

**ENVIRONMENTAL and SOCIAL IMPACT ASSESSMENT FOR  
THE PROPOSED ESTABLISHMENT OF THE CONSTRUCTION  
OF GOLD ORES PROCESSING AND WASHING FACILITIES  
AT MACHINJIONI MTA, MGUSU WARD IN GEITA TOWN  
COUNCIL, GEITA REGION**



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## EXECUTIVE SUMMARY

### Introduction and Background

The informal, unsafe, and largely unregulated use of mercury in the Artisanal and Small-scale Gold Mining (ASGM) sector continues to result in significant and, in many cases, irreversible environmental degradation and adverse human health impacts. Mercury is commonly used in ASGM gold extraction due to its ability to form an amalgam with gold; however, crude handling, open burning, and inadequate containment measures lead to widespread mercury releases into the environment. These practices expose miners, surrounding communities, and ecosystems to serious health and environmental risks. In recognition of these challenges, reducing and, where feasible, eliminating the use of mercury in ASGM operations is a priority under Article 7 of the Minamata Convention on Mercury, to which Tanzania is a Party.

Current gold processing methods at many ASGM sites in Tanzania involve limited controls, poor use of personal protective equipment (PPE), and insufficient awareness of mercury risks. As a result, mercury emissions from ASGM activities contribute significantly to global mercury pollution, with the highest exposure occurring during amalgamation and burning processes. Addressing mercury use in ASGM therefore, requires the promotion of safer handling practices and the introduction of improved processing technologies that reduce mercury releases and associated risks.

In response to these concerns, the Government of the United Republic of Tanzania, through the National Environmental Management Council (NEMC) and the Mining Commission, is implementing the Environmentally Sound Management of Mercury in ASGM (EHPM) Project. The project aims to reduce mercury exposure among miners and surrounding communities by promoting improved mercury management practices, the use of appropriate PPE, and adoption of safer gold processing technologies. A key component of the EHPM Project is the establishment of Mercury Mineral Processing Centres that will serve as demonstration and training facilities at selected ASGM sites across seven regions of the country.

Mgusu ASGM site, located at Machinjioni–Mgusu in Geita District, Geita Region, has been identified as one of the strategic locations for the establishment of a Mercury Mineral Processing Centre. The site is operated by Mgusu Miners Cooperative Society, which comprises approximately 900 registered members. The mining area is surrounded by other active mining sites and holds a total of twenty (20) active Primary Mining Licences (PMLs). Mining operations at Mgusu commenced in 2013, and the site currently supports daily artisanal and small-scale mining activities involving an estimated population of over 13,000 people, including miners, traders, and service providers.

The proposed Mercury Mineral Processing Centre at Mgusu is intended to function as a demonstration facility for safe mercury handling and improved gold processing practices. The centre will be equipped with appropriate PPE and technologies designed to minimize mercury releases, improve occupational health and safety, and reduce environmental contamination. The facility will also provide training and awareness-raising opportunities for miners and other stakeholders, with the objective of improving compliance with environmental, health, and safety standards within ASGM operations.

The identification of Mgusu as a suitable site followed field assessments conducted by a multi-disciplinary technical team comprising representatives from the Ministry of Minerals, the Mining Commission, the Geological Survey of Tanzania (GST), the relevant Local Government Authority (LGA), the Federation of Mining Associations of Tanzania (FEMATA), and NEMC. These assessments considered factors such as the scale of mining activities, existing mercury use practices, accessibility, and potential environmental and social risks.

The long-term objective of establishing the Mercury Mineral Processing Centre at Mgusu is to enhance knowledge, awareness, and adoption of environmentally sound mercury management practices among ASGM miners. This initiative is expected to contribute to improved health outcomes, reduced environmental pollution, and the promotion of safer, more sustainable, and responsible gold extraction practices in line with national policies and international commitments.

## **Alternative Considerations**

Several alternatives were assessed to identify the most environmentally and socially appropriate option for the project. These included alternative site locations, processing technologies, water supply options, energy sources, and the “no project” scenario.

The Machinjioni–Mgusu site was selected as the preferred location because it is already within licensed mining areas, close to the ore source, and does not require land acquisition or resettlement. Alternative locations would have resulted in additional land disturbance and higher environmental and social impacts.

Mercury-based gold processing methods were rejected due to their serious health and environmental risks and inconsistency with national regulations and international commitments. Mercury-free gravity concentration technologies were selected as they significantly reduce health risks, minimize environmental pollution, and align with the objectives of mercury phase-out programs.

Groundwater abstraction from on-site boreholes was identified as the most suitable water supply option due to its reliability and minimal environmental impact. Surface water abstraction and municipal water supply were not preferred because of potential ecological impacts and high costs.

Electricity supply from the national grid (TANESCO) was selected as the primary energy source due to its availability and lower emissions, with diesel generators used only as backup. Solar energy may be considered in future expansions.

The “no project” option was not preferred, as it would allow continued unsafe mercury use and associated environmental and health risks. Overall, the selected alternatives represent the most sustainable and feasible option in line with World Bank Environmental and Social Standards.

## **Construction Materials and Equipment**

The construction of the Mgusu Gold Ore Processing and Washing Facilities will require standard construction materials, including cement, concrete blocks, sand, gravel, aggregates, stone chippings, reinforcement steel bars, water, PVC/HDPE pipes, and related admixtures. Additional materials will include fencing materials such as barbed wire and wire mesh.

Construction equipment to be used will include excavators, backhoes, shovels and pickaxes, concrete mixers, dump trucks, haulage trucks, water pumps, welding machines, and other light construction tools.

## **Construction Labor**

It is estimated that 30–50 workers will be engaged during the construction phase. These will include unskilled laborers, drivers, masons, carpenters, plumbers, electricians, mechanics, equipment operators, supervisors, engineers, and administrative staff.

Unskilled labor will be sourced locally from Machinjioni Mtaa and Mgusu Ward, where there is availability of youth seeking employment. Skilled labor may be hired from outside the project area. Potential risks associated with labor influx, including social conflict, spread of communicable diseases, and gender-based violence (GBV), have been identified. To mitigate these risks, measures such as Codes of Conduct, awareness training, and strict supervision have been incorporated into the ESMP.

During the operational phase, the project will engage approximately five (5) professional staff and more than fifteen (15) workers involved in day-to-day small-scale mining and processing activities at the site.

The project will develop and implement an Emergency Preparedness and Response Plan, including an Evacuation Plan, in accordance with applicable national legislation and relevant international standards. Adequate fire-fighting equipment will be provided and maintained on site. All staff and workers will receive regular training and participate in emergency response and fire drills to ensure readiness and effective response in the event of an incident.

## **Objective and Purpose of the ESMP**

The purpose of this Environmental and Social Management Plan (ESMP) is to provide guidance for managing environmental and social risks and impacts associated with the design, construction, operation, and decommissioning of the Mgusu Gold Ore Processing and Washing Facilities. The ESMP ensures that project activities are implemented in a manner that is environmentally sound, socially acceptable, and consistent with national regulations and the World Bank Environmental and Social Framework (ESF).

## **Relevant Policies, Legal and Administrative Framework**

The proposed project will comply with all applicable Tanzanian environmental, mining, labor, and occupational health and safety laws, as well as the World Bank Environmental and Social Framework (ESF).

Key national legislation and regulations applicable to the project include:

- Environmental Management Act, 2004
- Mining Act, 2010 (as amended)
- Occupational Health and Safety Act, 2003
- Water Resources Management Act, 2009
- Mining (Environmental Protection for Small Scale Mining) Regulations, 2010
- Environmental Impact Assessment and Audit Regulations, 2005 (as amended)

## **World Bank Environmental and Social Framework**

The Mgusu project is supported under the Environmental Health and Pollution Management Project (EHPMP) and is therefore required to comply with the World Bank ESF. The applicable Environmental and Social Standards include:

- ESS 1: Assessment and Management of Environmental and Social Risks and Impacts
- ESS 2: Labor and Working Conditions
- ESS 3: Resource Efficiency and Pollution Prevention and Management
- ESS 4: Community Health and Safety
- ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement
- ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- ESS 7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities
- ESS: Cultural Heritage
- ESS 10: Stakeholder Engagement and Information Disclosure
- ESS 9 on Financial Intermediaries is not applicable.

## **Stakeholder Consultations**

Stakeholder consultations were conducted with relevant government institutions, regulatory authorities, local leaders, cooperative members, and community representatives from Mgusu Ward and Machinjioni Mtaa. Consultation is an ongoing process and will continue throughout project implementation.

Key concerns and views raised by stakeholders included:

- Strong support for the project due to its focus on safer gold processing and reduced mercury exposure
- Concerns regarding operational costs and accessibility of the facility to all miners
- The need for proper management of tailings storage facilities to protect nearby communities and water resources
- These concerns have been incorporated into the ESMP mitigation and management measures.

## Potential Environmental and Social Risks and Impacts

### Positive Impacts

- Increased awareness of mercury risks and safer gold processing practices
- Employment and income generation for local communities
- Technology transfer and capacity building for small-scale miners
- Improved occupational health and safety
- Contribution to local and national economic development

### Potential Adverse Impacts

- Temporary dust, noise, and vibration during construction
- Risks to water quality if waste and tailings are poorly managed
- Occupational health and safety risks to workers
- Community safety risks from increased vehicle movement
- Risks related to labor influx, including GBV and communicable diseases
- Proposed Enhancement and Mitigation Measures

An Environmental and Social Management and Monitoring Plan (ESMMP) has been developed to ensure that all identified risks and impacts are avoided, minimized, or mitigated across all project phases. The plan includes mitigation measures, monitoring indicators, institutional responsibilities, reporting arrangements, and budget provisions to ensure effective implementation and compliance.

### Grievance Redress Mechanism

A Grievance Redress Mechanism (GRM) has been established to allow community members, workers, and other stakeholders to raise complaints or concerns related to the project. Complaints can be submitted verbally or in writing through local leaders, project representatives, phone calls, or suggestion boxes.

All grievances will be recorded, investigated, and resolved within defined timelines. Sensitive cases, including GBV and SEA/SH, will be handled confidentially and referred to appropriate service providers.

### Capacity Building Plan

Capacity building activities will be conducted for contractors, workers, cooperative members, local leaders, regulatory authorities, and project staff. Training will focus on ESMP implementation, occupational health and safety, mercury risk management, stakeholder engagement, and grievance handling.

### Estimated Cost for ESMP Implementation

The total estimated cost for implementing the ESMP, including mitigation measures, monitoring activities, capacity building, and grievance management, is included within the overall project budget of TZS 62,448,990.

### Conclusion

The proposed Mgusu Gold Ore Processing and Washing Facilities represent a strategic intervention to reduce mercury use in artisanal and small-scale gold mining while improving environmental performance, worker safety, and community health.

The ESMP demonstrates that the project's environmental and social risks are manageable and can be effectively mitigated through the proposed measures. Overall, the project is expected to deliver significant environmental, health, and socio-economic benefits without causing significant adverse impacts, provided the ESMP is fully implemented.

**LIST OF REGISTERED EXPERTS INVOLDED IN CONDUCTING THE STUDY**

<b>S/N</b>	<b>EXPERTS</b>	<b>SPECIALTY</b>	<b>SIGNATURES</b>
1.	Lusako Raphael	Environmental/Team Leader	
2.	Anamary Philemon	Municipal and Industrial Services Engineer	
<b>Other Experts Involved in the Study (Non-Registered by NEMC)</b>			
1.	Neema Bundala	Environmental scientist	

## ACRONYMS AND ABBREVIATIONS

ASGM	Artisanal and Small-scale Gold Mining
CIC	Carbon in Column
DO	Dissolved Oxygen
EHPM	Environmental Health and Pollution Management
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESS	Environmental and Social Standards
FEMATA	Federation of Mining Associations of Tanzania
GRM	Grievance Redress Mechanism
GST	Geological Survey of Tanzania
LGA	Local Government Authority
MC	Mining Commission
MEO	Mtaa Executive Office
ML	Mining License
MoM	Ministry of Mineral
NEMC	National Environmental Management Council
PL	Prospective License
PML	Primary Mining License
WEO	Ward Executive Office

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## CHAPTER ONE

### 1 INTRODUCTION

#### 1.1 Background of the Client

Artisanal and small-scale gold mining (ASGM) in Tanzania has resulted into significant environmental and social impacts. The use of mercury in the gold extraction process has led to contamination of water sources and soil, as well as harm to the health of miners and the communities at large. The destruction of forests and other habitats caused by mining activities can also have negative impacts on biodiversity. Additionally, the informal nature of ASGM often leads to a lack of regulation and oversight, which can result in unsafe working conditions and lack of access to basic services for the miners and their families.

Tanzanian government has taken steps to address these issues, including the creation of a 2020-2025 National Action Plan for The Elimination of Mercury Use in ASGM (as means of implementation of ratification of 2013 Minamata Convention on Mercury) and increasing efforts to formalize the sector and improve working conditions.

To further on earlier efforts, The Government of Tanzania through Environmental Health and Pollution Management Project (EHPMP) has received a grant from World Bank to construct mineral processing centres in mainland Tanzania. Anticipated outcomes are reduction of the health risks associated with the unsafe use of mercury by ASGM. These facilities will be used as demonstration centres for the safe handling of mercury to ASGM in the project implementation Regions i.e., Geita, Mara, Mwanza, Shinyanga, Singida, Mbeya and Songwe.

Construction, operation and eventually decommissioning of such projects might cause significant environmental and social risk. In that regard, Environmental and Social Impact Assessment (ESIA) is required.

With that regard the National Environmental Management Council (NEMC) will construct the Gold Ores Processing and Washing Facilities which will enhance knowledge and awareness among ASGM miners regarding the safe use and handling of mercury, ultimately promoting sustainable and responsible gold extraction practices.

The construction of gold ore washing facilities will go together with facilitating Mgusu gold mine which will be supplying ore to the proposed washing facilities. The facilitation will involve technical capacity building to enhance their operation and minimize the environmental pollution.

The Mining site is located at Machinjioni – Mgusu Geita district, Shinyanga Region, and is owned by Mgusu Miners Cooperative Society with 900 members. Adjacent to these PMLs, there are other mining sites on all sides. The mine has twenty (20) Primary Mining Licenses, covering all active licenses. The mining operations for this PML started in 2013, and there are more than 13,000 people involved in daily small-scale mining operations at this site.

The mining method employed is underground mining methods with 2401 mining pits (Maduara), whereby all are active. The underground mine pits developed have an average mining depth of 80M. The average daily mining production rate is 400tonnes of gold ore, equivalent to 5000 bags of 80Kg each.

The mining site has two gold ore processing and washing facilities (Mialo) and two crushers to crush and grind mined rock materials. All crushers and gold processing and washing facilities are within the PML. The water used for gold ore processing operations is obtained from the mined underground pits.

## 1.2 Regulatory Requirements

In terms of the Environmental Management Act (EMA) of 2004 and the Environmental Impact Assessment and Audit Regulations, 2005 (United Republic of Tanzania, 2005) amended in 2018, the project falls within the project type B1 which is the boundary list which may require Environmental Impact Assessment (EIA) or may not after screening as it is listed in Category B1 Projects **14. Extractive Industries, (b) Mining (small scale mines)**.

In order to meet the requirement, the detailed project brief is prepared to facilitate the National Environmental Management Council's further decision and approval.

This study was initiated in the September, 2023 whereby started by the meeting with NEMC (Project Coordinator) and Consultant for mutual understanding of the scope of the study through which various stakeholders were involved and the baseline data collected and registration of the project were started as well

## 1.3 Objectives of the Environmental and Social Impact Assessment (ESIA)

The Mining site is located at Machinjioni – Mgusu Geita district, Shinyanga Region, and is owned by Mgusu Miners Cooperative Society with 900 members. Adjacent to these PMLs, there are other mining sites on all sides. The mine has twenty (20) Primary Mining Licenses, covering all active licenses. The mining operations for this PML started in 2013, and there are more than 13,000 people involved in daily small-scale mining operations at this site.

The mining method employed is underground mining methods with 2401 mining pits (Maduara), whereby all are active. The underground mine pits developed have an average mining depth of 80M. The average daily mining production rate is 400tonnes of gold ore, equivalent to 5000 bags of 80Kg each.

The mining site has two gold ore processing and washing facilities (Mialo) and two crushers to crush and grind mined rock materials. All crushers and gold processing and washing facilities are within the PML. The water used for gold ore processing operations is obtained from the mined underground pits.

No environmentally sensitive areas, i.e. rivers, lakes, spring, forest reserves etc., are within 60M or nearby the mining sites. However, there is a river known as Mabubi, which is located 700M from the mining site.

Conducting an environmental impact assessment to prevent degradation and maintain ecological balance within the project area.

- Identify and evaluate the significant environmental impacts of the proposed project.
- To determine the compatibility of the proposed project of improved gold ore processing and washing facilities with the neighboring land use
- Formulation and incorporation of Environmental Management and Monitoring Plan during project implementation/construction, operation and decommissioning phases.

NEMC is committed to conducting his activities in compliance with the safety standards and protecting its natural and human environment in a long-term basis.

As per Mining Act of 2010 read with 2017 amendments and the Mining (Safety, Occupational Health and Environment Protection) Regulations, 2010, projects of these categories require an Environmental Impact Assessment before commencement which provide a practical way in which a proponent can demonstrate an understanding of environmental regulations, practices and procedures required to reduce or eliminate the potential environmental effects of the project.

## 1.4 Scope of the Study

The study was conducted in accordance with the guidelines laid down by the Environmental Management Act of 2004, and its regulations amended in 2018 as well as the World Bank requirements as provided in the Environmental and Social Management Framework which goes down to the ten environmental and social standards. In its undertaking, the key consideration among others included the following:

- To ensure that environmental considerations are explicitly addressed and incorporated into the decision-making process, with the aim to anticipate and avoid, minimize, or offset the adverse significant biophysical and social effects of the proposed project; and to protect the capacity of natural systems and ecological processes to maintain their functions.
- To promote development that is sustainable and optimizes resources use and management opportunities
- Identify and assess the anticipated environmental and social impacts of the proposed projects – both positive and negative;
- Identify and analyze alternatives to the proposed project;
- Propose mitigation measures for negative impacts and enhancement measures for positive impacts to be undertaken during and after the implementation of the proposed project;
- Verify compliance with national environmental regulations and policies, World Bank Safeguard Policies, and industry best practice and standards;
- Generate baseline data for monitoring and evaluation of how well the mitigation measures have been implemented during the project life cycle;
- Recommend cost effective measures to be used to mitigate against the anticipated negative impacts;
- Prepare an Environmental & Social Impact Assessment Report compliant with the Environmental Impact Assessment and Audits Regulations (Amendment) 2018 and World Bank Environmental and Social Standards which include ESS1, ESS2, ESS3, ESS4, and ESS10; and prepare an Environmental and Social Management Plan (ESMP)

## 1.5 Study Approach and Methodology

The approach to this exercise was structured to cover the requirements under the Environment Impact Assessment and Audit Regulations, 2005 amended 2018 and the requirements of WB ESF. It largely involved an understanding of the project background, the preliminary designs, and the implementation plan as well as commissioning.

In addition, baseline information was obtained through physical investigation of the project site areas, desktop studies, and public consultations with members of the community in the project areas, a survey, photography, the project ESMF, and discussions with the project Proponent.

The methodology used in this study follows specific procedures and guidelines set by the EIA & Audit Regulations of 2005 amended in 2018 and WB ESF Requirements. The study adopted the approach of conducting Impact Assessment that is closely related to the flowchart in Figure 1-1.

Figure 1-1: Impact Assessment Process

### 1.5.1 Issues Associated with the Proposed Project

Environmental and social Issues, risks and impacts associated with school construction activities were identified based on previous history and detailed project activities. These are detailed in Chapter Two.

### **1.5.2 Regulatory Framework with Associated Issues**

Description of the relevant regulations, WB ESF and standards that are governing environmental quality, health and safety, protection of sensitive areas, siting, land use control as detailed in Chapter 3.

### **1.5.3 How the Situation is Currently (Baseline Situation)**

To gauge the extent of impact, it is crucial to establish the status quo. The consulting team conducted the baseline study of the current level of impacts. This involved a specialized study on flora and fauna, air, soil and water.

It also covered socioeconomic issues, noise, vibration etc. The aim of ascertaining the baseline is to appreciate to what extent the proposed project can alleviate or exacerbate the current situation

### **1.5.4 Issues from Key Stakeholders**

This Environmental and Social Impact Assessment Report elaborates on the following:

- A list of stakeholders consulted together with a stakeholder analysis.
- The method used to get their views and issues of concern raised.
- Issues raised by the stakeholders and the way they were addressed.
- Records of stakeholder meetings, communications, and comments.

### **1.5.5 Assessment of Impacts (Both Good and Negative)**

This critically reviews and analyses interaction between the proposed project and the existing environment. In this analysis, the consultant distinguished between significant positive and negative impacts, direct and indirect impacts, and immediate and long-term impacts.

Impacts, which are unavoidable or irreversible, are also identified. Wherever possible, impacts are described quantitatively in terms of environmental costs and benefits.

### **1.5.6 Consideration of Alternatives**

This environmental assessment also involved an analysis of reasonable alternatives to meet the ultimate project objective. This analysis included any alternatives examined while developing the proposed project, and that from an environmental, socio-cultural, or economic point of view may be sounder than the proposed project. This also includes the 'no action' alternative, which assesses environmental conditions without project.

It describes how the alternatives compare in terms of potential impacts, costs, suitability under local conditions, as well as institutional, training, and monitoring requirements. To the extent possible, costs and benefits of each alternative are quantified, incorporating the estimated costs of any associated mitigating measures. Finally, this report described the reasons for selecting the proposed project over the other alternatives.

### **1.5.7 Developing an Environmental Management Plan**

This report recommends feasible and cost-effective measures to prevent or reduce any significant negative impacts to levels that are acceptable. This involves:

- Estimating the impacts and costs of those measures, and of the institutional and training requirements to implement them.
- Preparing a management plan including proposed work programs, budget estimates, schedules, staffing and training requirements, and other necessary support services to implement the mitigating measures.
- A management plan is also covering the decommissioning phase of the project.

### **1.5.8 Developing an Environmental Monitoring Plan**

This report contains a detailed plan to monitor the implementation of mitigation measures and the impacts of the project during its execution. This plan includes a cost estimate for carrying out the proposed monitoring plan.

## **1.6 Land Ownership**

The mining site, situated at 2°51'2.15"S 32°3'45.13"E in Machinjioni – Mgusu in the Geita town of the Geita Region, is under the ownership of Mgusu Miners Cooperative Society, boasting a membership of 900 individuals.

Adjacent to the Primary Mining Licenses (PMLs) of this site, there are numerous other mining sites, forming a cluster of mining activity in the region. The land use plan is for mining activities inspite the land surveying process was not conducted.

