) will ensure a long-term, regulated utility that enhances public health and ecological integrity within the Hwange District for decades to come.

8.2 RECOMMENDATION

The recommendations for the Kamativi Sanitary Landfill EIA report are structured to ensure that the transition from a mining-adjacent project to a public utility under the Hwange Rural District Council (HRDC) is seamless, safe, and legally compliant. These recommendations focus on long-term structural integrity and the "Social License to Operate" within the Kamativi community.

8.2.1 Technical and Engineering Safeguards

It is highly recommended that Kamativi Mining Company (KMC) installs a redundant liner system exceeding the minimum requirements of SI 37 of 2007. Given the historical mining activity in the area, the landfill must be equipped with permanent Groundwater Monitoring Boreholes both up-gradient and down-gradient. These "sentinel" wells should be sampled quarterly to provide a legal baseline of water quality, protecting both the developer and the HRDC from future liability regarding pre-existing subterranean contamination.

8.2.2 Community Integration and "Zero Harm"

To ensure the project genuinely benefits the Kamativi Communities, a formalized Waste Collection Strategy must be implemented. This includes the placement of communal "Skips" or collection points in high-density residential wards to prevent the recurrence of illegal dumping. Furthermore, the recruitment for construction and operational labor should prioritize local Kamativi residents, fostering a sense of ownership that will be vital for the facility's security and success once the mining company exits the management phase.

8.2.3 Institutional Capacity Building for HRDC

A critical recommendation is the initiation of a Two-Year Transitional Shadowing Program. Before the final handover, HRDC technical staff—specifically environmental health technicians and refuse managers—should be integrated into the KMC site team. This ensures that when the Hwange Rural District Council assumes full responsibility, they possess the technical expertise to manage leachate

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pumps, methane vents, and weighbridge software, preventing the facility from degrading into an unmanaged "open dump."

8.2.4 Regulatory Compliance and Financial Assurance

In accordance with the Environmental Management Act (Chapter 20:27), the developer must establish a Decommissioning Fund or an environmental bond. This financial mechanism must be transferred to the HRDC upon completion to guarantee that the costs of eventual closure, capping, and 20-year post-closure monitoring are fully funded. This prevents the landfill from becoming a "stranded asset" or a financial burden on the council's ratepayers in the future.

8.2.5 Biodiversity and Landscape Restoration

To mitigate land degradation, the project must implement a Progressive Rehabilitation Plan. Rather than waiting for the landfill to reach full capacity, completed sections of the landfill cells should be immediately capped with topsoil and re-vegetated with indigenous species hardy to the Matabeleland North climate. This reduces dust, prevents soil erosion into local stream networks, and ensures that the site remains aesthetically and ecologically compatible with the surrounding Kamativi landscape.

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Appendix A: Proof Of Land Ownership

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Appendix B: Stakeholder Consultation Input

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Appendix C: EIA Certificate of the whole KMC Boundaries – Archaeological Assessment confirmation

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Appendix D: Engineering Drawings

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