## **1.7 Project Location**

The Proposed project site is situated at 2°51'2.15"S 32°3'45.13"E in Machinjioni Mtaa, Mgusu Ward in the Geita Town of the Geita Region as shown in Figure 1-2 and the adjacent to the Primary Mining Licenses (PMLs) of this site, there are numerous other mining sites, forming a cluster of mining activity in the region.

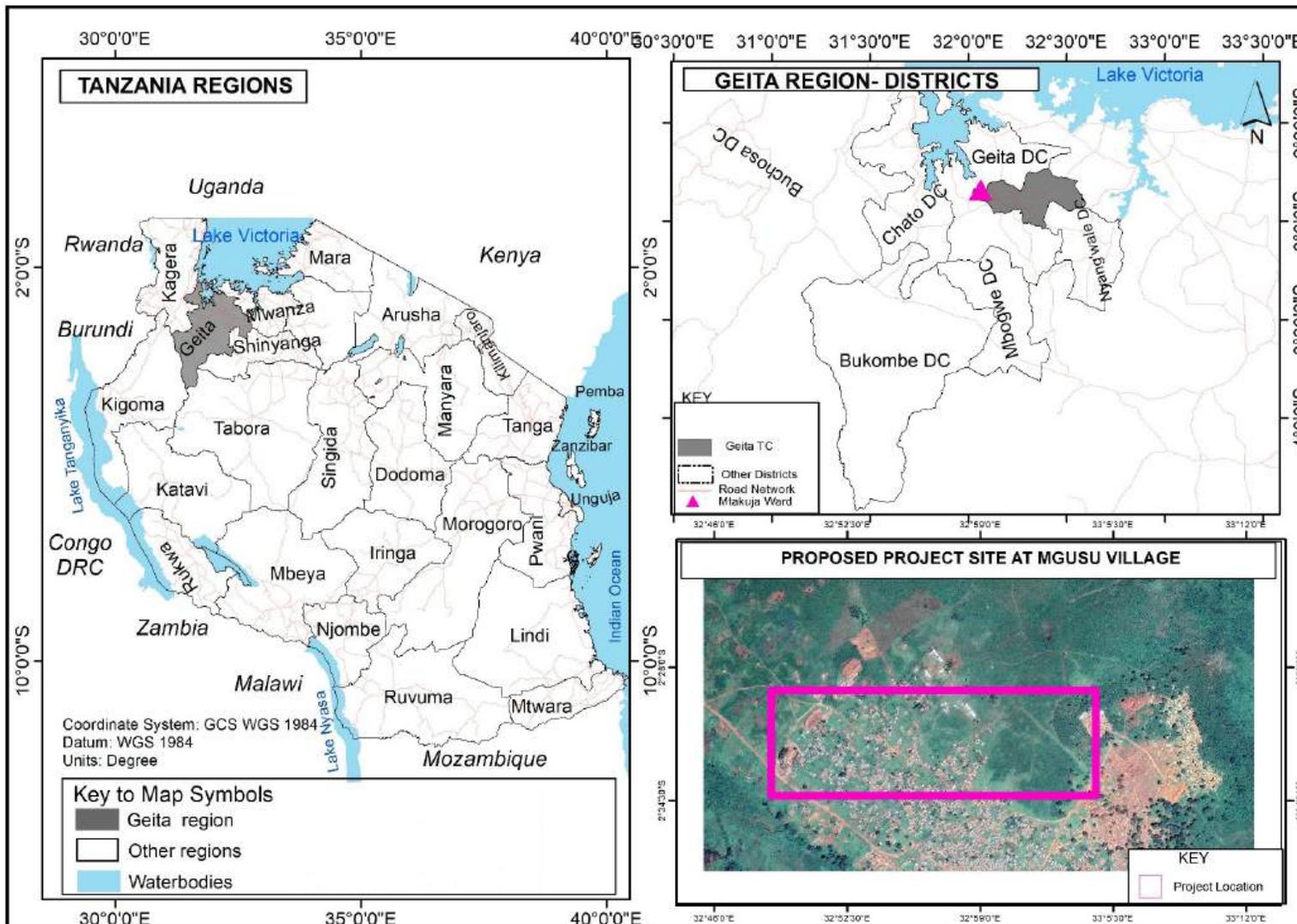


Figure 1-2: Proposed Location for the Gold Ore Processing and Washing Facilities (Source: Site Visit, October 2023)

## 1.8 Structure of the Report

This report is structured to follow the outline of Section 18 of the Environmental Impact Assessment and Audit Regulation of 2005 as amended 2018. Details of the content of the report are in Table 1-1.

Table 1-1: Structure of EIA Report

Chapter	Description
Executive Summary	Provides a short summary of each chapter in the EIA report
Acknowledgement	Express the appreciations and gratitude of the proponent in completion of the study
Abbreviations and acronyms	Provides the list of word used in the EIA Report in short term
Chapter 1	<b>Introduction</b> Provides a background to the proposed project, summarizing the rationale of the project
Chapter 2	<b>Project Background and Description</b> Describes the proposed project and its nature, together with the planning, design and activities of the project
Chapter 3	<b>Policy, Administrative and legal framework.</b> Describes the legal and regulatory framework for the ESIA, including relevant international conventions and local policies. Describes the authorized bodies that will be involved in the ESIA process
Chapter 4	<b>Baseline or Existing Conditions</b> Describes the existing biophysical and socio-economic environment that could be affected by the project.
Chapter 5	<b>Stakeholder involvement and Participation</b> This chapter describes how the people affected by the project either positively or negatively were involved in the project
Chapter 6	<b>Impact Identification and Assessment</b> This chapter describe on how impacts identified and how will be characterized to be compatible to the environment
Chapter 7	<b>Environmental Impact Mitigation Measures</b> In this chapter, the solutions for reducing severity of the negative impacts and enhancing the positive are being discussed.
Chapter 8	<b>Environmental and Social Management Plan;</b> This chapter describes the systematic plan on how to implement the measures provided in chapter six, responsible personnel and cost of implementation
Chapter 9	<b>Environmental and Social Monitoring Plan;</b> In this chapter describes on how to control the parameters of elements which seems to be more adverse to both environment and community
Chapter 10	<b>Environmental and Social Commitment Plan</b> This chapter outlines an organization's commitment to addressing environmental and social considerations in its operations and the project at whole.
Chapter 11	<b>Resource Evaluation or Cost Benefit Analysis;</b> This chapter provides compilation of a comprehensive list of all direct and indirect costs, intangible costs, opportunity costs and the cost of potential risks and direct and indirect revenues and intangible benefits, such as increased production from improved employee safety and morale, or increased sales from customer associated with the project or decision
Chapter 12	<b>Grievance Redress Mechanism</b> This chapter explains how communities and workers can report concerns, how those complaints are handled and resolved, who is

Chapter	Description
	responsible, and how the project ensures fairness, transparency, and timely responses
Chapter 13	<b>Conceptual Closure Plan</b> It summaries the report and hits the strategies and considerations for the eventual closure of the facility
References	<b>References</b> Provides a list of the sources used to compile this report
Appendices	<b>Appendices</b> Provides a list of evidence about the ESIA process and the Proponent.

## CHAPTER TWO

### 2 PROJECT DESCRIPTION

#### 2.1 Introduction

Tanzania stands as one of Africa's leading gold producers, with a rich history of over a century in Artisanal and Small-scale Gold Mining (ASGM). This sector has been pivotal in supporting government revenues, individual incomes, and employment opportunities. In the 2019/2020 fiscal year, ASGM contributed 15.3 tons of gold valued at 1.5 billion dollars, marking a 12% increase from the previous year. Remarkably, ASGM constituted 26% of Tanzania's total gold production during this period. However, this sector struggles with significant challenges, notably the pervasive and unregulated use of toxic mercury in gold recovery, as documented by Schoneveld et al. in 2018.

Mercury, a common tool in small-scale gold mining, is employed to separate gold from other minerals due to its unique ability to bind with gold and form an amalgam. Unfortunately, this process leads to substantial mercury emissions, contributing to about 37% of global mercury emissions. The adverse effects of mercury are most pronounced during the amalgamation process and open burning, especially when miners lack appropriate Personal Protective Equipment (PPEs) or use retorts improperly. Effectively managing mercury in ASGM gold extraction operations is crucial to mitigate health and environmental risks. Mercury emissions negatively impact the local environment, miners' health, and neighboring communities.

To address these pressing issues, the National Environmental Management Council (NEMC) and Mining Commission are guiding the EHPM Project, focusing on constructing Mercury mineral processing centers equipped with PPEs. These centers are intended to serve as demonstration hubs, showcasing safe handling of mercury in ASGM sites across seven selected regions. A collaborative effort involving technical teams from the Ministry of Minerals, the Mining Commission (MC), the Geological Survey of Tanzania (GST), the Local Government Authority (LGA), the Federation of Mining Associations of Tanzania (FEMATA), and the NEMC conducted surveys of existing ASGM sites to pinpoint strategic areas for establishing these centers. The long-term goal is to enhance knowledge and awareness among ASGM miners regarding the safe use and handling of mercury, ultimately promoting sustainable and responsible gold extraction practices.

The proposed construction of Gold Ore Processing and Washing Facilities at Machinjioni Mtaa, Mgusu Ward, Geita Town Council forms part of the broader Environmental Health and Pollution Management Project (EHPMP) financed by the World Bank and implemented by the Government of the United Republic of Tanzania through the Vice President's Office (Environment Division) as the executing agency. The EHPMP aims to reduce environmental health risks associated with the use of mercury and other pollutants in Artisanal and Small-Scale Gold Mining (ASGM). Within this framework, the National Environment Management Council (NEMC) serves as the implementing agency responsible for coordinating the construction of demonstration mineral processing centers in selected regions, including Geita.

Funds for the EHPMP are disbursed from the World Bank to the Ministry of Finance, then to the Vice President's Office (VPO), and subsequently disbursed to NEMC for implementation of the project. At the local level, Mgusu Miners Cooperative Society acts as the beneficiary and host institution for this subproject, providing land, operational support, and manpower in collaboration with the Mining Commission, Geita Town Council, and Local Government Authorities (LGAs). The proposed project therefore be implemented through a multi-institutional arrangement, whereby NEMC oversees overall coordination and compliance, while the cooperative society manages day-to-day operational aspects under technical supervision from the Ministry of Minerals and the Geological Survey of Tanzania (GST).

##### 2.1.1 The proposed project site

The mining site, situated at 2°51'2.15''S 32°3'45.13''E | Machinjioni – Mgusu in the Geita town of the Geita Region, is under the ownership of Mgusu Miners Cooperative Society, boasting a membership of

900 individuals. Adjacent to the Primary Mining Licenses (PMLs) of this site, there are numerous other mining sites, forming a cluster of mining activity in the region.

In the proposed site from the backward in several meters there is cemetery area also the proposed site is surrounded by mining pits and crushers. Again, the proposed site have corporative houses where corporative workers are resided in that area not only that but also there is office where administrative events or activities are held on, regardless of all there are also mining activities of small miners continue to take place.

### 2.1.2 Surroundings

The project site is situated within a community of miners, as indicated by the Ward Executive Officer, who confirmed that all members of Mgusu Ward are also members of Mgusu Miners. This aligns well with the project's objectives. From an environmental perspective, the site is not in immediate proximity to sensitive areas, such as rivers, lakes, springs, or forest reserves, within a 60-meter radius. However, it's worth noting that the Mabubi River is located 700 meters away from the mining site. Additionally, the project site is bordered by the Geita Gold Mine (GGM) and Mgusu Forest, overseen by the Tanzania Forest Services (TFS).

## 2.2 Project Components

### 2.2.1 Proposed Project Facilities

The proposed facilities for processing and washing gold ore will consist of the following basic infrastructures; -

Project Facilities	Processing capacity
Crushers	2-600 tons per hour (tph)
Sluicing box with size of 3M x 0.4M, Slope = 10 - 15 degree	1-2 tons of ore per hour
Washing bay/pond	1-2 tons of ore per hour
Collection water pond	1-2 tons of water per hour
Panning and amalgamation pool	1-2 tons of ore per hour
Amalgam burning chamber/room	1-2 kg of amalgam per hour.
Water storage tank with a capacity of 5,000 litres	5,000 liters.
Water pump	1-2 tons of water per hour
Area for storage of mercury-contaminated tailings and;	1-2 tons of tailings
Office buildings	20 peoples

### 2.3 Project Implementation Phases

The proposed project will be implemented as per the phases presented in Table 2-1.

Table 2-1: Project Activities to be implemented in phases

S/N	PROJECT PHASE	ACTIVITIES
1.	Design	<ul style="list-style-type: none"> <li>• Site selection</li> <li>• Flow sheet development &amp; generation</li> <li>• Site Layout</li> <li>• Gold ore washing facilities</li> </ul>
2.	Mobilization	<ul style="list-style-type: none"> <li>• Equipment purchase</li> <li>• Mobilization and shipment</li> </ul>

S/ N	PROJECT PHASE	ACTIVITIES
3.	Construction	<ul style="list-style-type: none"> <li>• Surface preparation</li> <li>• Site clearance</li> <li>• Earth work/ digging</li> <li>• Building</li> </ul>
4.	Operation	<ul style="list-style-type: none"> <li>• Loading and Haulage</li> <li>• Slurry transportation</li> <li>• Separation and recovery</li> <li>• Waste (solid and liquid) disposal</li> </ul>
5.	Decommissioning	<ul style="list-style-type: none"> <li>• Structure dismantling</li> <li>• Equipment removal</li> <li>• Rehabilitation of the surface</li> </ul>

## 2.4 Design Phase

The design stage will start with selection of the respective site for undertaking the proposed project; the site selection normally depends on several factors and parameters. The proposed site location was selected based on the locality of the mining sites which will provide raw materials for the proposed ore processing and washing facilities.

In this proposal, the mercury-free technology is adopted which will assist the artisanal miners to high rates of gold recovery without mercury, benefiting their health, the health of their communities, and the environment.

### 2.4.1 Flow sheet development and generation

The processing and washing facilities design involved flow sheet generation and development stage these stages are conducted simultaneously to accommodate process design parameters optimisation.

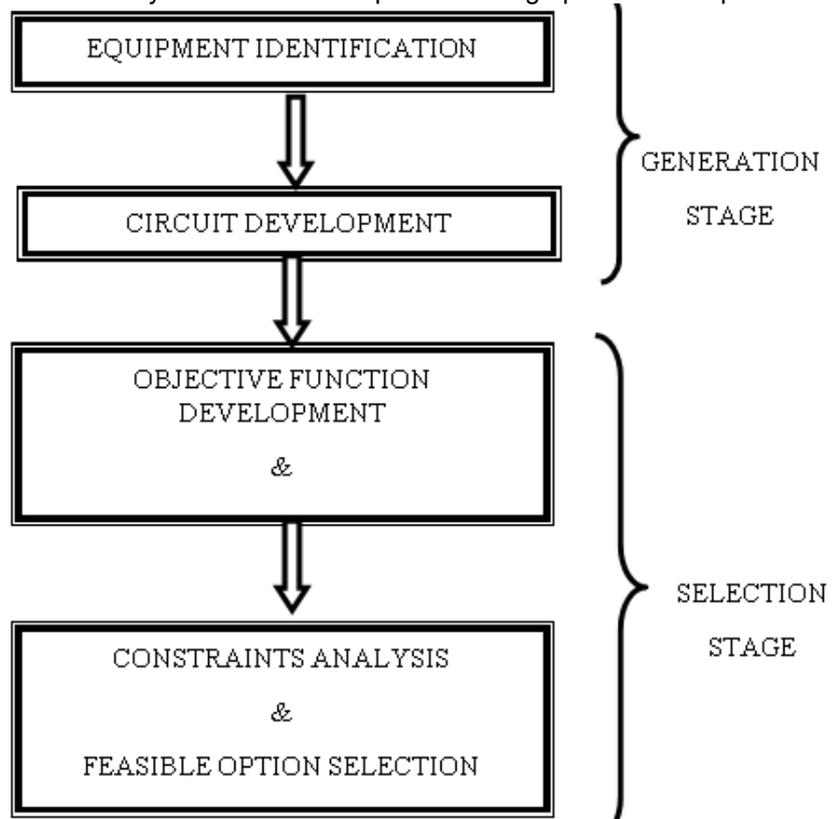


Figure 2-1: Flow sheet design stages

## 2.4.2 Gold Ore Processing and washing facilities design

The proposed processing facility has been strategically located in close proximity to the active mining pits and existing site runoff collection ponds. This location was selected to optimize ore transportation efficiency, reduce material handling distances, and enable effective management of process water and stormwater runoff.

The proposed development will comprise an integrated gold ore processing complex designed to support crushing, milling, gravity concentration, amalgamation, tailings management, and water management operations. The key facilities to be constructed are described in Figure 2-2 and in subsequent section as well as in appendix III

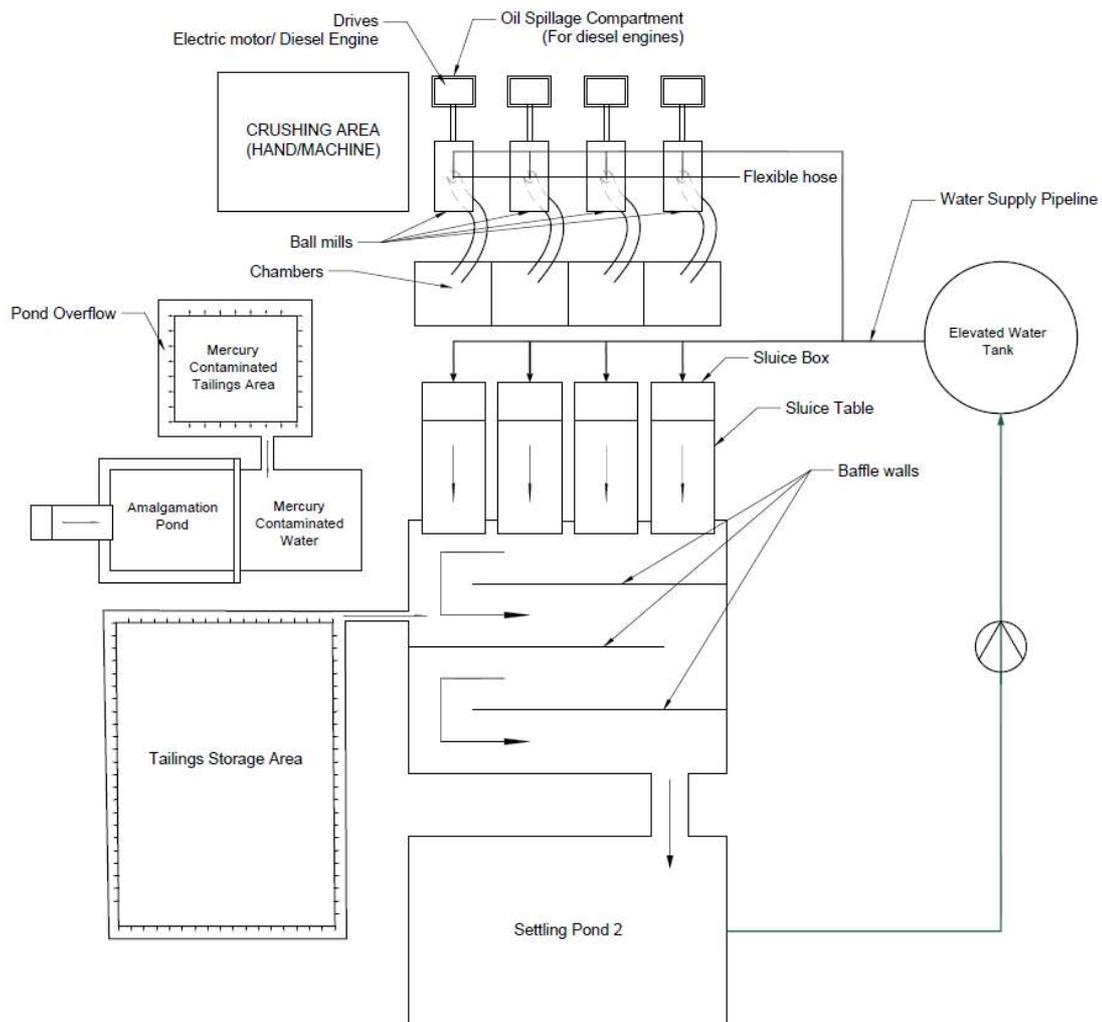


Figure 2-2: Facility layout plan

### 2.4.2.1 Crushing area

The crushing area is located upstream of the processing line and is designed for both manual and mechanical crushing of run-of-mine ore prior to milling. The facility occupies an approximate footprint of 4.0 m × 4.85 m and is constructed on a 125 mm thick reinforced concrete slab (Grade 15, 1:3:6 mix) with BRC mesh (A142), damp-proof membrane, and compacted subgrade.

Crushing equipment is powered by electric motors or diesel engines, with oil spillage containment compartments installed beneath diesel-powered units to prevent soil and water contamination.

#### **2.4.2.2 Milling area**

The milling chambers and ball mill area are positioned immediately downstream of the crushing area and occupy an approximate plan area of 4.85 m × 4.85 m. The milling area is constructed on reinforced concrete foundations designed to withstand dynamic loading and vibration from rotating ball mills. The layout incorporates two working levels, with the lower level at +0.00 m and an upper platform at +0.99 m, accessible via ramps and stairs, to facilitate safe operation and maintenance.

Following milling, the slurry is directed to the sluice table, which is designed for gravity separation of gold-bearing material. The sluice table measures approximately 1.50 m in length and 0.60 m in width, with an adjustable slope ranging between 10° and 15°.

The unit is fitted with concentrate recovery mats, controlled water jets, and a regulated discharge system to maximize gold recovery efficiency while minimizing water losses.

#### **2.4.2.3 Amalgamation pond**

The amalgamation pond is constructed adjacent to the sluice table to enable controlled mercury-based gold recovery. The pond has approximated internal dimensions of 4.38 m × 4.38 m and is constructed with 150 mm thick reinforced concrete walls and a 125 mm thick reinforced concrete base slab incorporating a damp-proof membrane.

The pond is fully lined to prevent seepage and includes a dedicated zone for the collection of mercury-contaminated water prior to transfer to the settling system.

#### **2.4.2.4 Amalgam press**

An amalgam press is installed next to the amalgamation pond to recover excess mercury from the gold amalgam. The press has an approximate height of 0.30 m and a base diameter of 0.20 m and consists of a threaded compression mechanism, mercury passage channels, and a sealed containment base to safely collect recovered mercury for reuse.

#### **2.4.2.5 Settling Ponds**

Process effluent and stormwater runoff from the processing area are conveyed to Settling Pond 1, which serves as the primary sedimentation unit. The pond has approximate plan dimensions of 12.39 m × 10.87 m and is constructed with 150 mm thick reinforced concrete walls and a 125 mm thick reinforced concrete floor slab reinforced with BRC mesh and lined with a damp-proof membrane. The pond is designed to accommodate high sediment loads and extreme rainfall events.

Water from Settling Pond 1 flows to Settling Pond 2 for secondary clarification. Settling Pond 2 measures approximately 3.50 m × 2.00 m and is similarly constructed with reinforced concrete walls and a lined base slab. This pond provides polishing of effluent prior to reuse in the processing circuit or controlled discharge in compliance with environmental standards.

#### **2.4.2.6 Tailings Storage Area (TSA)**

The tailings storage area is located downstream of the settling ponds and is designed for secure containment of process tailings using sub-aerial and dry deposition techniques. The facility includes containment embankments and designated zones for mercury-contaminated tailings, ensuring long-term stability and protection of soil and groundwater resources.

#### **2.4.2.7 Water Supply and Storage Infrastructure**

Supporting the processing operations is the water supply and storage infrastructure, which comprises flexible water supply pipelines, an elevated water tank, and controlled distribution points. This system provides water for crushing, milling, sluicing, amalgamation, and dust suppression while enabling effective collection and reuse of process water and stormwater runoff.

### 2.4.3 Building Designs

The design considerations for the buildings shall incorporate aspects of modern architecture and the current local government building policy guidelines including:

- **Ventilation:** The design caters for natural ventilation with features that encourage natural air circulation and mechanical ventilation with suitable dust collectors to minimize presence of particulate matter in the work environment and emission to the external environment.
- **Lighting:** The design caters for various types of luminaries including fluorescent lamps.
- **Sanitary Accommodation:** The number of toilets and wash hand basins will be constructed to meet demand of workers, expected visitors and customers.
- **Plumbing and drainage:** Sewage to be drained into septic tanks using UPVC piping and water supply and reticulation from the boreholes to be done using galvanized steel piping.
- **Sustainable resource use:** The design of the development incorporates landscaped lawns which will be planted with suitable species of trees, shrubs and grass to prevent ecological deterioration and improve aesthetic value of the site. Energy efficiency measures will also be incorporated by installing energy efficient luminaries for both indoor and security lighting.
- **Ergonomics:** The designing of the buildings shall ensure accessibility and good working environment for workers.
- **Fire Safety:** Adequate number of firefighting equipment shall be provided including hose reel system, sprinkler system, portable fire extinguishers and an associated fire alarm system.

## 2.5 Construction Phase

### 2.5.1 Construction Facilities

The proposal is to construct a modest site office and a sample materials store with timber walls and framing and a raised timber floor. The roof will be made using iron sheets whereas the ceiling board will be constructed using soft board on timber framing. Also pit latrines to cater for both men and women will be built for usage by visitors, workers and office staff during construction phase. A Water fountain will be provided for hygienic purposes.

Processing and washing facilities buildings will comprise several demountable and prefabricated steel-framed units, and the existing site exploration office will be relocated and refurbished for use as administration building and plant crib room.

#### 2.5.1.1 Construction Activities

The Construction activities will include fencing the proposed project with 3 meters high iron sheets which will help to control access to the site for purposes of security and safety.

The fence will also serve to reduce the amount of dust and other solid waste that have a potential of getting into and out of the site especially if the climate becomes windy.

Site clearance and excavations will be carried out using earth-moving equipment. The topsoil shall be stored onsite to be used for rehabilitation after the span of the project. The rest of the excavated material will be used for landscaping. Backfilling of the excavated area will be carried out using Moram and quarry chips which will be compacted in layers to achieve firm bases for the buildings, driveways and parking.

Mixing of Concrete using diesel driven concrete mixers will be carried at the site. The process will generate some noise, smoke and dust especially from the cement. The main contractor will provide workers with appropriate personal protective equipment and sensitize them on their usage and management of air pollution from construction machinery.

### 2.5.2 Construction of the Tailings/Slurry Storage Area

The proposed Tailings Storage Area (TSA) for the Mgusu Gold Ore Processing and Washing Plant is designed as a small, above-ground containment pond for the temporary storage and natural settling of

tailings and process slurry generated during gold ore washing. The TSA will not involve the construction of a dam or large embankment structure but rather a low-lying earth bund system engineered to safely contain the expected volume of tailings. The estimated storage capacity is below 10,000 cubic meters, with embankment heights less than 3 meters. The facility will be located within the project boundary, approximately 70 meters away from the processing area, and designed with a HDPE liner to prevent seepage and protect soil and groundwater quality.

The ESIA recommends that the TSA be constructed with the following key design features:

- Base Lining:
- Impermeable HDPE geomembrane ( $\geq 1.5$  mm thickness) to minimize infiltration of contaminated water.
- Embankment Design:
- Compacted lateritic soils reinforced with gravel to enhance structural integrity and prevent erosion.
- Drainage and Overflow Control:
- A controlled spillway system to channel excess stormwater to a sedimentation pond to prevent overtopping.
- Freeboard:
- A minimum freeboard of 0.5–1.0 meter to accommodate storm events.
- Monitoring and Maintenance:
- Regular inspections for cracks, seepage, or erosion, and maintenance logs kept by the operator under NEMC oversight.

The Gold Ore Processing and washing facilities will generate the Slurry which will need the proper management. Tailings from this process to be managed will still contain 30% of the gold, they are accumulated on site for future collection for subsequent processing, perhaps by a flotation and leaching technology.

With that regards, the construction of the storage is mandatory to hold and store the tailings/slurry from the processing and washing facilities. The engineering designs and details will be provided.

## **2.6 Operation Phase**

The operation activities will include the collection ore from several small scale miners while controlling the quality of material they produce on daily basis. The gravity method of Gold Ore processing will include sluicing, panning and direct smelting with this process no mercury will be employed in processing the Gold ore

### **2.6.1 Gold Ore Processing**

With the right equipment and a suitable ore, high gold recoveries will be possible with only gravity methods. The system of process to be employed and installed will recover around 70% of the total gold - a relatively high percentage for an ASGM operation. By gravity method, gold ore recovery will pass through several stages which will facilitate the recovery process of the production for Artisanal small miners.

#### **2.6.1.1 Ore extraction or collection from Artisanal Miners**

The first step in the ore processing chain is the extraction or collection of raw ore from artisanal miners. Artisanal mining is typically characterized by small-scale operations, often conducted by individuals or small groups using manual techniques. These miners usually work in remote areas where larger mining companies may not operate. The collection process involves establishing relationships with local miners, who may have valuable knowledge about the mineral deposits in their area. It's crucial to assess the quality and type of ore being collected to ensure it meets the specifications required for subsequent processing stages. Hence Gold bearing rocks are extracted from a properly timbered mine shaft.

### **2.6.1.2 Crushing**

Once the ore has been sourced, the next step is crushing, which involves breaking down the ore into smaller, more manageable pieces. This process is critical because it prepares the material for further processing by increasing its surface area and facilitating the liberation of valuable minerals from the waste material. Crushing typically employs various types of equipment, such as jaw crushers or cone crushers, which mechanically reduce the size of the ore. The crushed material needs to meet specific size requirements to ensure optimal performance in subsequent milling processes. The extracted rocks are crushed down to 1-2 cm size using a jaw crusher

### **2.6.1.3 Milling**

The ore is subjected to milling, where it is ground into a fine powder. This step is essential for liberating valuable minerals from the gangue (waste material) and preparing the ore for concentration. Milling typically utilizes equipment such as ball mills or rod mills, which combine mechanical force with water to facilitate grinding. The resulting slurry consists of finely ground ore mixed with water, creating an environment conducive to mineral separation. Mills are used to mill the rock- a large portion of the gold stays in the mill; rock powder flows with water from the mill onto a primary sluice, and then a secondary scavenger sluice which captures fine gold.

### **2.6.1.4 Washing and concentration of the ore**

After milling, the next phase involves washing and concentrating the ore so that to remove impurities and enhance the concentration of valuable minerals. Washing techniques vary but often include gravity separation methods or flotation processes that exploit differences in density or surface properties between minerals. This step is crucial because it not only improves the quality of the concentrate but also reduces the volume of material that needs to be processed in later stages.

Concentrate is washed from sluice carpets. Then, sluice and mill concentrates both go to panning process for secondary concentration from this stage, the gold concentrated is produced.

### **2.6.1.5 Smelting**

The final step in this processing chain is smelting, a high-temperature process that extracts metal from its concentrated ore. Smelting transforms concentrated minerals into pure metals through a series of chemical reactions that occur at elevated temperatures, typically within furnaces such as blast furnaces or electric arc furnaces. The choice of furnace depends on the type of metal being extracted and the specific characteristics of the concentrate.

During smelting, fluxes are often added to facilitate purification by binding with impurities and forming slag, which can be removed from the molten metal. Maintaining optimal temperature conditions is crucial for maximizing metal recovery while minimizing energy consumption.

After producing of the Gold concentrated, the gold concentrate is smelted (with borax) and poured into iron molds. The resulting unrefined gold ingots (gold ore) are ~94% pure. However the Purity of gold ore varies with ore core type. Figure 2-3 illustrates the simplified Gold ore processing without mercury application

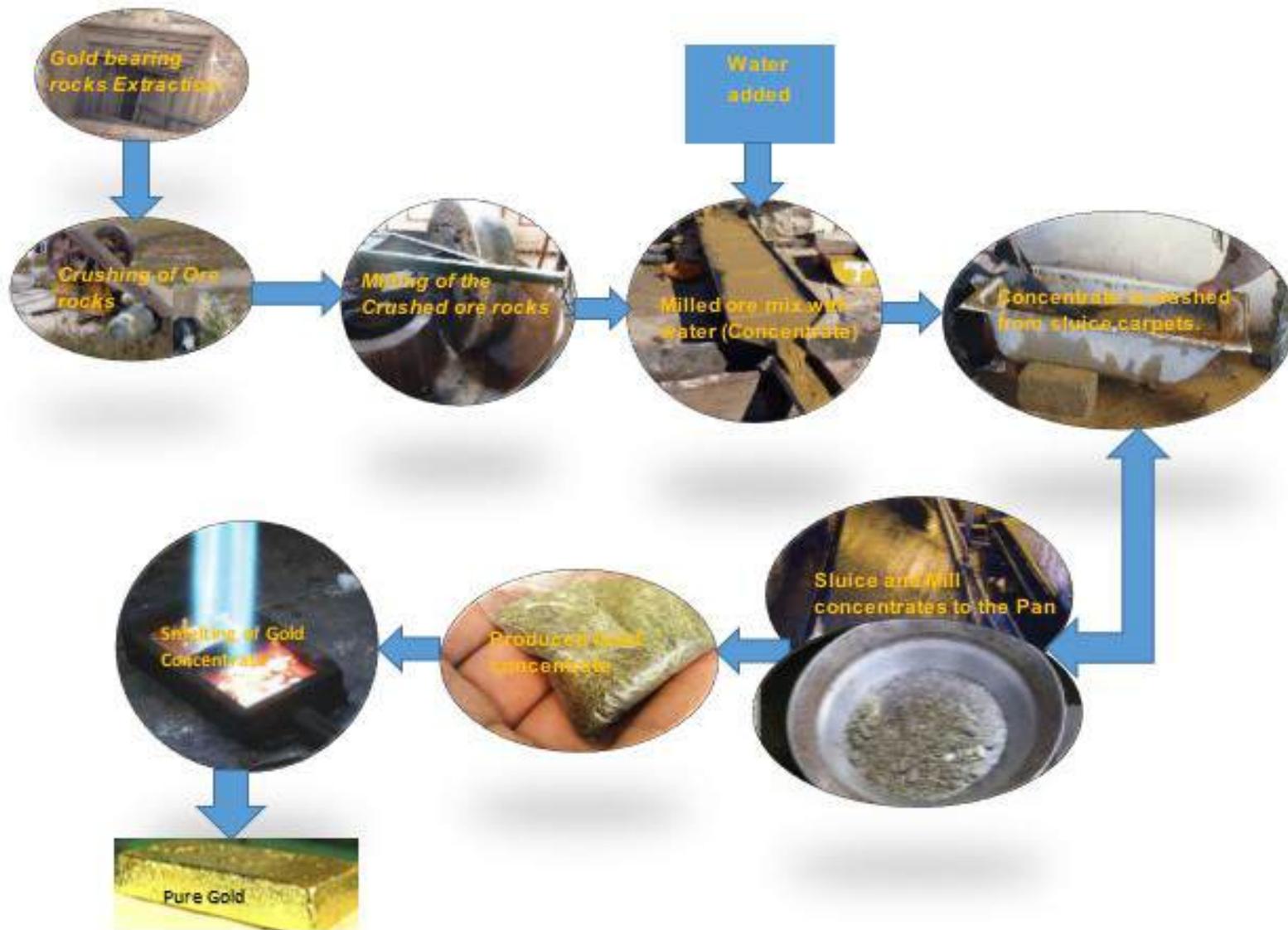


Figure 2-3: Mercury free Gold Ore processing flow sheet

## 2.6.2 Man Power

It is estimated that 30–50 workers will be engaged during the construction phase. These will include unskilled laborers, drivers, masons, carpenters, plumbers, electricians, mechanics, equipment operators, supervisors, engineers, and administrative staff.

Unskilled labor will be sourced locally from Machinjoni Mtaa and Mgusu Ward, where there is availability of youth seeking employment. Skilled labor may be hired from outside the project area. Potential risks associated with labor influx, including social conflict, spread of communicable diseases, and gender-based violence (GBV), have been identified. To mitigate these risks, measures such as Codes of Conduct, awareness training, and strict supervision have been incorporated into the ESMP.

During the operational phase, the project will engage approximately five (5) professional staff and more than fifteen (15) workers involved in day-to-day small-scale mining and processing activities at the site.

The project will develop and implement an Emergency Preparedness and Response Plan, including an Evacuation Plan, in accordance with applicable national legislation and relevant international standards. Adequate fire-fighting equipment will be provided and maintained on site. All staff and workers will receive regular training and participate in emergency response and fire drills to ensure readiness and effective response in the event of an incident.

## 2.6.3 Decommissioning Phase

It is envisaged that the Gold Ore Processing and washing facilities will be operational for at least the next 50 years, and it is likely that this period will be extended. Decommissioning of the facility will be undertaken in accordance with Environmental Management Act of 2004 and its regulations of 2005 amended in 2018 that will be prevalent at the time as well as WB ESF.

The environmental concerns of decommissioning include safe disassembling of structures, storage of derived materials and waste, and their safe removal from site. Where the site is not immediately put to another use, its rehabilitation will be necessary, awaiting redevelopment. Decommissioning strategies to be adopted include:

- Assess the prevailing planning and development policy in application in the area to determine the appropriate use of the land.
- Assessment of the condition of the building to determine appropriate use or disposal of materials.
- Preparation a demolition plan and application for approvals to the relevant agencies.
- Issuance of vacation notices to all the affected people.
- Screening and hoarding of the affected site.
- Disconnection and removal of utilities e.g. water pipes, electricity and computerized cables.
- Removal of all the underground facilities like water pipes, septic tanks, electricity and telephone cables.
- Mechanical demolition of the structures.
- Reuse or sell of the salvaged materials.
- Disposal of waste materials at designated Misungwi District Council disposal sites.
- Leveling and landscaping, including re-vegetation.

The completion of the decommissioning should ensure that the site is restored to its original state as much as possible; this will thus open an opportunity for another development cycle.

## 2.7 Project Ancillary Facilities

The ESF define ancillary facilities as facilities that are refers to all the supporting infrastructure that helps the mining project operate smoothly. The construction of Gold Ore Processing and Washing Facilities project has the following project components that include:

- Water connection
- Energy (electricity, LPG and Natural gas)
- Rehabilitation of access roads

### 2.7.1 Water supply system

The project will require water for different activities for the project. Water will be required for construction activities such as concrete works, earthworks, laying of some of the pavement layers, dust suppression, as well as domestic purposes at the camps. The amount of water required during the construction of the project is estimated to be 18000 litres per day. This use of water will be for both construction and dust suppression during construction.

Domestic use at the construction site will depend on the number of people and the project expects to recruit about 50 local people and 10 personnel. The estimated amount of water to be consumed for 60 people is estimated to be 3600 litres per day. Thus, the amount of water required during construction is 21,600 litres per day. The water will be tapped from local shallow boreholes constructed by local people in village areas and can be used for drinking and washing. Mine water from the pits available in the proposed site.

During the operation phase, water will be used for gold ores washing, domestic uses, cleaning and for sanitation which will depend on the number of small miners who will be involved in the washing process.

### 2.7.2 Power supply

The proposed project will source the electricity from the National grid (TANESCO) as the proposed area is nearby the Electric Pole where electricity will be connected from to supply to the school. Also a standby diesel fueled generator will be installed. This will be used in case of main electricity interruption. The generator to be installed has a capacity ranging from 10kVA to 60kVA.

Emission level of generation will be considered during installation to make sure the generator has a low emission. The type and size of the generator will be decided during the operation to be aware of which equipment will be installed and will need power to operate whenever there is a main electricity interruption.

## 2.8 Environmental and Social Management Framework

The ESF instruments that have been prepared for Environmental Health and Pollution Management Project (EHPMP) to incorporate measures for project site selection and to ensure designs and school construction align with the ESF requirements.

It has been agreed that civil works will follow building standards acceptable to the World Bank and required under the ESF; taking into account structural safety, universal access, changes in the standard drawings, water source availability and quality, efficient use of materials (wood) to reduce pressure on natural resources, Water and Sanitation for Health (WASH) and solid waste management at the schools, among other risks identified as part of the due diligence process.

The building standards acceptable to the World Bank typically include internationally recognized codes and standards such as:

- International Building Code (IBC): A comprehensive set of building regulations that covers various aspects of construction, including structural safety, fire protection, accessibility, and energy efficiency.
- International Fire Code (IFC): Provides requirements for fire prevention, fire protection systems, and emergency planning to ensure the safety of occupants in buildings.
- International Plumbing Code (IPC): Sets standards for plumbing systems, including water supply, drainage, and sanitation, to ensure safe and efficient water management.
- International Energy Conservation Code (IECC): Establishes energy efficiency requirements for buildings, promoting sustainable construction practices and reducing energy consumption.

- Universal Design Standards: Guidelines that promote accessibility and inclusivity in buildings, ensuring that people of all abilities can access and use the facilities comfortably.

### **2.8.1 Health and Safety**

As the ESMF directives, the campaign has been conducted with the utmost regard for occupational health and safety requirements of local authorities, management system, and of recognized industry standards. As a rule, all activities that present a risk to employees, contractors, and or neighboring communities are planned, and controls are implemented to limit exposure.

In addition, a Permit to Work system is in effect for risk-specific activities that are working at height. All EHS incidents, observations, near misses, etc. will be reported and investigated to prevent recurrence during construction phase and the proper way of reporting and registration during the operation phase will be employed as well. Regular emergency evacuation drills will be connected to test the training and response capacity of the workforce at the site during all phases of the project.

Occupational health and safety issues for further consideration in processing plant and washing facilities construction and operation phases includes Fire and collapse and Slippery

#### **Fire**

The project shall be designed, constructed, and operated according to standards for the prevention and control of fire hazards. In design phase of the project, the fire prevention and management (signage, fire extinguishers, evacuation paths, etc.) will be done according to national laws or GIMP.

The most effective way of preventing fires is to avoid any source of fires in inside the plant and store reasonable weight of equipment should designed according to the construction standards and considering building materials fire detector alarms should be placed in the processing facilities premises

#### **Collapse**

The result analysis showed that the major factors responsible for collapse are usage of substandard building materials, non-involvement of relevant and qualified professionals, defective design, and poor maintenance culture, poor Workmanship/Supervision and Natural Occurrences.

The remedies to mitigate the problems are but not limited to the professional bodies through their government regulatory bodies need to ensure effective monitoring to control quackery and ensure violators are punished, building and construction permit should be adhered, ensure the use of professional people during construction etc.

### **2.9 Project Cost**

Total Project Cost is 62,448,990/= i.e. Sixty-two million four hundred forty-eight thousand nine hundred ninety Tanzanian shillings.

### **2.10 Waste Management**

Gold processing and washing facilities consist of light machineries also produce solid waste. They include, power plant, processing facilities, and mineral extraction tools and chemicals stores. Among the wastes produced include, industrial process wastes, unwanted specification products, plastics, metal parts just to mention but a few.

The main waste produced on site is sewage and solid waste which are being dealt with in accordance with District Council by-laws. The section below describes the handling and estimated amount of each waste expected to be generated by the proposed project.

### **2.10.1 Wastewater management**

Waste water produced from toilets, laundry and kitchen is directed in the septic tank present at the proposed site while waste water from the laboratory and processing equipment will be directed to Tailings Storage Facility for recycling purposes

During construction phase of the project 240 kg/per day of solid waste expected to be generated while during operations 225kg/per day are expected to be generated. All waste generated will be handled within the site, no solid waste will receive the site.

### **2.10.2 Solid waste management**

The nature of solid waste to be generated includes worn-out gloves, papers, plastic bags, and domestic waste. The expected about to be generated is 240kg/per week and solid waste is collected to temporary storage area within the project and from there will be handled over to the contractor for disposal at the authorized dumpsite in weekly basis.

### **2.10.3 Hazardous waste management**

Hazardous waste, a waste with properties that make it dangerous or capable of having a harmful effect on human health or the environment. It is expected that no hazardous waste will be generated during construction phase as all equipment maintenance will be carried out outside the proposed project site in Geita. Examples of hazardous waste in mining sites are tailings which often containing toxic heavy metals like arsenic, lead, mercury, and cyanide, Acid mine water and process water which both of them may contain heavy metals as the result may percolate and pollute the environment.

All hazardous waste to be generated during operation phase will be handled according to Environmental Management (Hazardous waste handling and Control) Regulations of 2021 directives. Additionally, all liquid hazardous will be directed to the tailings storage facility for treatment and for scrap metals and oil waste will be collected to temporary transfer station within the site and then it will be handed over to registered hazardous collector within the Lake Zone

## CHAPTER THREE

### 3 POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

#### 3.1 Introduction

There are number of policies and legislations, which set out the legal and regulatory requirements and which are relevant to the proposed project. There are also pertinent national standards governing environmental management and protection, health, and safety.

This section discusses Tanzania national and sectoral policies and legislation, which are relevant to environmental and social issues pertaining to the planning and implementation of the project in Tanzania.

#### 3.2 Constitution of United Republic of Tanzania

The Constitution of the United Republic of Tanzania 1977 - 1995 (revised 1997) recognizes the basic rights and equality entitled, without any discrimination, protection, and equality of all persons before the law. The United Republic of Tanzania is committed to the conservation of the country's natural environment as is evident through the Constitution and various Mission Statements.

Article 21 of the Constitution reads:

- Take part in matters related to governance of the country, every citizen of the United Republic is entitled to take part in matters pertaining to the governance of the country, either directly or through representatives freely elected by the people, in conformity with the procedures laid down by, or in accordance with, the law.
- Every citizen has the right and the freedom to participate fully in the process leading to the decision on matters affecting him, his well-being, or the nation.”
- Article 24 of the Constitution reads:
- “Subject to the provisions of the relevant laws of the land, every person is entitled to own property, and has a right to the protection of his property held in accordance with law.”
- Article 27 of the Constitution reads:
- “Every person has the duty to protect the natural resources of the United Republic, the property of the state authority, all property collectively owned by the people, and also to respect another person's property.”
- “All persons shall be required by law to safeguard the property of the state authority and all property collectively owned by the people, to combat all forms of waste and squander, and to manage the national economy assiduously with the attitude of people who are masters of the destiny of their nation.”

#### 3.3 Strategies

The following are relevant sectoral and cross–sectoral policies, which provide directives on how projects should be operated in/on concerned natural resources and sensitive ecosystems. The project proponent will consult these strategies in the course of designing and implementing the proposed project activities.

##### 3.3.1 National Strategy for Growth and Reduction of Poverty (2005)

The National Strategy for Growth and Reduction of Poverty (NSGRP) is viewed as an instrument and channeling national efforts towards broadly agreed objectives and specific inputs and outputs. Achieving the target of accelerating growth requires significant efforts by different stakeholders to enhance productivity and increase investment in both human and physical capital.

Mining can play a significant role in a country's economic growth and poverty reduction by creating jobs, generating government's revenue, and attracting foreign investment. It is important for the government to ensure that the mining industry is well regulated, sustainable and beneficial to all members of the society, including those living in and around mining area. Therefore Mgusu miners cooperation society will employ people which in turn, they will be paid salary and eradicate poverty among themselves.

### **3.3.2 The Tanzania Development Vision (2025)**

The National Vision 2025 foresees the alleviation of widespread poverty through improved socio-economic opportunities, good governance, transparency and improved public sector performance. These objectives not only deal with economic issues, but also include social challenges such as education, health, the environment and increasing involvement of the people in working for their own development. The vision seeks to mobilize the people and resources of the nation towards achievement of shared goals and achieving sustainable semi-industrialized middle market economy by the year 2025. The government's plan is to have the mining sector contribute 10% of GDP by 2025. Thus Mgusu miner's cooperation society will enhance The Tanzania Development Vision by creating and improve education, health facilities and contributing some of the basics in the community hence will increase development in the society.

## **3.4 Policies**

### **3.4.1 The National Environmental Policy (URT, 1997) revised 2021**

The National Environmental Policy (NEP), 1997 appropriately sets broad goals committing Tanzania to sustainable development of its natural resources heritage. The policy promotes the use of EIA as a planning tool that integrates environmental issues into the planning process, the implementation of the "polluter pays" principle and the use of precautionary principle (i.e. it is better to be roughly right in time, than to be precisely right in too late).

It also stipulates the use of numerous approaches in environmental management in Tanzania including; use of economic instruments, development of environmental standards, indicators and their use, and that environmental legislation is an essential component of effective environmental management.

The policy contends, "One of the cornerstones of the EIA process will be the institution of public consultations and public hearings in the EIA procedures". In undertaking the EIA, project has observed one of the requirements of the national environmental policy and will continue to observe the requirements of the policy during the whole life cycle of the project.

The policy proposes the following measures as means for minimization of pollution likely to emanate from the mining sector:

- (i) Overall project cycle of mining (including reclamation and restoration of land after use) shall be adequately managed to minimize adverse environmental impacts;
- (ii) Mining discharge to grounds and water shall be controlled;
- (iii) Preventive and clean up measures for accidents shall be formulated and implemented;
- (iv) Air pollution from mining areas shall be controlled;
- (v) Strict regulations shall be put in place to control the use of any chemicals in project activities, use of retorts will be promoted; and
- (vi) Regular and periodic environmental audits shall be maintained to ensure the adoption of environmentally sound practices in rehabilitation activities execution.

In undertaking the EIA, Project has observed one of the requirements of the national environmental policy and will continue to observe the requirements of the policy during the whole life cycle of the project.

### **3.4.2 The Mineral Policy of Tanzania (URT, 1997)**

This policy underscores the need to balance the protection of flora and fauna and the natural environment with the need for social and economic development. It recognizes that severe environmental management and appalling living conditions that exist in mining camps is due to lack of coordination, insufficient operation funds and inadequate expertise. In order to address these problems, the policy has put forward strategies aimed at reducing/eliminating adverse environmental effect of mining, improving health and safety conditions in mining areas, and, addressing social issues affecting women, children and the local communities.

The specific strategies for protecting the environment that shall be adhered by the client are as follows:

- i. Drawing up comprehensive environmental management programs for the mining industry.
- ii. Establishing effective environmental regulations and putting in place procedures for monitoring compliance.
- iii. Setting up and strengthening the institutional capacity – especially the field offices Regional mines offices) – for monitoring and enforcing environmental regulations.
- iv. Requiring new projects to carry out baseline environmental studies and prepare environmental assessment and environmental action plans.
- v. Instigating environmental audits to evaluate performance of existing mines and identify areas for improvement.
- vi. Specify procedures for determining environmental liability
- vii. Providing rules for setting up reclamation funds to reinstate land to alternative uses after mining.
- viii. Setting appropriate guidelines for allowing the conduct of mining in restricted areas such as forests, national parks, sources of water and other designated areas unless proper mitigation are adhered.

The project proponent shall practice all strategies aiming to eliminate effects associated with mining activities and improving health safety conditions in mining area and addressing all issues concerning people and the associated community.

### **3.4.3 National Land Policy of 1995**

The National Land Policy emphasizes the importance of undertaking EIA for the management of land-based development. Additionally, the policy advocates the protection of land resources from degradation for sustainable development. The policy addresses several environmental issues; of relevance to this project is land use planning. Land use planning takes into consideration the land capability, ensures proper management of coastal/urban/rural land resources, promote resource sharing and multiple land use techniques in area of conflicting land use, and lastly advocates the involvement of community in resource management, land use and conflict resolution. Important sections of the policy relevant to this project on the use of land to provide social economic development and section 2.8 on protection of land resources, the project proponent shall observe this provision.

### **3.4.4 Construction Industry Policy, 2003**

This policy promotes among other things, application of cost effective and innovative technologies and practices to support socio-economic development including utilities and ensure application of practices, technologies and products, which are not harmful to both the environment and human health. This policy is undertaken to ensure that the project proponent uses technologies and products not harmful to both the environmental and human health by providing feasible alternatives and appropriate mitigation measures. The project proponent will make sure to use technologies and products which are not harmful in the environment and human health.

### **3.4.5 The National Water Policy (URT, 2002)**

The policy underscores the importance of holistic approach by saying that “all water abstractions and effluent discharges into water bodies shall be subjected to a water use permit or discharge permit to be issued only for a determined beneficial use and for a specified period of time. This project will seek to obtain a water right for the abstraction of water from one of the nearby sources in order to meet the

requirements of its minerals processing and domestic usage. Being one of the major consumers and whose activities may, if not properly managed, impact negatively on the water resources, the following policy elements will be observed by NEMC during the project life cycle:

- Development of large schemes and inter-basin water transfers shall be subjected to a permit and mandatory requirement for an environmental study for all water supply and sewerage projects.
- The “Polluter Pays Principle” shall apply in conjunction with other legal and administrative actions.
- All water abstractions and effluent discharge into water bodies shall be subject to water a permit or “discharge permit” to be issued for a specific season and duration (repetition see above preamble).
- Standards for in-stream flows, industrial effluents and other waste discharges to be developed and enforced.
- Water related activities should aim to enhance or to cause least detrimental effects on the natural environment.
- The allocation and consumption of water for environmental purposes to be given appropriate considerations.
- Water for environment shall be determined on the best scientific information available considering both the temporal and spatial water requirements to maintain the health and viability of riverine and estuary ecosystem.
- A sound information and knowledge base including both data on surface and groundwater (quantity and quality), socio and economic data shall be established;
- Status of surface and ground water resources, in terms of quantity quality and its use shall regularly be determined and info made easily accessible to stakeholders and decision makers.

The proponent will make sure not to direct wastewater to any water streams , and do monitoring of water and wastewater so as to check the quality of water used and discharged i.e. effluents and influents by using appropriate SOP’s and methods.

### **3.4.6 Cultural Policy, 1997**

Section of the 3.2.1 of the Cultural Policy stipulates, “All land development shall be preceded by Cultural Resource Impact studies. Furthermore, Section 3.1.5 states that “mechanisms shall be established to enable the nation to identify, own and preserve national treasurers e.g. art, objects, natural resources minerals as well as archaeological, paleontological and botanical remains.

Various personnel (Contractors) from various countries, which will be interacting with local people on one way or another, will execute the mining activities. Thus, the government through NEMC will observe this policy accordingly during this project execution to maintain the local traditional and customs intrusion.

### **3.4.7 National Women and Gender Policy, 2000**

The key objective of the Policy is to provide guidelines that will ensure that gender sensitive plans and strategies in all sectors and institutions are developed. While the Policy aims at establishing strategies to eradicate poverty, it emphasizes gender equality and equal opportunity for both men and women to participate in development undertakings and to value the role played by each member of society. Specifically, this Policy advocates for opportunities for both men and women in projects including construction works and related activities, and for women to be involved at all levels of the project from planning to implementation.

On employment strategies for women, Section 30 of the Policy requires presence of equal employment opportunities between men and women depending on required qualifications at all level. In addition, there should be records of exact number of women and men at levels in order to assist monitoring and follow-ups, less bureaucratic special system in the provision of business licenses especially to women working in the informal sector. The government through NEMC must adopt such an approach during all stages of the implementation of this project that is in line with the aims of this Policy. The project

proponent will employ laborers by considering equal chances for each gender to participate in the project site in project phases.

#### **3.4.8 National Health Policy, 2003**

The overall objective of the National Health Policy, 2007 is to improve the health and well-being of all Tanzanians. In line with environmental health, Policy seeks to protect community health by enhancing sustainable environmental health. The Policy emphasizes on community adherence to environmental health standards; Improvement of waste management systems including disposal of hospital wastes; educating health service providers on the importance of environmental health in their working areas; and putting in place laws and procedures for conservation and protection of the environment in the health sector.

The Policy is relevant to the project because the project is situated in mining sites that many livelihoods depend on, therefore the government through NEMC should adhere to environmental standards to safeguard public health. The project proponent will adhere all environmental health standards for the surrounding community and his all employees.

#### **3.4.9 National Policy on HIV/AIDS, 2001**

The overall goal of this policy is to provide for a framework of leadership and coordination of the national multi-sectoral response to the HIV/AIDS pandemic. This includes the formulation by all sectors of appropriate interventions, which will be effective in preventing transmission of HIV/AIDS and other sexually transmitted infections, protecting and supporting vulnerable groups, and mitigating the social and economic impacts of HIV/AIDS.

The project proponent will, in accordance with Policy provisions, carry out workplace awareness seminars and have counselling sessions for affected or infected employees to counter stigmatization.

#### **3.4.10 The National Employment Policy (1997)**

The major aim of this policy is to promote employment mainly of Tanzania Nationals. Relevant sections of this policy are (i) 10, which lays down strategies for promoting employment and section, 10.1 particularly focusing on industry and trade sectors, and (ii) 10.6 which deals with employment of special `groups i.e. women, youth, persons with disabilities. For project sustainability, the project government through NEMC will have to observe the above policy.

#### **3.4.11 National Forest Policy, 1998**

The overall goal of the National Forest Policy (1998) is to enhance the contribution of the forest sector to the sustainable development of Tanzania and the conservation and management of her natural resources for the benefit of present and future generations.

The policy emphasizes on biodiversity conservation; describes the importance of forest ecosystems for maintaining biodiversity and the threats to biodiversity. One of the main objectives envisaged in the policy focuses on ensured ecosystem stability through conservation of forest biodiversity, water catchments, and soil fertility.

The project proponent will conserve and manage all natural resources surrounding the project area.

#### **3.4.12 Occupational Health and Safety Policy 2008**

The main objectives of OHS Policy are to reduce the number of work-related accidents and diseases in Tanzania. This required the adoption and implementation of a culture to prevent OHS hazards by Government, Employers and Employees. The effective prevention of work - related accidents and ill-health will have enormous social and economic benefits. These include improvements in productivity and competitiveness and the quality of life of the working population.

The effective management of many safety hazards will contribute to improved levels of public health and safety. The effective control at source in workplaces of hazardous substances will improve levels of public health and minimize environmental pollution. The policy emphasizes on Sustainable safe and healthy working conditions and environment at all workplaces for the entire diversity of the workforce contributing to broad based economic growth.

The project proponent will establish and make visible to all employees and employer OHS policies so as to emphasize safe and healthy working environment to all people at the workplace.

#### **3.4.13 National Energy Policy, 2003**

The Policy, among others, focuses on utilization of various energy resources in a sustainable and environmentally friendly manner. The Policy recognizes that energy is a prerequisite for the proper functioning of all sub-sectors of the economy.

Energy can have a significant impact on the mining sector, as it is a crucial input for mining operations. If energy policy can result to a reliable and affordable supply of electricity, then it can improve competitiveness of the mining industry and attract investment.

The project proponent will consider alternatives sources of energy which are affordable and less harmful in the environment.

#### **3.4.14 National Transport Policy, 2003**

The main objective of this Policy is to enhance transport systems and promote environmental protection. The mission is to develop safe, reliable, effective, efficient and fully integrated transport infrastructure and operations that were to meet the needs of travel and transport by improving levels of services at lower costs.

Transportation can have a significant impact on the mining industry, as it affects the ability of transporting mining products to the market but also movement of mining equipment and materials. A well-developed transportation infrastructure, such as roads, rails, ports, can make it easier and more cost-effective to transport mining products to domestic and international markets, improving competitiveness of the mining industry and attracting investment.

The project proponent upon transportation of all chemical and other good will ensure and enhance safe transport system and promote environmental protection.

### **3.5 Legislation, Acts and Regulations**

#### **3.5.1 The Employment and Labour Relation Act No. 6 of 2004**

This Act guarantees fundamental labour rights and establishes basic employment standards. The Act provides broad protection against discrimination. Specifically, the Act mandates that employers "promote equal opportunity in employment and strive to eliminate discrimination in any employment policy or practice". It prohibits direct or indirect discrimination by employers, trade unions and employers' associations on a number of grounds, including gender, pregnancy, marital status or family responsibility, disability, HIV/AIDS and age. Harassment of an employee on any of these grounds is equally prohibited. The Act also requires employers to take "positive steps" to guarantee women and men the right to a safe and healthy environment.

Reflected in project that developer management of key social issues, the intention is to observe both the Tanzania and international labour laws and to work with local authorities (District/village) to allocate jobs fairly, giving preference to local people, women and youth, etc.

### **3.5.2 The Environmental Management Act, 2004**

The Environmental Management Act (United Republic of Tanzania, 2004) (EMA) guides environmental management and is administrated by the National Environmental Advisory Committee, the Directorate of Environment and the NEMC.

The EMA provides a legal and institutional framework for among other things for sustainable management of environment; to outline principles for management, impact and risk assessments, prevention and control of pollution, waste management, environmental quality standards, public participation, compliance and enforcement; to provide basis for implementation of international instruments on environment and to provide for implementation of the National Environment Policy. Section 81 in Part six of the EMA requires the project Developer to undertake an EIA prior to the commencement or financing of a project or undertaking.

The project proponent prior to the EMA requirement EIA will be conducted and all important procedure will be adhered so as to have safe environment for the workers and the environment.

### **3.5.3 Mining Act Cap.123, 2010**

This is the principle legislation that governs the mining industry in the country. The act sets out legal framework for the exploration, development, and exploitation of mineral resources in Tanzania. It establishes the regulatory regime for the mining industry, including the granting of mining licenses, collection of royalties and taxes, and the compliance with environmental and social standards.

The act can have a significant impact on the mining industry by affecting the ease of doing business, level of investment, and returns on investment. The act creates a favorable environment for the mining industry by providing clear and stable regulations, protecting property rights, and ensuring an equitable sharing of benefits between the government, mining companies, and local communities.

Regarding the mining act the project proponent can comply by having mining license, and registered under TRA for collection of royalties and taxed in which all this documents the proponent already have.

### **3.5.4 The National Land Act, 1999**

The major function of this land act is to promote the fundamentals of the “National Land Policy” through giving clear classification and tenure of land, land administration procedures, rights and incidents of land occupation, granted rights of occupancy, conversion of interests in land, dispositions affecting land, land leases, mortgaging of land, easements and analogous rights, co-occupation and partitioning and, settlement of land disputes. One of the pertinent issues when dealing with land is the right of occupancy. According to the Land Act, 1999, the right of occupancy is given in two categories that separate citizens and non-citizens rights to occupy land.

- (i) For a citizen or in a group of two or more formed in an association, partnership or corporate body will enjoy the right of being granted the right of occupancy or derivative of a granted right of occupancy.
- (ii) (ii) For a non-citizen, or in a group whether formed into a corporate body under the Companies Ordinance or otherwise, (including corporate bodies whose majority shareholders or owners are non-citizens) may only obtain a right of occupancy or derivative right for purposes of investment prescribed under the Tanzania investment act 1997.

### **3.5.5 The Occupational Health and Safety Act, 2003 (Act No. 5/2003)**

The Occupation Health and Safety Act, (No.5), 2003, is an act for health and safety different from the regulations provided under the Mining Act, 1998. The Act is administered through the Ministry of Labour. Under the Act, the Minister responsible for Labour shall appoint the Chief Inspector (CI) to perform the functions stipulated in the act.

The CI may in turn also designate any person as an inspector to perform all functions assigned to an inspector. Any person owning a mine or workplace is required, to register such factory or workplace

under this act prior to its operation. A thorough pre-placement and periodic occupational medical examination is mandatory under the act.

In addition, an exit medical examination carried out by a qualified occupational health physician is required for each employee leaving the mine. Other provisions for safety and health while attending to machinery and other works are provided. Thus Mgusu miner's cooperation society will operate within the requirements of this legislation in addition to those of Mining Act.

### **3.5.6 Public Health Act 2008**

An Act to provide for the promotion, prevention and maintenance of public health with a view to ensuring the provisions of comprehensive, functional and sustainable public health services to the general public and to provide for other related matters. This Act has provisions for

- Solid and Liquid Waste Management
- Gaseous Waste Management
- Excreta Waste Management

These provisions have direct implication to the proposed project. The government through NEMC has the responsibility of ensuring that it complies with the requirements of the Act in all phases of the project i.e., construction, operation and decommissioning. Hence through this act Mgusu miner's cooperation society will promote and maintain this act throughout the project phases.

### **3.5.7 Fire and Rescue Act 2007**

The Fire and Rescue Act, 2007 under section 24-(1) requires every person who owns or manage a high raise building, large school, factory, department store or any building or place where a large number of people enter, work or live, or deals with chemical or petrochemical activities, shall designate a fire protection manager from amongst persons qualified to perform such functions who shall;

- Prepare a fire and rescue action plan;
- Conduct fire drills on extinguishing fire;
- Report fire and escape according to the plan;
- Inspect and maintain fire protection equipment, water sources or firefighting equipment;
- Supervise the use and handling of fire and firefighting facilities;
- Control the number of persons to be admitted; and
- Perform any other functions necessary for the fire and other hazard protection management.

Fire and Rescue Force (Safety Inspection and Certificates) Regulations, 2008 under section 3-(i) (j) stipulates that mines shall be inspected for issuance of Fire Safety certificates.

The regulations also require the owners of the premises to observe safety and train staff, section 6-(1) stipulates that the owner shall ensure that "any person employed to work in premises, vehicle, vessel and any other conveyance facility receive instruction or training on fire precaution management through a program approved by the Commissioner –General."

Before a Fire Safety Certificate is granted, the Fire Authority may require the owner or operator to provide information relating to the premises, vehicle, and vessel or conveyance facility as stipulated in section 8- (1). The plan should comprise of drawings showing the essential features, although a Fire Authority may accept architects plan if they are available and suitable for the purpose

The Mgusu miner's cooperation society shall adhere to provision of the Act and its regulations. SRC shall appoint a fire protection manager who shall be part of the emergency response.

### **3.5.8 The Water Resource Management Act, 2009 (Act No. 12/2009)**

The Water Resource Management Act 2009 is a new principal legislation dealing with the protection of water resources and control of water extraction for different uses. According to section 39 (1) of this act, owner or occupier of land on which any activity or process is or was performed or undertaken, or

any other situation exists which causes has caused or is likely to cause pollution of a water source, shall take all reasonable measures to prevent any such pollution from occurring, continuing or recurring. It is stated under section 39 (2) that a Basin Water Board may direct any person who fails to take the measures required under subsection (1) to:-

- a) Commence taking measures before a given date;
- b) Diligently continue with those measures; and
- c) Complete the measures before a given date

Section 40 (1) states that where a person fail to comply or comply inadequately with a directive given under Section 39 (2), the Basin Water Board may take measures as it considers necessary to remedy the situation.

- a) Section 40 (2) provide that a Basin Water Board may recover all reasonable and justifiable costs incurred as a result of the Board taking action under subsection (1) jointly and severally from the following persons:- any person who is or was responsible for, or who directly or indirectly contributed to, the pollution or the potential pollution;
- b) The owner and or occupier of the land at the time when the pollution or potential for pollution occurred; and
- c) Any person who negligently failed to prevent the activity or process being performed or undertaken or the pollution or potential for pollution occurring.

Section (2) provide more that the responsible person, any other person involved in the incident or any person with knowledge of the incident must, as soon as is practicable after obtaining knowledge of the incident, report the incident to the Basin Water Board or any public officer and the a responsible person shall:-

- a) take all reasonable measures to contain and minimize the effects of the incident;
- b) undertake clean-up procedures; and
- c) Take such measures as the Basin Water Board may verbally or in writing direct, and any verbal directions shall be confirmed in writing within fourteen days to have effect under this subsection.

The project needs to understand the procedures for acquiring and managing water rights, discharges to open environment and maintenance of water quality that are provided by this act.

### **3.6 Regulations**

#### **3.6.1 Mining (Mineral Rights) (Amendment) Regulations, 2020**

The holder of Mining License and any other person who exercise powers or perform functions or carries duties in relation therewith shall be under statutory obligation to comply with the Environmental Management Plan approved by the National Environment Management Council (NEMC) as well as environmental principles and safeguards prescribed under the Environmental Management Act, Cap. 191 and other relevant laws. Thus Mgusu miner's cooperation society shall carry all duties in a way that he will comply with the Environment Management Plan which will be approved by NEMC.

#### **3.6.2 Mining (Local Content) Regulations, 2018**

Section 12(1) requires a contractor, sub-contractor, licensee to give consideration to services provided within the country and goods manufactured in the country where the goods meet specifications of the mining industry as established by the standards authority or by other internationally acceptable standards. Apart from those contractors, sub-contractors, licensee should ensure that qualified Tanzanians are afforded first opportunity for employment and prioritization of on-job training for Tanzanians.

#### **3.6.3 Mining (Environmental Protection for Small Scale Mining) Regulations, 2010**

Section 3(1), a holder of primary mining license is required to conduct baseline environmental investigation and social study with regard to human settlement, burial sites, cultural heritage sites, water, vegetation, animal and soil and submitting a report regarding the outcome of the investigation

and Environmental Protection Plan to mitigate environmental effects to be caused by mining operations before commencing with mining operations.

Mgusu miner's cooperation society engaged with TANSHEQ for collection of baseline data as required in mining regulation.

#### **3.6.4 Environmental Impact Assessment and Audit Regulations, 2005 amended in 2018**

The EIA process is described under the Environmental Impact Assessment and Audit Regulations No. 349 of 2005 ('the EIA Regulations') promulgated in terms of the EMA Sections 82(1) and 230(2) (h) and (q). The objectives of the NEMC are to undertake the enforcement, compliance, review and monitoring of EIA in terms of the EMA, including the facilitation of the public participation process in environmental decision-making.

These regulations require mining operations to assess and report on the potential environmental impacts of their operations. This includes impacts on air and water quality, wildlife and habitat, and cultural resources. Overall, these regulations aim to ensure that mining operations are conducted in a sustainable and responsible manner and that the environment is protected. Thus Mgusu miner's cooperation society engaged with TANSHEQ for so as to undergo EIA process so that to ensure all regulation requirements are met.

#### **3.6.5 Environmental Management (Air quality Standards) Regulations, 2007**

The objectives of the Air Quality Standards Regulations are to set baseline parameters on air and emissions; enforce minimum air quality standards prescribed by the National Environmental Standards Committee; help developers such as industrialists to keep abreast with environmentally friendly technologies; and ensure protection of human health and the environment from various sources.

These regulations ensure that the mining industry operates in a way that is protective of human health and the environment, and also operating in legal and societal expectations of the country. Thus Mgusu miner's cooperation society shall make sure all requirements are met.

#### **3.6.6 Environmental Management (Water Quality Standards) Regulations, 2007**

The objectives of the Water Quality Standards Regulations are to protect human health and conserve the environment; enforce minimum water quality standards prescribed by the National Environmental Standards Committee; enable the National Environmental Standards Committee to determine water usage for purposes of establishing environmental quality standards and values for each usage; and ensure all discharges of pollutants take account of the ability of the receiving waters to accommodate contaminants without detriment to the uses specified for the waters concerned.

During construction and operation phases, water quality will be continuously monitored especially those from the gold ore washing facilities. Water samples will be collected and tested periodically in order to detect any possible contamination to ensure compliance with regulations and implement remedial measures. Hence Mgusu miner's cooperation society will monitor continuously water quality during all phases.

#### **3.6.7 Environmental Management (Soil Quality Standards) Regulations, 2007**

The objectives of the Soil Quality Standards Regulations are to set baseline parameters on soil limits for soil contaminations; enforce minimum soil quality standards prescribed by the National Environmental Standards Committee; prescribe measures designed to maintain, restore and enhance the sustainable productivity of the soil; prescribe minimum soil quality standards to maintain, restore and enhance the inherent productivity of the soil in the long term; enforce minimum soil standards prescribed by the National Environmental Standards Committee for such purposes as agricultural practices.

In compliance with this Regulation, the Mgusu miner's cooperation society shall conduct soil quality analysis for monitoring purpose especially during operation phase.

### **3.6.8 Environmental Management (Control of Ozone Depleting Substances) Regulations, 2007**

The objectives of the Regulations for Control of Ozone Depleting Substances are to eliminate the production and consumption of ozone depleting substances in accordance with the phase out schedule of the Montreal Protocol; to regulate the production, import, export, trade, disposal and use of ozone depleting substances and its products; to control and monitor the amount of ozone depleting substances entering or leaving the United Republic of Tanzania; to provide a system of data collection that will facilitate compliance with relevant reporting requirements under the protocol; to promote measures, strategies, programs, incentives, equipment and technologies in favor of the use of ozone friendly substances, products and equipment in line with national obligation specified by the Montreal Protocol; and to facilitate the link between the National Ozone Unit and the Ozone Secretariat of the Protocol.

NEMC will strive to observe this Regulation by collaborating with relevant government authorities such as Tanzania Bureau of Standards, Vice President's Office-Division of Environment and Tanzania Atomic Energy Commission (TAEC) in regulating importation of the equipment containing ozone-depleting substances.

### **3.6.9 Environmental Management (Solid Waste Management) Regulations, 2009**

These regulations are intended to protect human health and the environment by ensuring that solid waste is properly managed and disposed in a way that does not pose risk to public health and the environment.

Mining industry is affected by this regulation in a way that they require permits for the management and disposal of solid waste and complying with standards set by permits.

Thus Mgusu miner's cooperation society will make sure to have the required permits for management and disposal of solid waste from appropriate authority.

### **3.6.10 Environmental Management (Hazardous Waste Management) Regulation, 2009**

The focus of this regulation is to ensure proper management of hazardous waste from the generation to the disposal area to ensure that there is sustainable environment.

The Mgusu miner's cooperation society should ensure proper management of hazardous waste produced at the mine from generation area to the collection point.

## **3.7 World Bank Environmental and Social Framework**

The proposed Gold Ore Processing and Washing Facilities project at Mgusu is supported under the Environmental Health and Pollution Management Project (EHPMP) and is therefore required to comply with the World Bank Environmental and Social Framework (ESF). The ESF is a set of standards that guide the identification, assessment, and management of environmental and social risks associated with projects financed or co-financed by the World Bank. Its objective is to ensure that projects are environmentally sustainable, socially responsible, and economically beneficial, while preventing or mitigating adverse impacts.

The ESF recognizes that certain activities during project design, construction, operation, and decommissioning may have potential environmental and social risks and impacts. These include risks to worker health and safety, community health, natural resources, biodiversity, land use, and cultural heritage. Table 3-1 illustrates the application of the Environmental and Social Standards to the project.

Table 3-1: World Bank Environmental and Social Standards (ESS) Applicable to Project and Associated Instruments

S/N	Instrument for Project Implementation	Environmental and Social Standards (ESS)	Purpose/Objectives	Reason for its Application in the Project
1.	Environmental and Social Management Framework (ESMF)	<b>ESS1:</b> Assessment and Management of Environmental and Social Risks and Impacts	<p>Identification of adverse impacts and respective mitigation measures</p> <p>Enable screen and follow-up of remedies achieved through application of prevention, mitigation and compensation measures</p> <p>Enable allocation of responsibilities and resources to implement required mitigation measures</p>	The application of ESS1, focusing on environmental and social risk assessment and management, is crucial for the "Construction of Gold Ores Processing and Washing Facilities" project in Mwanza, Geita, and Mara regions under the EHPMP. It's vital to identify and mitigate potential environmental and health risks associated with gold mining and processing, ensuring responsible and sustainable practices while safeguarding local communities and the environment.
2		<b>ESS2:</b> Labor and Working Conditions	<p>Ensure the healthy and safe working environment during projects implementation.</p> <p>Ensure the provision of fair working conditions.</p>	The application of ESS2, which focuses on Labor and Working Conditions, is vital for the "Construction of Gold Ores Processing and Washing Facilities" project in Mwanza, Geita, and Mara regions under the Environmental Health and Pollution Management Project (EHPMP). This project involves labor-intensive activities, and ensuring proper working

S/N	Instrument for Project Implementation	Environmental and Social Standards (ESS)	Purpose/Objectives	Reason for its Application in the Project
				<p>conditions, fair wages, occupational safety, and health standards is paramount. Adhering to ESS2 helps promote a safe, ethical, and inclusive work environment, fostering employee well-being, productivity, and compliance with international labor standards. Ultimately, it contributes to the overall success and sustainability of the project while upholding social responsibility and ethical practices within the mining industry.</p>
3		ESS3: Resource Efficiency and Pollution Prevention and Management	<p>To promote the sustainable use of resources including energy, water and raw materials.</p> <p>To avoid or minimize generation of hazardous and non-hazardous wastes.</p>	<p>The application of ESS3, focusing on Resource Efficiency and Pollution Prevention and Management, is essential for the "Construction of Gold Ores Processing and Washing Facilities" project in Mwanza, Geita, and Mara regions under the Environmental Health and Pollution Management Project (EHPMP). Gold processing is resource-intensive and can generate significant pollution if not managed properly. Adhering to ESS3 ensures efficient resource utilization,</p>

S/N	Instrument for Project Implementation	Environmental and Social Standards (ESS)	Purpose/Objectives	Reason for its Application in the Project
				minimization of waste, and effective pollution control measures. It aligns with sustainable practices by reducing the project's environmental footprint, optimizing resource consumption, and managing pollution, ultimately fostering environmentally responsible gold ore processing within the specified regions.
4		ESS4: Community Health and Safety	To manage potential risks to the community during construction and operation of school infrastructures.	The application of ESS4, focusing on Community Health and Safety, is fundamental for the "Construction of Gold Ores Processing and Washing Facilities" project in Mwanza, Geita, and Mara regions under the Environmental Health and Pollution Management Project (EHPMP). Gold processing operations inherently impact local communities. Prioritizing community health and safety through ESS4 ensures measures are in place to mitigate potential risks and hazards associated with the project. This includes not only the health and safety of workers but also the neighboring communities, considering the potential

S/N	Instrument for Project Implementation	Environmental and Social Standards (ESS)	Purpose/Objectives	Reason for its Application in the Project
				environmental and health impacts of mining activities. Implementing ESS4 fosters a safer and healthier environment for both project stakeholders and the communities residing in the vicinity, promoting responsible and sustainable gold ore processing within the outlined regions.
10	Stakeholder Engagement Plan	ESS10: Stakeholder Engagement and Information Disclosure	To develop a systematic approach to stakeholder engagement to develop good relationships and gather their views on issues that could affect them. To provide stakeholders with a mechanisms through which to raise grievances.	The application of ESS10, focusing on Stakeholder Engagement and Information Disclosure, is fundamental for the "Construction of Gold Ores Processing and Washing Facilities" project in Mwanza, Geita, and Mara regions under the Environmental Health and Pollution Management Project (EHPMP). Involving stakeholders and ensuring

S/N	Instrument for Project Implementation	Environmental and Social Standards (ESS)	Purpose/Objectives	Reason for its Application in the Project
				<p>transparency in the project's activities is essential to build trust, maintain credibility, and foster a sense of ownership within the communities and organizations involved. ESS10 emphasizes open communication, active engagement with stakeholders, and timely dissemination of accurate project-related information. By doing so, the project aims to integrate diverse perspectives, address concerns, and actively involve stakeholders in decision-making processes. Ultimately, this approach enhances accountability, promotes social inclusivity, and enables the project to align with the community's needs and expectations, thereby contributing to a sustainable and successful implementation of the gold ore processing and washing facilities.</p>

### **3.8 International Agreements, Conventions and Treaties**

International agreements convention and treaties, which are relevant to this project, are:

#### **3.8.1 Africa Convention on the Conservation and Natural Resource (1968)**

The contracting States shall undertake to adopt the measures necessary to ensure conservation, utilization and development of soil, water, flora and faunal resources in accordance with scientific principles and with due regard to the best interests of the people. The government through NEMC must cooperate with other related contracting parties for the conservation and sustainable use of natural resources.

#### **3.8.2 Convention on Biological Diversity (1992)**

To promote conservation of biological diversity; sustainable use of its components; and fair and equitable sharing of benefits arising out of the utilization of genetic resources. This Convention is relevant to the proposed project because the government through NEMC will be responsible for ensuring that the biological diversity of the mine environment is not compromised by its operations.

### **3.9 Other relevant International Conventions Ratified by Tanzania include:**

#### **3.9.1 Working Environment (Air Pollution, Noise and Vibration) Convention (No. 148)**

Concerning the protection of workers against occupational hazards in the working environment due to air pollution, noise and vibration, came into force in 1979. Tanzania acceded in 1984 to the provisions regulating air pollution and these provisions apply to the project.

#### **3.9.2 The Convention on Preservation of Fauna and Flora in their Natural state, London, (Ratified - 1993)**

To preserve the natural fauna and flora of certain parts of the world, particularly of Africa, by means of national parks and reserves, and by regulation of hunting and collection of species.

### **3.10 IFC Environmental, Health and Safety Guidelines**

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP).

The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them.

The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project based on the results of an environmental assessment in which site-specific variables, such as host country context, assimilative capacity of the environment, and other project factors, are considered.

The applicability of specific technical recommendations should be based on the professional opinion of qualified and experienced persons. Guidelines used for this project include:

- Environmental Health and Safety Guidelines, 2007
- Environmental Health and Safety Guidelines for Mining 2007

### 3.11 Institutional Framework

The Tanzania EIA Procedure confers different roles and responsibilities to all parties involved in the EIA process of any proposed development undertaking to which EIA is obligatory. Important institutions to the proposed project are as summarized in Table 3-2.

Table 3-2: Relevant Key Institutions for proposed mining activities

Level	Institution	Role and Responsibility
National	Vice President's Office (Division of Environment)	<ul style="list-style-type: none"> <li>• Co-ordinate Environmental Management Policy, Environment Management Act and EIA guidelines</li> <li>• Approves, signs and issues Environmental Certificate</li> <li>• Advise Government on all environmental matters</li> <li>• Enforces and ensures compliance with the national environmental quality standards</li> <li>• Provides policy direction and leadership in all matters, particularly those pertaining to hazardous waste management under the Environmental Management Act</li> </ul>
	National Environment Management Council (NEMC)	<ul style="list-style-type: none"> <li>• Project registration, approval of ToR, and review of EIA and EA</li> <li>• Environmental Monitoring and Compliance Auditing</li> <li>• Advises Government on all environmental matters</li> </ul>
Ministry	Ministry of Industry, Trade and Investment	<ul style="list-style-type: none"> <li>• Issuing policy guidance</li> <li>• Providing legal frameworks</li> <li>• Enforcement of laws and regulations</li> <li>• Setting operation standards for energy generation projects</li> <li>• Project monitoring.</li> </ul>
	Ministry of Lands, Housing and Human Settlements Development	<ul style="list-style-type: none"> <li>• Land use planning</li> <li>• Issuing of Right of Occupancy;</li> </ul>
Institution	Occupational Safety and Health Authority (OSHA)	<ul style="list-style-type: none"> <li>• General understanding and views about the project</li> <li>• Requirements of the project in terms of safety at the workplace</li> <li>• Land use in the area of vicinity in terms of safety</li> </ul>
	Mining Commission	<ul style="list-style-type: none"> <li>• Issuing licenses for mining companies</li> <li>• Regulation of mining activities</li> </ul>
	Geological Survey of Tanzania	<ul style="list-style-type: none"> <li>• Overseeing exploration and environmental issues at the mining site</li> </ul>
Region and District	Geita Region	<ul style="list-style-type: none"> <li>• Oversee and advice on implementation of national policies at city level</li> <li>• Oversee enforcement of laws and regulations</li> <li>• Advice on implementation of development projects and activities at city level</li> </ul>
	Geita Town Council office	<ul style="list-style-type: none"> <li>• Oversee and advice on implementation of national policies at District level</li> <li>• Oversee enforcement of laws and regulations</li> <li>• Advice on implementation of development projects and activities at District level</li> </ul>
	Town Director(Geita Town Council)	<ul style="list-style-type: none"> <li>• Supervise and coordinates all development activities in the district level</li> </ul>
	Town level – Environment/ Planning/ Community	<ul style="list-style-type: none"> <li>• Baseline data on social and economic conditions</li> <li>• Extension services</li> </ul>

Level	Institution	Role and Responsibility
	Development Departments etc.	<ul style="list-style-type: none"> <li>Plan and coordinate activities on community-based natural resource and environment management</li> <li>Enforcement of laws and regulations</li> <li>Responsible for waste management within Municipal</li> </ul>
Ward	Mgusu Ward	<ul style="list-style-type: none"> <li>Oversee general development plans for the Ward.</li> <li>Provide information on local situation and extension services</li> <li>Technical support &amp; advice</li> <li>Project Monitoring</li> </ul>
	Chairman, Communities groups (Members of Mtaa Council)	<ul style="list-style-type: none"> <li>Information on local social, economic, environmental situation</li> <li>View on socio-economic and cultural value of the sites</li> <li>Rendering assistance and advice on the implementation of the project</li> <li>Project Monitoring (watchdog for the environment, ensure well-being of residents and participate in project activities)</li> </ul>

## CHAPTER FOUR

### 4 BASELINE DATA

#### 4.1 INTRODUCTION

A baseline study simply defines the 'pre-implementation exposure' condition for the set of indicators that will be used to assess impacts of the development plan in the project area. When compared with the condition of the same indicators at some point during implementation and post-operation implementation, the baseline study forms the basis for a 'before and after' assessment or a 'change over time' assessment. Without baseline data to establish pre-operation conditions for outcome and impact indicators it is difficult to establish whether change at the outcome level has in fact occurred.

Therefore, environmental and social baseline indicators existing along the area that will likely see the development taking place shall be examined.

#### 4.2 Project Core Area

Geita Town Council lies between 1,100 to 1,300 meters above the sea level. It lies between 2° 8' to 3° 28' South of the Equator and 32° 45' to 37° East of Greenwich. The Council shares its borders with Geita rural District Council to the West and South; Sengerema District Council and Nyang'wale District Council to the East. The Council covers 1080.3km<sup>2</sup>.

The Council is divided into two divisions namely Kasamwa and Geita town. There are 13 Wards 65 Mitaa and 13 villages with 47 Hamlets. Politically Geita Town Council has one constituency (Geita Town) represented by elected Member of Parliament. The 13 elected Councilors each represent their respective wards. In addition, there are four appointed women Councilors for special seats. This implies that the full council has 17 members. Villages and Mitaa are headed by Village chairperson and Mtaa Chairperson respectively.

#### 4.3 General Conditions

##### 4.3.1 Current Land Uses and Activities at the proposed Project Site

The project site is situated within a community of miners, as indicated by the Ward Executive Officer, who confirmed that all members of Mgusu Ward are also members of Mgusu Miners thus activities going on adjacent to the project site are mining activities. This aligns well with the project's objectives.





Figure 4-1: Current land uses and activities at the project site (Consultant field work, October 2023)

#### 4.4 Socio-economic baseline

##### 4.4.1 Background

A development envelope (Area of Interest - AOI) is situated at Machinjioni Mtaa, Mgusu Ward, Geita Town Council, and Geita Region. A detail of the study area for the Social Impact Assessment (SIA) is in Table 4-1.

Table 4-1: Study Areas for the SIA

Study Area	Definition	Areas included for this project
Site-specific study area	Area likely to experience impacts associated with project infrastructure and activities	The project footprint, excluding the access roads, etc.
Local study area	Areas likely to experience impacts related to population influx, etc.	The neighboring settlements in Mgusu ward and Machinjioni Mtaa.
Regional study area	Area likely to experience economic impacts of the project	Geita Town Council (since most of the development envelope falls within this district). This is set against the backdrop of Geita Region and Tanzania as a whole

##### 4.4.2 Demographic Condition

Based on National census of 2022 Geita Town Council has a total population of 361,671 with 177,271 male and 184,400 female. The population growth rate according to 2022 census data is 5.2%. The average household size is estimated at 4.6 which are below the regional average of 5.3 and below the National average of 4.3. Demographic profile can help estimate the potential labor force available for the mining project and associated industries and also helps assess the potential social impacts of the mining project. The table 4-2 shows the population size, growth and density in Geita town council.

Table 4-2: Population Size, Growth Rate and Density

Council/Ward	Population			Sex Ratio	Number of Households	Average Household Size
	Both Sexes	Male	Female			

Geita Town Council		361,671	177,271	184,400	96	78,531	4.6
1	Nyankumbu	87,367	41,685	45,682	91	19,839	4.4
2	Bombambili	4,571	2,209	2,362	94	1,041	4.4
3	Mtakuja	26,676	13,212	13,464	98	6,328	4.2
4	Mgusu	31,092	17,918	13,174	136	6,428	4.8
5	Kalangalala	57,881	27,356	30,525	90	15,405	3.8
6	Buhalahala	62,693	29,853	32,840	91	14,781	4.2
7	Nyanguku	12,077	6,076	6,001	101	1,797	6.7
8	Ihanamilo	12,751	6,325	6,426	98	2,021	6.3
9	Kasamwa	18,751	9,022	9,729	93	3,511	5.3
10	Bulela	11,439	5,767	5,672	102	1,599	7.2
11	Shiloleli	7,603	3,770	3,833	98	1,030	7.4
12	Kanyala	17,815	8,608	9,207	93	3,140	5.7
13	Bung'wangoko	10,955	5,470	5,485	100	1,611	6.8

#### 4.4.3 Ethnicity

Geita Town Council has seven tribes namely Sukuma, Longo, Haya, Sumbwa, Luo, Zinza and Kuria. The major and distinctive tribe is Sukuma by 60% and Zinza by 30% which is found in all over the wards followed by Longo tribe.

It is essential to comprehend this linguistic variation in order to implement community engagement and communication techniques related to the planned project. Positive relationships and inclusivity among the region's many ethnic groups can be fostered by taking into account both Swahili and tribal languages.

#### 4.4.4 Economic Activities

##### 4.4.4.1 Agriculture

Agricultural activities constitute the primary livelihood for residents in Geita Town Council, which is characterized by undulating terrain with hills and mountains. The soil diversity, encompassing black cotton soil, loam, sand, sandy loam, and clay loam, supports the cultivation of various crops such as cassava, bananas, sweet potatoes, beans, paddy, maize, cotton, and millet.

The council experiences moderate temperatures ranging from 22°C to 30°C, with an average annual rainfall of 900mm–1200mm. Rainfall is evenly distributed, with short rains from September to December, a dry spell from January to February, and long, heavy rains from March to the end of May. The dry season occurs from June to September.

About 63,828 peasants engage in small-scale agriculture, predominantly utilizing traditional methods like hand hoes, animal power, and tractors. While 68% employ hand hoes, 30% use animal power, and 2% use tractors. Limited access to farm machinery and fertilizers is common in subsistence farming. Despite challenges in marketing and transportation, the council is self-sufficient in food production, with surplus sold to neighboring regions and countries. Some residents use food crops as cash crops to augment their incomes.

#### **4.4.4.2 Livestock**

Livestock rearing serves as the second economic activity for the residents of Geita Town Council, with a predominantly traditional focus, particularly on indigenous cattle. Other livestock include goats, sheep, pigs, donkeys, and chickens.

Chickens dominate with a population of 703,592, followed by 25,760 cattle, 19,281 goats, 7,889 sheep, and 2,239 pigs. Donkeys and broiler chickens had the least population, with 535 and 261, respectively, constituting 0.1 and 0.2 percent of the total livestock in the council, respectively. Hence by considering the number of livestock provided its important to monitor the quality of environment so as to protect the life of the livestock and also the health of human being because the last consumption of livestock is human hence the protection of environment will help to protect the human health.

#### **4.4.4.3 Mining**

The mining sector in Geita Region involves both large-scale mining (LSM) and artisanal and small-scale mining (ASM) operations. The former is highly mechanized, with active participation of multinational enterprise, i.e. Geita Gold Mine Ltd (GGML), whilst the latter is undertaken by individuals or groups with limited capital, equipment, and crude technology, often operating informally and without mineral rights. Artisanal and small-scale mining in Geita often involve local miners using basic methods to extract near surface deposits in an informal, low investment and labor-intensive operation, alongside the use of informal marketing channels. Katoro area, which is located on the highway links Mwanza to the neighboring countries of Uganda, Rwanda, Burundi and DRC, becoming a major gold trading centre, attracting small-scale miners from Nyarugusu, Rwangasa, and beyond. In these artisanal and small-scale mining sites there are many on-site brokers who buy small collections of gold and sell to big brokers in Geita and Mwanza markets. The existence of the different mines at Geita will help to the exchange of knowledge on the methods and markets competition skills to the proposed site.

#### **4.4.4.4 Forestry**

The Geita region has witnessed a significant decline in its forest cover, primarily due to extensive deforestation practices such as clearing land for agriculture, logging for timber, and harvesting trees for charcoal, poles, and firewood without adequate reforestation efforts. The loss of forest and tree cover is further exacerbated by recurrent wildfires in woodlands. Forest is very important because Forests absorb carbon dioxide from the atmosphere; helping to mitigate climate change thus forest acts as carbon credit because during mining activities carbon dioxide produced can be mitigated by the number of forest present in the proposed site.

In response to these environmental challenges, Geita Town Council has taken initiatives to promote tree planting by encouraging various institutions. This proactive approach aims to facilitate environmental protection and mitigate deforestation, recognizing the escalating demands on forests driven by a growing population and increased encroachment for various uses.

### **4.4.5 Physical Environment**

#### **4.4.5.1 Climate**

The Town Council has a moderate Temperature ranging between 17°C to 30°C. The area within the council gets an average of 1200mm of rainfall per annum which occurs in two seasons namely “Vuli” which starts in October to January and “Masika” which starts in March and mid-May. The council experiences a dry season Between June and September. Climate change can alter precipitation patterns, affecting water quality around the proposed site also factors like wind, precipitation, temperature and amount of rainfall are important factors to be considered because affect the design of the mining site the operation of the proposed site.

#### 4.4.5.1.1 Rainfall

The provided data represents monthly rainfall totals (in millimeters) for Geita Town over the years 2018 to 2022. In the context of a construction and operation phase for a project, especially one related to mining or infrastructure development, understanding the rainfall patterns is crucial for effective planning and management.

During the construction phase, the project is anticipated to face potential challenges during high rainfall months such as March, April, and December. Elevated rainfall levels can adversely impact construction activities by causing soil erosion, site flooding, and hindrances in excavation and foundation work. To mitigate these challenges, additional measures for erosion control and effective water management become imperative.

On the other hand, the dry season from June to September presents an opportune period for construction activities. This drier season offers favorable conditions for more efficient excavation, laying foundations, and conducting groundwork without the complications associated with excessive rainfall. Strategically aligning construction activities with the weather patterns ensures that the project can navigate both challenges and opportunities during the construction phase.

During the operational phase, strategic integration of the processing flow with historical rainfall data becomes essential to align critical phases with favorable weather conditions. This approach not only minimizes environmental risks but also optimizes operational efficiency. Regular monitoring and adjustments to the schedule, guided by real-time weather forecasts, contribute to enhanced environmental stewardship.

Coordinating the transfer of pregnant liquor to the adsorption tower with rainfall patterns is crucial for optimal flow management, mitigating potential runoff and soil erosion risks associated with rainwater. Timely scheduling of the discharging and replenishing of the tank with new tailing powders, taking into account historical rainfall data, is recommended to avoid complications related to the handling and transport of tailings, especially during months with higher rainfall.

Similarly, the leaching process, involving the loading of tailing powders into borate tanks, should be carefully conducted, with attention to rainfall patterns. Initiating leaching during periods of lower rainfall can contribute to effective liquid management within the tanks, minimizing the potential for overflow and associated environmental impacts.

This comprehensive approach ensures a harmonious integration of operational activities with weather conditions for sustainable and responsible project management.

Table 4-3: Geita Monthly Rainfall Total (mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2018	136.8	66.0	174.5	253.5	50.1	0.0	0.5	17.1	15.0	83.8	115.3	256.2
2019	106.2	98.1	106.9	154.2	64.0	14.5	0.3	13.0	66.9	193.8	258.4	220.6
2020	210.4	121.0	183.5	174.9	39.3	2.4	0.0	16.4	42.4	152.1	132.9	186.2
2021	138.6	110.3	169.9	203.7	78.3	0.2	0.0	10.4	112.0	118.1	117.3	231.4
2022	197.0	179.0	133.4	127.7	81.1	0.3	0.0	26.1	54.1	72.4	135.4	203.8

#### 4.4.5.1.2 Wind speed

In both the construction and operational phases of the project in Geita, the consistently low and generally favorable wind speeds ranging from 1 to 5 knots suggest minimal impact on activities. However, it is crucial to implement standard safety measures for wind-related construction activities, ensuring a secure working environment. During the operational phase, the project anticipates stable conditions, but occasional variations in wind speeds may occur. Therefore, a proactive approach

involving periodic monitoring and adjustments in operational procedures is recommended, particularly during months with slightly higher wind speeds. This comprehensive strategy ensures that the project maintains safety standards and operational efficiency throughout its lifecycle.

Table 4-4: Geita Monthly Wind Speed (Knots)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2018	2	2	1	2	4	4	5	3	3	2	1	1
2019	1	2	1	2	3	2	3	3	2	2	1	1
2020	1	1	2	2	4	4	5	3	3	2	1	1
2021	1	1	2	2	3	4	5	3	2	2	1	1
2022	1	1	2	2	3	4	5	3	2	2	1	1

#### 4.4.5.2 Geology, Topography and Soils

The project area lies within the Lake Victoria Goldfields, which form part of the Archean greenstone belt dominated by metasedimentary and metavolcanic rocks intruded by granitic bodies. The underlying formations are typically composed of banded ironstones, quartz veins, and dolerite intrusions, which are the primary hosts for gold mineralization in the Geita District.

The topographical and soil characteristics of Geita Region, marked by undulating land, hills, and mountains with a diverse soil composition including black cotton soils, loam, sand, sandy loam, and clay loam, play a significant role in influencing the proposed project. The undulating terrain may impact the construction and layout of infrastructure, requiring careful planning to navigate elevation changes effectively. Additionally, the varied soil types have implications for foundation design, excavation, and earthworks during the construction phase. Understanding and adapting to the specific soil conditions are crucial for ensuring the stability and longevity of structures.

Moreover, the topography and soil composition may influence environmental considerations, such as erosion control measures, during both the construction and operational phases of the project. Therefore, the project's design and implementation must take into account the unique geological and soil characteristics of Geita Region for successful and sustainable outcomes.

#### 4.4.5.3 Air quality within the project site

##### 4.4.5.3.1 Ambient air quality data

The consulting team also conducted the actual monitoring of air quality at the project site using an Aeroqual Outdoor Air Quality Test Kit. This is a complete outdoor air monitoring kit for the measurement of criteria air pollutants and VOCs.

Features Aeroqual's proven Series 500 portable monitor with interchangeable sensor heads, measuring particulate matter (PM<sub>2.5</sub>, PM<sub>10</sub>), four gas pollutant gas sensors (NO<sub>2</sub>, O<sub>3</sub>, CO, VOCs), and a combined temperature and relative humidity sensor.

Table 4-5: ambient Air Quality data measured from different station in the vicinity of the project site

Location	Coordinates S/E	CO ppm	NO <sub>2</sub> ppm	O <sub>3</sub> ppm	VOC ppm	SO <sub>2</sub> ppm	PM <sub>2.5</sub> ppm	PM <sub>10</sub> ppm
Monitoring Point 1	2° 51' 4" S 32° 3' 45" E	3.4	0.09	0	0.00	0	0.007	0.021

Location	Coordinates S/E		CO ppm	NO <sub>2</sub> ppm	O <sub>3</sub> ppm	VOC ppm	SO <sub>2</sub> ppm	PM <sub>2.5</sub> ppm	PM <sub>10</sub> ppm
Monitoring Point 2	2° 51' 3" S	32° 3' 44" E	1.7	0.015	0	0.08	0	0.002	0.019
<b>Tanzania Standard [TZS 845:2007]</b>			<b>20</b>	<b>0.1</b>	<b>0.0</b>	<b>10</b>	<b>0.05</b>	<b>0.05-0.08</b>	<b>0.05-0.116</b>
<b>World Bank EHSs for air quality</b>			<b>10</b>	<b>0.2</b>	<b>0.1 (8hr)</b>	<b>NM</b>	<b>0.125</b>	<b>0.075</b>	<b>0.15</b>

The results indicate that CO levels ranged from 1.7 to 3.4 ppm, well below the Tanzanian standard of 20 ppm and the World Bank EHS limit of 10 ppm. NO<sub>2</sub> concentrations were between 0.015 and 0.09 ppm, also within the Tanzanian limit of 0.1 ppm and the World Bank EHS guideline of 0.2 ppm. Ozone and SO<sub>2</sub> were not detected, while VOCs were negligible, indicating minimal potential for photochemical smog formation. Particulate matter concentrations were extremely low, with PM<sub>2.5</sub> ranging from 0.002 to 0.007 ppm and PM<sub>10</sub> from 0.019 to 0.021 ppm, significantly below both the national standards (0.05–0.116 ppm) and World Bank EHS limits (0.075–0.15 ppm).

Analysis: These results demonstrate that baseline air quality at the Mgusu site is good, with all pollutants well below national and World Bank recommended limits. This indicates minimal existing air pollution and low risk to community and worker health. The data provide a reference point for ongoing monitoring during project construction and operation, ensuring that any potential increases in air emissions from mining activities, such as dust or exhaust from machinery, remain within acceptable levels. Adherence to mitigation measures, including dust suppression and controlled equipment use, will maintain compliance with both Tanzanian standards and World Bank EHSs, safeguarding environmental and public health.

#### 4.4.5.4 Noise and Vibration levels

According to the IFC General EHS Guidelines, a sensitive receptor is defined as any point on the premises or location occupied by persons where extraneous noise and/or vibration is received. Typical examples of such sensitive receptor locations include permanent or seasonal residences, hotels or motels, schools and daycares, hospitals and nursing homes, places of worships, parks and campgrounds.

For this study, the identification and selection of sensitive receptors for noise and vibration within the project area was conducted based national standard TZS 934 (Part I): 2017 (3rd Ed) ISO 1996-1: 2016 and the Environmental Management (Standards for Control of Noise and Vibration Pollutions) Regulations, 2014).

Criteria considered for identification and selection of sensitive receptors within the project area include:

- a) **Affected Community:** residential, institutional, and commercial areas with significant number of affected people in the proximity of the project area have been considered to be sensitive receptors for this study;
- b) **Avoidance of intervening row(s) between noise and sensitive receptor and reflective surfaces:** Receptors should not be shielded or blocked by structures such as buildings and the measuring point should be located several meters from reflecting surfaces to provide an unbiased indication of the incident sound pressure level;
- c) **Preference:** where two or more receptors are aligned in a straight line and on the same side of the project area, the most exposed receptor to the project activities was chosen.
- d) Topography of the project influence area
- e) Major components of the proposed project
- f) Wind Direction

During monitoring activities two (2) sampling locations were selected within the project area for noise and Vibration monitoring. Monitoring location details are provided in table below;

Monitoring Points	Latitude	Longitude
Point 1	2° 51' 4" S	32° 3' 45" E
Point 2	2° 51' 3" S	32° 3' 44" E

A noise meter Lutron SL4033SD was used for measurement of baseline noise level for all sensitive receptors within the project area. The device is a class I noise meter and is complying with international standards for sound level meter specifications IEC 61672:1999, IEC 61260:1995 and IEC61672 Class 1 and provides an automatic or manual recording of actual noise level.

Measurement of baseline noise conditions was conducted as per national standard TZS 934 (Part I): 2017 (3rd Ed) ISO 1996-1: 2016. The measurement was conducted at the receiving point. Baseline noise levels were collected According to Tanzania standard (TZS 932:2017) and the Environmental Management (Standards for Control of Noise and Vibration Pollutions) Regulations, 2014.

For, noise measurement the meter was held approximately 1.5 m above the ground surface and at least 0.5 m away from hard reflecting surfaces such as walls. The equipment used and data collected are shown in Figure 4-2 and Table 4-6.

During the baseline assessment, ambient noise levels were measured at several points around the proposed project area, including within the Mgusu Miners Cooperative site and in nearby residential clusters. Recorded noise levels generally ranged between **48 dB(A) and 62 dB(A)**, influenced primarily by artisanal mining, crushing operations, and local vehicular movement.

The baseline table (Table 4-5) is aligned with international best practice, the project adopts the World Bank Group (WBG) Environmental, Health and Safety (EHS) Guidelines (2007) for community noise. Under these guidelines, acceptable ambient noise limits are:

Receptor Type	Daytime (07:00–22:00)	Nighttime (22:00–07:00)	Reference
Residential, institutional, educational	55 dB(A)	45 dB(A)	WBG EHS Guidelines (2007)
Industrial, commercial	70 dB(A)	70 dB(A)	WBG EHS Guidelines (2007)

For the **noise monitoring** for this project will use **55 dB(A)** (daytime) and **45 dB(A)** (nighttime) as **benchmark limits for communities and residential areas**, while the **70 dB(A)** threshold will apply **only within the industrial/processing zone**.



Figure 4-2: Noise level meter used to collected data on the project site (Consultant field work, October 2023)

Table 4-6: Noise Level data

Monitoring Point	Noise Levels [ dB (A)] Reading Value					
	Value 1	Value 2	Value 3	Value 4	Value 5	Average
Point 1	50.6	47.5	48.3	45.4	46.5	47.7
Point 2	52.3	45.7	48.8	51.6	48.1	49.3
<b>Local: TZS: [1471: 2011]</b>						<b>60</b>
<b>International: BS ISO [4866:2010]</b>						<b>70</b>
<b>Residential, institutional, educational</b>				<b>WBG EHS Guidelines (2007)</b>		<b>45 - 55</b>
<b>Industrial, commercial</b>						<b>70</b>

In summary, the current noise level data indicates satisfactory compliance with both local and international standards. However, it is essential to remain vigilant, implement mitigation measures as needed, and maintain open communication with the community to address any noise-related concerns that may arise during the project's operation.

### Effects of Noise

Noise is known to have auditory and non-auditory health impacts. Environmental noise causes both psychological and physiological non-auditory health effects and the evidence for the non-auditory effects is growing (WHO). Noise pollution may increase one's risk of hearing loss, stress, sleep disturbances, heart disease, and more.

A 5-decibel noise reduction would reduce the prevalence of high blood pressure by 1.4 percent and coronary heart disease by 1.8 percent (International Standard Organization). Examples of Long-term Effects Related to Noise Exposure are provided in Table 4-7.

Table 4-7: Long-term Effects Related to Noise Exposure

Effect	Exposure type	Measure	dB	Location of assessment
Hearing Impairment	Environmental	Laeq (24 hr avg)	70	Indoors
	Occupational		75	
Hypertension	Environmental	Ldn (24 hr avg)	70	Outdoors

Effect	Exposure type	Measure	dB	Location of assessment
	Occupational	Laeq (24 hr avg)	<85	Indoors
Ishchemic Disease	Heart Environmental	Laeq (24 hr avg)	70	Outdoors
Annoyance	Environmental	Ldn (24 hr avg)	42	Outdoors
	Occupational	Laeq (24 hr avg)	Industry <85 Office <55	Indoors
Performance	School	Laeq (avg during school day)	70	Outdoors
	Occupational		70	
Disturbance of Sleep pattern	Sleep	Laeq (overnight avg)	<60	Outdoors
Awakening	Sleep	SEL	55	Indoors
Sleep Quality	Sleep	Laeq (overnight avg)	40	Outdoors
Mood Next Day (sleep disturbance)	Sleep	Laeq (overnight avg)	<60	Outdoors

The potential risk of adverse health effects associated with exposure to noise is dependent on the duration of exposure (acute or chronic), intensity (decibel level), and sound frequency. Noise-induced hearing loss can result from a one-time exposure to sounds  $\geq 120$  decibels (dB) or exposure to sounds  $\geq 85$  dB over an extended period without hearing protection.

Vibration measurement was done by standard method for vibration levels determination using vibration meter known as LUTRON BVB-8207SD - 4-channel vibration meter datalogger. It is certified by the ISO-9001, CE, IEC1010 with measurement range of 0.1 to 199.9mm/s (0.02 to 7.87inch/s) and the frequency range is 10Hz to 1 kHz, sensitivity relative meet ISO 2954.

The accuracy of the vibration meter is  $\pm (5\% + 5d)$  reading @ 160 Hz, 80 Hz,  $23 \pm 5$  °C. The meter is calibrated using electrical calibration with calibration point of 50mm/s (160Hz).

On taking measurement the meter is set to millimeter per second (VEL mm/s) scale which enables to respond in velocity in the same manner as peak particle velocity (PPV).



Figure 4-3: Vibration level meter used to collected data on the project site (Consultant field work, October 2023)

Table 4-8: Vibration Level data

Monitoring Location	Vibration (mm/s)					Source of Vibration
	CH1	CH2	CH3	CH4	Avg.	
Point 1	2.9	2.3	2.6	2.3	<b>2.52</b>	Normal
Point 2	4.2	3.3	3.1	3.6	<b>3.55</b>	
<b>Local: TZS: [1471: 2011]</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5.00</b>	
<b>International: BS ISO [4866:2010]</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5.00</b>	

In summary, the data indicate a potential concern since they are observed to be slightly above the limits of both the local and international standards (5.00 mm/s). This has been so due various mining activities that were going on adjacent to the project site such as operation of crushers and movement of vehicles.

Regular monitoring and adherence to standards are essential to ensure the safety and structural integrity of the project site and surrounding communities.

#### 4.4.5.5 Water Quality at the proposed site

Water quality monitoring is essential for assessing the suitability of water for domestic, occupational, and project-related use, as well as for understanding potential environmental impacts. The Mgusu area in Geita relies on borehole groundwater and treated water supplied by GEUWASA. Baseline measurements focused on key physical parameters, including pH, turbidity, electrical conductivity, temperature, total dissolved solids (TDS), and salinity, in accordance with Tanzanian Bureau of Standards (TBS) and World Bank Environmental, Health, and Safety Guidelines (WB ESHSGS).

All measurements were obtained in situ using portable instruments such as the Hach HQ40d Multimeter, Turbidimeter (Hach 2100Q) and DR300, ensuring accurate field-level assessment

Table 4-9: Water quality analysis results for physical parameters

Parameter	Borehole Water (Drilled)	Cooking Water (GEUWASA)	TBS Standard (TZS 789)	WB ESHSGS
pH	8.9	8.7	6.5 – 9.2	6.5 – 9.5
Turbidity (NTU)	5.7	3.0	≤5	≤5
Electrical Conductivity (µS/cm)	620	90	1500	≤1500
Temperature (°C)	27	25	NM	15–30
Total Dissolved Solids (TDS) (mg/L)	400	60	NM	≤1000
Salinity (ppt)	0.25	0.03	NM	≤0.5
Oxidation-Reduction Potential (ORP, mV)	+150 – +250	+200 – +300	NM	200–400

Source: Consultant field work, October 2023

pH measures the hydrogen ion concentration in water and affects chemical speciation, solubility of metals, and aquatic life survival. Both sources are slightly alkaline. A pH above 8 can slightly increase solubility of certain metals (e.g., arsenic, lead), but values are within safe consumption limits. Alkalinity also influences the taste and palatability of water. Slight fluctuations in pH may occur seasonally, but no immediate treatment is required.

Turbidity measures suspended particles (silt, clay, organic matter). Borehole water slightly exceeds the recommended limit (5.7 NTU > 5 NTU), indicating potential sediment intrusion, soil erosion, or minor contamination. Turbidity can reduce disinfection efficiency by protecting microorganisms from treatment. GEUWASA water (3.0 NTU) is within limits. Borehole water requires filtration or

sedimentation treatment before human consumption. Turbidity monitoring is crucial, especially after heavy rainfall or aquifer disturbance.

Electrical Conductivity (EC) indicates the concentration of dissolved ions (e.g., calcium, magnesium, sodium, chloride). Borehole water is moderately mineralized, while GEUWASA water is low in ionic content due to treatment. EC is a useful proxy for detecting contamination from anthropogenic sources. Both sources are within safe limits for human use. Borehole water's higher conductivity reflects natural aquifer mineralization.

Temperature affects dissolved oxygen, chemical reaction rates, toxicity, and microbial activity. Both water sources are within safe limits. Elevated temperatures can reduce oxygen solubility and impact aquatic ecosystems. Safe for consumption and project use. Monitoring is recommended to detect seasonal or anthropogenic thermal changes.

TDS represents total dissolved inorganic and organic substances. Borehole water is moderately mineralized, affecting taste but safe. GEUWASA water is low in TDS, reflecting effective treatment. High TDS may indicate natural mineral dissolution or contamination. Both sources are safe for drinking and project use. Regular monitoring ensures early detection of increasing mineral load.

Salinity measures total dissolved salts. Borehole water shows low salinity typical of freshwater aquifers. Salinity affects taste, freshwater suitability, and aquatic life. Both water sources comply with freshwater standards and are suitable for domestic and occupational uses

The water analysis conducted on samples from the Mgusu mine site did not include measurements of heavy metals such as Mercury, Arsenic, Copper, Cadmium, Lead, and Zinc. While the available data on physical water parameters (pH, turbidity, conductivity, TDS, temperature, and salinity) indicate that the water quality is generally within acceptable standards for potable use, the absence of heavy metal analysis highlights a data gap.

For the proposed project, it is essential to implement continuous monitoring of heavy metals and other potential chemical contaminants as part of the environmental management plan. Proactive measures to maintain and enhance water quality should be prioritized to ensure that water resources remain safe for workers, the local community, and the surrounding ecosystem.

Adhering to regulatory standards and international guidelines not only ensures compliance but also supports sustainable and responsible mining practices, minimizing potential adverse environmental and health impacts during the project lifecycle.

#### **4.4.6 Existing infrastructure and services**

##### **4.4.6.1 Transportation Services**

Transportation services in Geita Region are characterized by a road network spanning 8,019.57 kilometers, with 58.1 percent of it being passable throughout the year. The road infrastructure is categorized into trunk roads (7.3%), regional roads (5.8%), district roads (45.1%), and feeder roads (41.8%). The road surface types vary, with 4.7 percent being tarmac, 25 percent gravel, and 70.3 percent earth.

Geita Region features four ports—Nkome, Chato, Nyamirembe, and Muganza—along with the rehabilitated Nungwe Harbour, which facilitates the movement of people and cargo across Lake Victoria. The Nungwe Harbour bay, located approximately 40 kilometers from Geita Town, has the capacity to dock cargo ships.

The region is equipped with two airports managed by Geita Gold Mine and Rubondo National Park, serving the interests of the mine and park exclusively. The upcoming Chato Airport is poised to become a gateway to international tourism attractions, including the Rubondo Island National Park in Chato District and other destinations in the Lake Zone regions. Chato Airport is anticipated to stimulate business opportunities across the Great Lake Region, fostering international travel for both business and leisure purposes and positioning the region as a key player in the global market.

#### **4.4.6.2 Energy**

The Geita Town Council faces challenges with inadequate energy systems, particularly in peri-urban areas. While electricity is accessible in Geita Town and the small town of Kasamwa ward, the provision of this essential service is primarily handled by TANESCO.

The current energy infrastructure falls short of meeting the demands of the entire Town Council, emphasizing the need for further development and expansion to ensure reliable and widespread access to electricity, especially in peri-urban regions;

##### a) Electric supply

Geita Region is connected to the national electricity grid; the power supply line connects the small town of Kasamwa and Geita Town. The region receives electricity from two ways: from Sengerema (33KV) that serves power for Geita District only) and from Bulyanhulu (33KV), which serves power for Chato, Bukombe, Mbogwe and Nyang'hwale.

##### b) Fossil fuels

Petroleum products are the most important source of lighting energy not only in rural areas but also in urban areas. Fossil fuels energize transport, industries and various commercial establishments. The region is supplied with petroleum products from private companies; there are 53 petroleum filling stations in the region.

##### c) Fuel wood

The majority of households in Geita Region use fuel wood in the form of either firewood or charcoal for cooking and heating. Given the regional population, the region requires 3.479 million cubic meters of wood to meet the demand.

##### d) Solar energy

Solar energy is available to a few individuals who have financial ability to pay the cost of installing the facility. For low-income individuals, the cost of installing solar power is far beyond their ability. Some solar panels have been stationed in five high schools, namely Iparamasa, Mnekezi, Makurugusi, Bwina and Maguli.

#### **4.4.6.3 Telecommunication**

The communication network in Geita Town Council is primarily influenced by major companies, playing a pivotal role not only in social development but also in economic progress. Key players in the communication sector include Tigo, Voda, Airtel, Zantel, Halotel, and TTCL (Mobile). TTCL provides 600 landlines within the council, complemented by a television station, a radio station, and six internet café centers.

The accessibility of mobile phone services is impressive, with coverage exceeding 90 percent. Tigo boasts 90 percent coverage, Voda achieves 99 percent coverage, and Airtel reaches 98 percent coverage. Each mobile phone company is associated with a single post office, collectively contributing to a well-established and widely accessible communication infrastructure in Geita Town Council.

#### **4.4.6.4 Water Supply**

Water supply in Geita Region is satisfactory due to its availability from Lake Victoria. Other sources of water are rivers, streams, shallow wells, bore holes, rain water harvesting and springs. The demand for water is driven by human and livestock population; in year 2018 demand for water in Geita Region was 53,149 cubic metres (m<sup>3</sup>) against availability of 27,637.5 m<sup>3</sup>, which was fifty-three percent (53%) of total demand.

Residents of Mgusu ward rely on water sources such as rivers and boreholes within the ward for their daily water needs. However, for activities at the mining site, Mgusu miners opt to draw water from

existing open pits, obtaining water through gravity. This practice suggests a specific water sourcing strategy for mining operations in the Mgusu area, potentially influenced by the efficiency and accessibility provided by gravity-fed systems.

It is essential to consider the impact of such water usage on both local communities and the mining site and implement sustainable water management practices to ensure the well-being of residents and the environment.

#### **4.4.6.5 Sanitation**

The sanitation system in Geita predominantly relies on an On-site Sanitation System, where residents in Geita town construct on-site treatment facilities like septic tanks and soak-away pits to manage wastewater. Overflowing septic tanks are emptied by trucks owned by the Geita Urban Water Supply and Sanitation Authority (GEUWASA) or private companies. The wastewater is then transported to a Fecal Sludge Treatment Plant located at Usindakwe in Geita town, designed to handle 50,000 liters per day, with an average daily emptying of 30,000 liters. Geita does not currently have an offsite treatment system conveyed by sewers.

For solid waste management, the district employs waste collection trucks that gather waste from households and dispose of it at the Lukirini dumpsite. In the project context, there is an opportunity to collaborate with the Lake Victoria Basin Water Board to explore the feasibility of implementing sediment retention ponds or similar wastewater recycling methods. This collaboration could play a vital role in reducing water pollution, especially if the project activities have the potential to impact water quality. The funding challenge highlighted by the Water Board for constructing a pilot project underscores the importance of financial support. If the proposed project in Geita involves extraction methods that may impact water bodies, securing funds for implementing innovative and environmentally friendly wastewater management practices, such as sediment retention ponds, is essential. This collaborative effort not only addresses environmental concerns but also contributes to the sustainable and responsible implementation of the project.

#### **4.4.6.6 Health services**

Geita, a region in Tanzania, grapples with health challenges and is striving to meet the increasing demand for improved healthcare services. Social security funds, serving as financial safety nets, particularly in old age, play a crucial role in enhancing social security for households. The 2018 Population and Housing Census revealed that over 6.33 percent of households in Geita Region had at least one member enrolled in a social security scheme. Notably, the National Health Insurance Fund (NHIF) and Community Health Fund (CHF) are the most popular schemes, with 1.8 percent of households reporting membership. Chato and Geita district councils have the highest proportions of households registered in social security schemes at 45.3 percent and 35.4 percent, respectively.

Within Mgusu ward, there are two active dispensaries, and an additional dispensary is currently under construction. Recognizing the importance of existing health facilities is vital for the proposed project. Collaboration with these healthcare centers, and dispensaries can be established to ensure the well-being of the project's workforce and the surrounding community. Incorporating health and safety protocols, conducting regular check-ups, and potentially contributing to the improvement of local health facilities can be crucial aspects of the project's corporate social responsibility and community engagement initiatives. This approach not only addresses immediate health needs but also establishes a positive impact on the overall community well-being.

### **4.5 Biological Environment**

#### **4.5.1 Fauna and Flora**

The project area and its surroundings are located within a disturbed mining landscape, characterized by sparse secondary vegetation, small patches of grassland, and shrubs that have regenerated on previously mined or cleared ground.

No natural forest or ecologically sensitive habitats occur within the immediate footprint of the proposed facilities. The nearest notable natural feature is the Mgusu Forest Reserve, located approximately 1.5 km east of the site, under management of the Tanzania Forest Services (TFS).

A rapid ecological assessment indicated the presence of common savanna flora species such as *Acacia senegal*, *Terminalia brownii*, *Commelina benghalensis*, and *Sporobolus africanus*. Faunal presence is limited to small mammals, reptiles, birds, and insects adapted to disturbed environments. No IUCN Red List or CITES-listed species were observed or reported during community consultations.

#### **4.6 Hydrological pattern**

The hydrological pattern of Mgusu in Geita is characterized by a tropical savanna climate with bimodal rainfall, consisting of long rains from March to May and short rains around October to December, receiving an annual total of about 900–1,200 mm. The area's undulating terrain supports surface runoff that drains northwards toward nearby streams such as the Mabubi River approximately 700 meters, which becomes active mainly during the rainy season.

During the dry season, most channels remain ephemeral. Groundwater occurs in shallow weathered rock aquifers, commonly accessed through hand-dug wells and boreholes used for domestic and small-scale mining purposes. Within the mining areas, abandoned and active pits often accumulate water, forming localized ponds that interact with shallow groundwater systems.

Overall, Mgusu's hydrology is defined by seasonal surface flows, shallow groundwater tables, and moderate flood and erosion potential during heavy rainfall events.

## CHAPTER FIVE

### 5 STAKEHOLDER IDENTIFICATION AND INVOLVEMENT

#### 5.1 Introduction

This chapter describes the main stakeholders that have been identified and contacted to date as well as their main concerns regarding the proposed development.

Stakeholders are identified as “those people and institutions that have an interest in the successful design, implementation and sustainability of the project and will either be negatively, positively or not at all impacted by the proposed development”. Section 89 of the Environmental Management Act (EMA, 2004) provides directives on public participation and its importance to ESIA.

Furthermore, section 17 of the EIA Regulations provides details and procedures for public participation in the ESIA process. Also this process followed directives as per the ESS10 which entail the stakeholder Engagement and Information Disclosure by pinpointing the involvement of stakeholder for the project sustainability

Stakeholder participation aims to involve processes whereby all those with a stake in the outcome of a project actively participate in decisions on planning and management. Stakeholders may share information and knowledge, and contribute to the project, to enhance the success of the project and hence ultimately their own interest.

#### 5.2 Stakeholder Engagement Process

The Constitution of United Republic of Tanzania recognizes the sovereignty of the people and that people possess the power to guide development within their areas either directly or indirectly. The public should therefore be involved in the evaluation process because the Environment Management Act (2004) and ESS10 demands it to be so.

The main objectives of the stakeholder engagement process are to:

- Inform the stakeholders about the proposed project and provide opportunities for influencing/amending the plans;
- Collect stakeholders' views on the proposed project including potential positive/negative impacts the stakeholders may associate with the project
- Get an idea of Stakeholders' preferred approaches to implementation of the project;
- Get local knowledge on any sensitive areas within the project area of influence (physical, environmental, cultural or proposed facilities); and
- Get expert advice on land use/ area zoning, water availability and supply, power and road infrastructure

Stakeholder consultation is initiated mainly during the scoping phase as various stakeholders are identified and then proceed throughout the EIA process.

There are different levels of public participation. Table 5-1 shows the categories of public participation according to the goals.

Table 5-1: Levels of Public Participation

LEVELS OF PUBLIC PARTICIPATION GOALS	
<b>Inform</b>	To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions.
<b>Consult</b>	To obtain public feedback for decision-makers on analysis, alternatives and/or decisions.
<b>Involve</b>	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered in decision-making processes.

<b>LEVELS OF PUBLIC PARTICIPATION GOALS</b>	
<b>Collaborate</b>	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.
<b>Empower</b>	Inclusion of the public in the decision-making processes.

The team put in place a stakeholder engagement process, which helped to:

- Identify and involve all potentially affected stakeholders
- Generate a good understanding of the project amongst those that was affected
- Identify issues early in the project cycle that may pose a risk to the environment, project or its stakeholders
- Ensure that mitigation measures are appropriate (implementable, effective, and efficient)
- Establish a system for long-term communication between the project and communities that is of benefit to all parties.

The primary goal of the Stakeholder Engagement Process was to ensure transparency and involvement of individuals, groups and organizations affected by and/or interested in the project (to be called as stakeholders) in assessing and managing the potential environmental and social impacts of the project, and to provide relevant, timely and accessible information in an appropriate and understandable format (e.g., Project Information Document).

We discussed the different steps to be taken in the next sections. The process was reported in the stakeholder engagement plan.

The Stakeholder Engagement Plan is the public document, which presents plans for stakeholder engagement, consultation, and disclosure, and is to be updated for each phase of the project. Parts of the report need to be published through ESIA (public involvement and disclosure). The main purpose of this document is to:

- Define the consultation approach for stakeholders,
- set up a process to address public views and/or concerns,
- Identify resources and responsibilities for implementation and monitoring of the consultation program, and
- Set up a grievance mechanism for local stakeholders.

It consists of the following information:

- Introduction (project information, project program, summary of potential environmental and social impacts);
- National and international requirements;
- Consultation undertaken to date;
- Stakeholders;
- Disclosure of information and public consultation;
- Grievance management;
- Resources and responsibilities;
- Reporting; and
- Annexes: comment/complaint form; complaint action form

The purpose of the SEP is to engage with organisations and people who may be affected by the project(s) or who may be interested in the Project, as mentioned above. Each stakeholder will need a different level of engagement. Throughout the process, we made clear the levels for the respective stakeholder and took the necessary steps.

### 5.3 Stakeholder

Stakeholders are individuals or groups who are affected or likely to be affected by the project (project affected parties PAP) and who may have an interest in the project and/or the ability to influence its outcome, either positively or negatively (other interested parties OIPs).

The identification of stakeholders under the project was based on (a) their roles and responsibilities; (b) possible influence/interest on the project; and (c) their particular circumstances as they may be

disadvantaged or vulnerable in different ways from each other. Stakeholders' analysis involved identifying the stakeholder groups that are likely to affect or be affected by proposed project components and sorting them according to the potential impact the activities will have on them.

The preliminary stakeholder analysis has identified the various interests of stakeholder groups and the influence these groups may have on the project. The analysis also shaped the design of stakeholder consultation events and how to engage them. Stakeholders' interest was determined based on the extent to which they may be involved in implementing elements of the project, likelihood in being impacted (positively or negatively) or in which they may benefit from components.

#### **5.4 Stakeholder Identification and Consultation**

The team started with stakeholder consultations in October 2023. The below bullets capture the process undertaken to date:

- Geita Region Office (REME)
- Geita Town Council Office (TD, TNREO, TPO)
- Residents Mines Office
- Lake Victoria Basin Water Board
- Occupational Health and Safety Authority (OSHA)
- Fire Force and Rescue unit-Geita Region
- Ward Executive Officer at Mgusu Ward
- Mtaa Executive Office and Mtaa Chairperson (Machinjioni Mtaa)

Each representative had an opportunity to state their understanding of what is proposed, and they fully support the project and said that they welcomed the team to undertake the requisite study.

#### **5.5 Vulnerable Group**

Means a group of people who, due to their characteristics and circumstances, are likely to suffer more adverse impacts of natural disasters than other groups in the community.

Vulnerable Person means any person who by reason of age, infirmity, illness, disability or any other circumstance needs care or attention. Vulnerable groups associated to this project include:

- Age group (children & elders)
- Indigenous
- Physical challenged group
- Women/Sexuality (Gender issue)

#### **5.6 Other Stakeholders**

Individual stakeholders refer to those occupying, owning, living, or working within the AOI and surroundings that may be impacted upon resulting from project implementation. They include the community members around proposed area.

#### **5.7 Main Concerns and Comments of Stakeholders**

The comprehensive list of all stakeholders consulted is in appendix I. Main concerns and comments from the consultation process raised by stakeholder to date are in Table 5-2.

Table 5-2:Stakeholder consultation views, comments and concern

Name of Stakeholders	Place	Dates/	Comments, views and concerns from the stakeholders	Project Phases
Dr. Omary Sukari (Ag.RAS)	Geita	16/10/2023	<ul style="list-style-type: none"> <li>It is recommended that the project proceeds. However, there is a concern regarding other groups of miners who have not been selected for the construction of the demonstration units in their mines. Alternative methods should be explored to assist these groups, as their primary concern is the use of mercury in gold extraction.</li> </ul>	During operation phases
Elisha.D. Kembo and Emmanuel Michese (OSHA-Inspectors)	Mwanza	11/10/2023	<p><u>During Construction stage</u></p> <ul style="list-style-type: none"> <li>Contractor who will win the tender should register the project and comply with OSHA Act No. 5 of 2003.</li> <li>The awarded contractors should protect their workers regarding the potential hazards by preparing Risk Assessments along with Safety Management Plans.</li> <li>The contractors should provide clean and safe drinking water to their workers.</li> <li>Contractors should ensure availability of a safety aid box on site.</li> <li>Contractors should provide adequate PPEs to workers according to each assigned task.</li> <li>Contractors should ensure that welfare facilities are well organized at site.</li> <li>Contractors should have Safety Policies within the work places and should be in understandable languages to favor the surrounding communities.</li> <li>Contractors should conduct medical examinations during employment, periodic and exit.</li> </ul> <p><u>During Operation stage</u></p> <ul style="list-style-type: none"> <li>The proposed workplaces should be registered under the Workplace Information Management System (WIMS).</li> </ul>	During construction and operation phase

Name of Stakeholders	Place	Dates/	Comments, views and concerns from the stakeholders	Project Phases
Renatus Ishinde (Lake Victoria Basin Water Board)	Mwanza	20/10/2023	<ul style="list-style-type: none"> <li>• He said that it is a good project as the Water Board had also the same idea but theirs was more focused on building infrastructures for water management so as to reduce concentration of pollutants in the waste bodies.</li> <li>• For them, they suggest that proper wastewater management for reducing water bodies' pollution is through recycling where they are proposing Sediment Retention Ponds and this was a plan for whichever extraction method deployed by miners whereas the challenge was availability of funds for construction of a pilot project.</li> </ul>	Before design and construction phases and during construction and operation phase
SF Hamisi Dawa (Regional Fire Officer)	Geita	16/10/2023	<ul style="list-style-type: none"> <li>• He has a concern of wastewater disposal during operation as most mine sites tend to direct them to nearby water sources.</li> <li>• The concern about fencing in mining areas to control wastewater and potential environmental impacts, such as animals moving towards the mines, is expressed.</li> </ul>	Before design and construction phase
Musa Kazumila (Manager-Government Chemistry Laboratory)	Mwanza	11/10/2023	<ul style="list-style-type: none"> <li>• They believe the proposed sites for project implementation fit the purpose as NEMC had conducted an assessment prior to beginning of Environment and Social Impact Assessments.</li> <li>• Infrastructures established should be efficient to avoid environmental pollution.</li> <li>• Sodium tetraborate should be stored as per Medical Storage Department guidelines but should also be far away from acids to avoid reactions.</li> <li>• Organization of trainings on each proposed site regarding proper use and handling of chemicals upon beginning of project operation phase.</li> </ul>	Before design and construction phases and during operation phase

Name of Stakeholders	Place	Dates/	Comments, views and concerns from the stakeholders	Project Phases
Bingile Charles Washima (EMO)	Geita Town Council	16/10/2023	<ul style="list-style-type: none"> <li>• She is aware of the project.</li> <li>• It's a good project but more concern should be put on the fee for operation for the project.</li> <li>• The project should consider the surrounding environment especially on the operation of Tailing Storage Area (TSA) as they should be constructed far away from the surrounding community but large enough so as to not fill up easily.</li> </ul>	Before design and construction phases and during operation phase
Elias M Galila (WEO), Francis Mecho (MEO) and Beason Anthon (Mtaa Representative)	Mgusu Ward (Machinjioni Mtaa)	16/10/2023	<ul style="list-style-type: none"> <li>• They are aware of the project.</li> <li>• Mgusu Miners Cooperative Society fits for the project implementation as almost of community members of the two streets found within Mgusu Ward (Mgusu and Machinjioni Mtaa) are members of the cooperative society.</li> <li>• The project will help reduce environmental pollution specifically on the nearby source of water which is located 700m away from the proposed project site.</li> <li>• The two streets are occupied by people whom are not originally from the area but people whom came from various areas of Tanzania for mining activities.</li> </ul>	During construction and operation phase
Masabile Modest (Mgusu Miner Chairperson), Ismaili Lwambaisi (Mgusu Miner Board Chairperson), Philipo Andres (Mgusu Miner Accountant)	Machinjioni Mtaa	14/10/2023	<ul style="list-style-type: none"> <li>• They have enthusiastically embraced the project, recognizing its potential to instigate positive changes in the industry. Simultaneously, the initiative will contribute to the capacity building of small-scale miners, imparting knowledge on environmentally friendly techniques for gold extraction.</li> </ul>	During construction and operation phase



Figure 5-1: Consultation and site visit

## CHAPTER SIX

### 6 ASSESSMENT OF IMPACTS

#### 6.1 Introduction

This section includes expected environmental and social impact assessment during the entire lifecycle of the establishment of the Gold Ore processing and washing facilities. Methods used for impact assessment, as well as quantitative and qualitative criteria were developed to unify and standardize the assessment system, which ensures the objectivity of the assessment.

Impact assessment methodology preparation was based on the recommendations of the World Bank and other International Financial Institutions (EBRD, IFC, and ADB). The following scheme will be used for environmental and social impact assessment of the planned activities:

##### **Step I: Determination of basic impact types**

Determination of the impact is based on general analysis of activities, which may be important for these types of projects. This is incorporated in Chapter 3.

##### **Step II: Study of the environmental baseline – search and analysis of the existing information**

Analysis of the socioeconomic and environmental status quo of the project affected. This shall also involve identification of the receptors, which are expected to be affected by the planned activities, determination of sensitivity of the receptors

##### **Step III: Characterization and assessment of the impact**

Impact character, probability, significance other characteristic determination by considering the sensitive receptors, description of the expected changes in the environment and assessment of their significance. This is covered in this Chapter.

##### **Step IV: Determination of the mitigation measures**

Significant impact mitigation, prevention, or compensating measure determination. This is detailed in Chapter 7.

##### **Step V: Residual impact assessment**

Determination of the expected value of change in the environment after implementation of the mitigation measures

##### **Step VI: Monitoring and management strategy development**

Monitoring the effectiveness of the mitigation measures is needed to ensure, that the impact must not exceed the predetermined values, effectiveness of the mitigation measures must be confirmed, or the necessity of the corrective measures must be identified.

#### 6.1.1 Impact Identification and assessment methodology

Based on the project components, the baseline environmental status and the defined influence areas, the potential impacts were identified by considering the criteria as well as significance of the impacts illustrated in Table 6-1 and Table 6-2.

Table 6-1: Criteria for Assessment of Nature, Extension, Duration and Magnitude of Impacts

<b>Criterion</b>	<b>Description</b>
<b>Nature</b>	<b><i>Nature of the environmental change</i></b>
Positive	Beneficial environmental change
Negative	Adverse environmental change

Criterion	Description
<b>Extension</b>	<b><i>The geographical area that may be affected by the impact</i></b>
DIA	Only the place where the activities directly related to mining operations may occur, located within the boundaries project area
IIA	Effects in Mgusu Ward and the surrounding of Geita Town Council, where the project is located and at potential sources for construction materials in the neighboring Districts and Region
National WIA	Effects may occur within Tanzania
Regional or International WIA	Tanzania and neighboring countries
<b>Duration</b>	<b><i>Period along which the impact is expected to occur</i></b>
Short-term	Within the construction period or less than six months
Medium-term	Between six months and five years
Long-term	More than five years
<b>Magnitude</b>	<b><i>Effect on environmental and social processes</i></b>
High	Natural functions and processes/existing conditions are severely altered. Sensitive/protected species or habitats are severely affected
Medium	Natural functions and processes/existing conditions are notably altered. Sensitive/protected species or habitats affected
Low	Natural functions and processes/existing conditions are slightly altered. Sensitive/protected species or habitats not affected
Very low	Natural functions and processes/existing conditions are negligibly altered
Zero	Natural functions and processes remain unaltered

Table 6-2: Criteria for Assessment of Significance of Potential Impacts of the Project

Significance Category		Description
High negative Impact	High Positive Impact	High magnitude with a local extent and medium-term duration
		High magnitude with a regional extent and short-term period or a site-specific extent and long-term duration
		High magnitude with either a local extent and short-term period duration or a site-specific extent and medium-term duration
		Medium magnitude with any combination of extent and duration except site-specific and construction period or national/international and long-term
Medium negative impact	Medium positive impact	Low magnitude with regional extent and long-term duration
		High magnitude with a site-specific extent and short-term period duration
		Medium magnitude with a site-specific extent and short-term period duration
		Low magnitude with any combination of extent and duration except site-specific and short-term period or regional and long-term
		Very low magnitude with a regional extent and long-term duration
Low negative impact	Low Positive Impact	Low magnitude with any combination of extent and duration except site-specific and short-term period or regional and long-term
		Very low magnitude with a regional extent and long-term duration
No impact		Zero magnitude with any combination of extent and duration

## 6.2 Interactions of Project Activities with the Receptors

The potential impacts anticipated during the proposed project are identified through Interaction Matrix where interactions between project activities and environmental and social receptors are assessed.

It has been found that the project has both beneficial and adverse impacts, which are highlighted in the Matrix. The activities of the proposed project are classified into three phases, namely pre-construction, construction, and operation phase, already discussed in **chapter 2**.

Table 6-3: Interactive Matrix for Aspects and Impacts of the Gold Ore and Washing Facilities Establishment

ACTIVITIES	PARAMETERS																				
	Physical Environment							Biological Environment		Socio-economic Environment											
	Air quality/noxious smells	Noise and Vibration	Ground water	Surface Water	Land Use and land cover	Soil Quality & Erosion	Climate Change	Flora	Fauna	Project Affected People	Community Areas	Road Safety and Traffic Control	Public Utilities (Energy and Water)	Waste and hazardous material	Economy and Livelihood	Labor and Employment opportunity	Cultural, Change	Gender	Human rights	Occupational Health and safety	Landscape and Aesthetics
<b>Mobilization/Construction phase</b>																					
Site clearance (Demolition of some existing structures)	-	-		-				-	-	-	-		-						-	-	-
Recruitment of labor force														+	+	-	-	-	-	-	-
Vehicle Movement.	-	-					-				-								-	-	-
Storage of Construction Materials													-						-		
Construction of gold ore processing and washing facilities along with necessary supporting infrastructure	-	-			+	-						+	-						-	+	-
Waste handling	-			-	-	-	-	-	-										-	-	-
Training and Capacity building										+				+							
Lay off workers														-	-						
<b>Operation phase</b>																					
Recruitment of workers														+	+	-	-		-		-

ACTIVITIES	PARAMETERS																					
	Physical Environment							Biological Environment		Socio-economic Environment												
	Air quality/noxious smells	Noise and Vibration	Ground water	Surface Water	Land Use and land cover	Soil Quality & Erosion	Climate Change	Flora	Fauna	Project Affected People	Community Areas	Road Safety and Traffic Control	Public Utilities (Energy and Water)	Waste and hazardous material	Economy and Livelihood	Labor and Employment opportunity	Cultural, Change	Gender	Human rights	Occupational Health and safety	Landscape and Aesthetics	Community Health and safety
Ore Crushing	-	-											-							-		-
Grinding and Pulverization	-	-											-							-		-
Gravity Concentration																				-		-
Flotation																				-		-
Carbon Stripping and Electro-Winning	-																			-		-
Gold Smelting and Refining	-																			-		-
Gold Washing and Recovery	-			-									-							-		-
Waste handling (waste rock, tailing and overburden management)	-		-	-	-			-	-				-							-	-	-
<b>Decommissioning phase</b>																						
Recruitment of workers															+	+				-		-
Site rehabilitation																					+	+
Structure Dismantling	-	-											-							-	-	-
Equipment removal													-							-		-

ACTIVITIES	PARAMETERS																						
	Physical Environment						Biological Environment		Socio-economic Environment														
	Air quality/noxious smells	Noise and Vibration	Ground water	Surface Water	Land Use and land cover	Soil Quality & Erosion	Climate Change	Flora	Fauna	Project Affected People	Community Areas	Road Safety and Traffic Control	Public Utilities (Energy and Water)	Waste and hazardous material	Economy and Livelihood	Labor and Employment opportunity	Cultural, Change	Gender	Human rights	Occupational Health and safety	Landscape and Aesthetics	Community Health and safety	
Waste management							•								•					•			•
Lay off workers															•	•							

### 6.3 Assessment of Anticipated Negative Environmental and Social Impacts during Mobilization and Construction Phase

#### 6.3.1 Loss/ disturbance of biodiversity

The commencement of the proposed project has the potential to induce biodiversity loss, primarily attributed to site clearance activities required for project implementation preparation. These activities entail the removal of existing natural vegetation (Figure 6-1), leading to a disruption in the local ecosystem. The clearance of land poses a risk of displacing or harming various species, including birds, mammals, and insects, as it eliminates their habitats and food sources. Furthermore, the disturbance to vegetation can result in soil disruption and the introduction of sediments through surface run-offs into nearby water sources, such as the Mabubi River. This has the potential to adversely affect water quality and alter the natural habitat conditions in the surrounding area.

#### Fauna and Flora

The project area and its surroundings are located within a disturbed mining landscape, characterized by sparse secondary vegetation, small patches of grassland, and shrubs that have regenerated on previously mined or cleared ground.

No natural forest or ecologically sensitive habitats occur within the immediate footprint of the proposed facilities. The nearest notable natural feature is the Mgusu Forest Reserve, located approximately 1.5 km east of the site, under management of the Tanzania Forest Services (TFS).

A rapid ecological assessment indicated the presence of common savanna flora species such as *Acacia senegal*, *Terminalia brownii*, *Commelina benghalensis*, and *Sporobolus africanus*. Faunal presence is limited to small mammals, reptiles, birds, and insects adapted to disturbed environments. No IUCN Red List or CITES-listed species were observed or reported during community consultations. This information is also include under the biological environment in section 4.5.

Recognizing and mitigating these potential impacts through comprehensive environmental management practices are imperative to ensure the conservation of biodiversity and the overall ecological balance during the project's implementation.



Figure 6-1: Existing vegetation cover

#### 6.3.2 Disturbance of air quality

During the mobilization and construction phase of the proposed project, there is a likelihood of adverse impacts on air quality due to various construction activities. Dust emissions from earth-moving, excavation, and material transportation can lead to increased particulate matter in the air. Additionally,

the operation of construction machinery and vehicles may release pollutants such as nitrogen oxides, sulfur dioxide, and volatile organic compounds, contributing to air pollution. Diesel-powered equipment can emit pollutants through exhaust fumes, further impacting local air quality.

To address these challenges, the project can implement dust control measures, employ modern emission control technologies, consider alternative fuels for machinery, schedule activities strategically, and engage the local community in awareness campaigns. By adopting these mitigation measures, the project aims to minimize the negative effects on air quality, demonstrating a commitment to environmental responsibility and the well-being of the surrounding community.

### **6.3.3 Increased noise levels**

During the mobilization and construction phase of the proposed project, increased noise levels are anticipated as a consequence of various construction activities. The operation of heavy machinery, construction equipment, and vehicles can generate significant noise, potentially causing disturbances to the local environment and nearby communities. The continuous sound emissions may affect the overall acoustic environment and disrupt the daily activities of residents in the vicinity.

To mitigate these impacts, the project can implement noise reduction measures, such as using quieter equipment, establishing sound barriers, scheduling noisy activities during specific hours, and providing adequate information to the community about the construction schedule. These measures aim to minimize the adverse effects of increased noise levels and contribute to maintaining a more harmonious relationship with the surrounding environment and residents during the construction phase.

### **6.3.4 Destruction of the built environment due to increased vibration levels**

During the mobilization and construction phase of the proposed project, increased vibration levels may occur as a result of heavy machinery, pile driving, and other construction activities. Vibrations can be transmitted through the ground, potentially impacting nearby structures, infrastructure, and the overall environment. Excessive vibrations have the potential to cause structural damage to buildings and homes, disrupt sensitive equipment, and create discomfort for residents in the vicinity.

Monitoring programs can be established to assess and mitigate any adverse effects on nearby structures. Communication with the local community about construction schedules, potential vibrations, and the measures in place can also foster understanding and cooperation.

By proactively managing and mitigating vibration impacts, the project aims to ensure the well-being of the community and minimize disruptions during the construction phase.

### **6.3.5 Impact on water resources**

During the mobilization and construction phase of the proposed project, potential water resource impacts may arise due to increased water usage for construction activities.

The construction of the Gold Ores Processing and Washing Facilities is estimated to require 21,600 litres of water per day, with the majority (18,000 litres/day) used for construction activities like dust suppression and concrete mixing, and the rest for domestic use by personnel. The project plans to source this water from local shallow boreholes and mine water from existing pits. This demand creates a High Risk of straining the community's domestic water supply, especially given existing water scarcity if the available water sources are not managed efficiently.

Operation of the processing and washing facility will require water for ore washing, dust suppression, and sanitation. The estimated demand is approximately 10–15 m<sup>3</sup>/day, which will be met primarily from recycled process water and supplemented by pit water and borehole abstraction within the project boundary. This level of abstraction is not expected to significantly reduce water availability to surrounding communities or farmers, since the Mabubi River and community wells are hydrologically

distinct and located more than 700 meters from the site. Nonetheless, regular monitoring of groundwater levels and borehole yields will be conducted quarterly to ensure that project abstraction does not negatively affect community access to water.

The use of sodium tetraborate (borax) in ore beneficiation requires strict chemical management and containment practices to avoid soil or water contamination. Specifically, the project will:

- Store borax and similar reagents in a dedicated, ventilated chemical store with an impermeable concrete floor and bunded containment (110% capacity).
- Maintain Material Safety Data Sheets (MSDS) and provide chemical handling training to operators.
- Collect and neutralize process residues in a closed-loop tailings circuit to prevent any discharge to the environment.
- Conduct periodic effluent testing for boron and related compounds, ensuring concentrations remain below WHO and TBS permissible levels for discharge water.

These measures will ensure that chemical use does not lead to contamination or reduce water availability in nearby communities. Also the project can implement water conservation measures, such as recycling and reusing water where feasible. Compliance with environmental regulations and permits related to water usage and quality is crucial to minimizing adverse impacts on local water resources.

#### **6.3.6 Impact on soil quality**

During the mobilization and construction phase of the proposed project, potential impacts on soil quality may arise due to excavation, grading, and other earthmoving activities. The natural vegetation in the project area predominantly consists of sand and alluvial soil, indicating loose and unconsolidated materials. Construction activities can disturb the existing soil structure, leading to compaction, erosion, and loss of topsoil. Excavation for foundations, road construction, and other infrastructure development may expose soil to erosion risks, especially during periods of heavy rainfall.

To mitigate soil quality disruption, the project can implement best practices for construction site management, including proper handling and stockpiling of topsoil, minimizing bare soil areas, and adopting erosion control techniques. Soil stabilization measures, such as revegetation with native plants, can help restore and protect the soil during and after construction.

#### **6.3.7 Degradation of natural beauty, outbreak of diseases and injuries due to improper management of surrounding waste materials (Solid and Liquid Waste)**

During the mobilization and construction phases of the proposed project, there is a potential for increased environmental degradation and pollution associated with waste generation, both solid and liquid. Construction activities typically generate various types of waste, including construction debris, packaging materials, and wastewater. Proper waste management practices are crucial to mitigate the environmental impact.

**Solid Waste:** Construction sites generate solid waste in the form of construction debris, packaging materials, and discarded equipment. If not managed effectively, improper disposal can lead to environmental degradation. The project can implement waste segregation, recycling, and proper disposal methods to minimize the amount of solid waste sent to open dumpsites. Recycling construction materials, such as concrete and steel, can reduce the environmental footprint of the project.

**Liquid Waste:** Construction activities may generate liquid waste, such as wastewater from concrete mixing, equipment cleaning, and site drainage. Contaminated runoff can carry pollutants into nearby water sources, affecting water quality. Implementing proper containment measures can help prevent the release of harmful substances into the environment.

### 6.3.8 Occupational Health and Safety Risks

During the mobilization and construction phases of the proposed project, various occupational health and safety risks may arise. Construction sites are inherently dynamic and involve diverse activities, machinery, and workers, creating potential hazards that require careful management to ensure the well-being of personnel. The following are potential impacts related to occupational health and safety:

1. **Physical Hazards:** Construction sites often involve heavy machinery, tools, and equipment, increasing the risk of physical injuries such as falls, collisions, and crush injuries. Workers may face hazards from moving parts of machinery, falling objects, or uneven terrain.
2. **Chemical Exposure:** Construction materials, solvents, and other chemicals used during the construction phase can pose health risks through skin contact, inhalation, or ingestion. Proper handling, storage, and use of hazardous substances are critical to prevent chemical exposures.
3. **Noise and Vibration:** Construction activities generate high levels of noise and vibration, potentially causing hearing damage and musculoskeletal disorders among workers. Adequate personal protective equipment (PPE) and monitoring can help mitigate these risks.
4. **Ergonomic Strain:** Workers may experience ergonomic strain due to repetitive tasks, awkward postures, or lifting heavy loads. Implementing ergonomic practices and providing proper training can reduce the risk of musculoskeletal disorders.
5. **Confined Spaces:** Some construction tasks may require work in confined spaces, posing risks of asphyxiation, exposure to harmful gases, or entrapment. Strict safety protocols and training are essential for personnel working in confined spaces.
6. **Electrical Hazards:** Construction sites involve electrical installations, wiring, and equipment, introducing the risk of electric shocks or fires. Proper electrical safety measures, including insulation and grounding, are crucial.
7. **Communication Challenges:** The complexity of construction projects can lead to communication challenges, increasing the likelihood of misunderstandings and accidents. Clear communication protocols and regular safety briefings can enhance overall site safety.
8. **Fatigue and Stress:** Prolonged working hours and demanding schedules may contribute to worker fatigue and stress, potentially compromising judgment and reaction times. Adequate breaks, rest periods, and stress management initiatives can address these concerns.

Occupational Health and Safety Management: To address these impacts, the project should prioritize occupational health and safety management. This includes developing comprehensive safety plans, providing appropriate training, ensuring the availability of PPE, conducting regular safety audits, and promoting a culture of safety awareness among all personnel.

By proactively managing occupational health and safety risks, the project aims to create a secure working environment, prevent accidents, and protect the well-being of all individuals involved in the construction phase.

### 6.3.9 Public health and safety risks

During the mobilization and construction phases of the proposed project, several potential impacts on public health and safety, as well as the well-being of the local community, need careful consideration. Traffic disruptions and accidents may arise due to increased construction-related activities, necessitating effective traffic management strategies. Dust and air quality concerns should be addressed through measures like water spraying to mitigate respiratory risks. Noise and vibration issues can be minimized by implementing noise control methods and restricting construction hours. Visual disruptions should be managed through screening or landscaping to mitigate the aesthetic impact on the community. Community safety awareness programs, coupled with transparent communication, play a vital role in keeping residents informed about potential risks and emergency response procedures. Water quality and discharge management are essential to prevent pollution of nearby water sources.

Addressing community health concerns, engaging with local practices, and having robust emergency preparedness plans contribute to the overall goal of ensuring public safety and well-being during the project's mobilization and construction phases.

### 6.3.10 Potential GBV/SEA/SH related incidences

Gender-Based Violence (GBV), including Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH), is a recognized social concern within Geita Region, particularly in mining communities such as Mgusu, where the influx of workers, economic disparities, and limited social protection systems heighten vulnerability. The proposed project is expected to employ approximately 30 construction workers at any given time, comprising both local and non-local personnel. Although no workers' campsite will be established, the workforce will reside in nearby rental facilities, guesthouses, or community structures, increasing interaction between project workers and community members.

The presence of non-local workers and increased disposable income may elevate risks of SEA/SH, especially among girls, young women, female students, and vulnerable groups. Potential GBV/SEA/SH incidents that may arise during the construction phase include, but are not limited to:

- Sexual exploitation, including solicitation of sexual favors in exchange for money, gifts, employment opportunities, or preferential treatment.
- Sexual harassment, such as inappropriate comments, unwanted sexual advances, or physical contact.
- Physical or psychological abuse, including intimidation, threats, coercion, and manipulation.
- Abuse of power or trust, where workers exploit their positions to obtain sexual access or exert control over vulnerable individuals.
- Denial of access to resources or services based on gender or discriminatory practices.
- Sexual intrusion or assault, whether actual or threatened.

Gender inequality in mining communities may further restrict women's access to resources, economic opportunities, and essential services, thereby amplifying their vulnerability to SEA/SH. If unmanaged, the project may disproportionately affect women's livelihoods, dignity, and safety within the Mgusu community.

Given the community context and workforce dynamics, the likelihood of SEA/SH occurrences is considered negative, short-term, and of moderate significance.

Table 6-4: Assessment of Negative Impacts Significant and Risks

S/N	Impact/Aspect Description	Nature	Magnitude	Extension	Duration	Significance of Impact
1	Biodiversity loss, primarily attributed to site clearance activities required for project implementation preparation.	Direct	Medium	DIA	Short-term	Moderate
2	Construction activities often require significant water for purposes such as dust suppression, concrete mixing, and general site maintenance. Increased water demand can strain local water resources, especially if the region is already facing water scarcity or if the available water sources are not managed efficiently.	Direct	High	DIA	Short-term	Major
3	Construction activities can disturb the existing soil structure, leading to compaction, erosion, and loss of topsoil. Excavation for foundations, road construction, and other infrastructure development may expose soil to erosion risks, especially during periods of heavy rainfall.	Direct	Medium	DIA	Short-term	Moderate
4	Increased vibration levels may occur as a result of heavy machinery, pile driving, and other construction activities. Vibrations can be transmitted through the ground, potentially impacting nearby structures, infrastructure, and the overall environment. Excessive vibrations have the potential to cause structural damage to buildings and homes, disrupt sensitive equipment, and create discomfort for residents in the vicinity.	Indirect	Medium	DIA	Short-term	Moderate
5	Increased noise levels are anticipated as a consequence of various construction activities. The operation of heavy machinery, construction equipment, and vehicles can generate significant noise, potentially causing disturbances to the local environment and nearby communities. The continuous sound emissions may affect the overall acoustic environment and disrupt the daily activities of residents in the vicinity.	Direct	High	DIA	Short-term	Major

S/N	Impact/Aspect Description	Nature	Magnitude	Extension	Duration	Significance of Impact
6	Dust emissions from earth-moving, excavation, and material transportation can lead to increased particulate matter in the air. Additionally, the operation of construction machinery and vehicles may release pollutants such as nitrogen oxides, sulfur dioxide, and volatile organic compounds, contributing to air pollution. Diesel-powered equipment can emit pollutants through exhaust fumes, further impacting local air quality.	Direct	Medium	DIA	Short-term	Moderate
7	Various occupational health and safety risks may occur. These include physical hazards such as falls, collisions, and crush injuries due to heavy machinery and equipment. Chemical exposure risks arise from construction materials and solvents, requiring proper handling to prevent health issues. Noise and vibration from construction activities can lead to hearing damage and musculoskeletal disorders, necessitating the use of personal protective equipment and monitoring. Ergonomic strain may result from repetitive tasks, awkward postures, or lifting heavy loads, and can be mitigated through ergonomic practices and training. Confined spaces pose risks of asphyxiation, exposure to harmful gases, or entrapment, requiring strict safety protocols for workers.	Direct	High	DIA	Long-term	Major
8	Potential impacts on public health and safety, including traffic disruptions, accidents, dust and air quality concerns, noise and vibration issues, and visual disruptions. These impacts can lead to respiratory risks, safety hazards, and aesthetic concerns for the local community.	Indirect	Medium	DIA	Short-term	Moderate

S/N	Impact/Aspect Description	Nature	Magnitude	Extension	Duration	Significance of Impact
9	Increased water demand for dust suppression, equipment cleaning, and material preparation. Water will be sourced from existing mine pit and borehole within the site; baseline surveys identified Mabubi River and local wells as receptors requiring protection.	Direct	Medium	DIA	Short-term	Moderate
10	Gender-Based Violence (GBV), including Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH), is a recognized social concern within Geita Region, particularly in mining communities such as Mgusu, where the influx of workers, economic disparities, and limited social protection systems heighten vulnerability. The proposed project is expected to employ approximately 30 construction workers at any given time, comprising both local and non-local personnel. Although no workers' campsite will be established, the workforce will reside in nearby rental facilities, guesthouses, or community structures, increasing interaction between project workers and community members	Direct	Medium	DIA	Short-term	Moderate

## 6.4 Assessment of Anticipated Negative Environmental and Social Impacts during Operation Phase

### 6.4.1 Impacts on water sources

The proposed establishment of gold ore processing and washing facilities in Geita Town introduces both environmental challenges and crucial opportunities for water resource management. Currently, water from open pits, abstracted through gravity, is utilized for mine purposes at the proposed site. The use of sodium tetraborate in the leaching process raises concerns regarding potential environmental impacts and toxicity, necessitating rigorous chemical management and containment measures to prevent spills or leaks that could adversely affect local water sources. Considering the substantial water consumption during the leaching and washing stages, especially amid existing water stress in the region, the project's demands may exert pressure on Mgusu water resources, including rivers and boreholes.

Operation of the processing and washing facility will require water for ore washing, dust suppression, and sanitation. The estimated demand is approximately 10–15 m<sup>3</sup>/day, which will be met primarily from recycled process water and supplemented by pit water and borehole abstraction within the project boundary. This level of abstraction is not expected to significantly reduce water availability to surrounding communities or farmers, since the Mabubi River and community wells are hydrologically distinct and located more than 700 meters from the site. Nonetheless, regular monitoring will be conducted quarterly to ensure that project abstraction does not negatively affect community access to water.

The use of sodium tetraborate (borax) in ore beneficiation requires strict chemical management and containment practices to avoid soil or water contamination. Specifically, the project will:

- Store borax and similar reagents in a dedicated, ventilated chemical store with an impermeable concrete floor and bunded containment (110% capacity).
- Maintain Material Safety Data Sheets (MSDS) and provide chemical handling training to operators.
- Collect and neutralize process residues in a closed-loop tailings circuit to prevent any discharge to the environment.
- Conduct periodic effluent testing for boron and related compounds, ensuring concentrations remain below WHO and TBS permissible levels for discharge water.

These measures will ensure that chemical use does not lead to contamination or reduce water availability in nearby communities. Also due to the current reliance on gravity-fed water sources, it becomes essential to implement sustainable water management practices, integrating careful planning and water-efficient technologies. This proactive approach not only addresses potential environmental impacts but also ensures the long-term health and sustainability of the town's water supply, aligning with responsible project implementation and environmental conservation objectives.

### 6.4.2 Air quality disturbance

The operational phase of the Mgusu Gold Ore Processing and Washing Facility has the potential to generate air emissions that could affect environmental and public health. Key processes crushing, grinding, ore drying, smelting, and roasting are expected to release particulate matter (PM), heavy metals (mercury, lead, cadmium, arsenic), sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), volatile organic compounds (VOCs), and borax compounds.

Air quality monitoring at two points within the project area shows that pollutant levels are well below national and World Bank standards. This indicates that ambient air quality is currently good, providing a favorable baseline for assessing operational impacts. If uncontrolled, operational emissions could:

- Increase PM and heavy metal concentrations, raising risks of respiratory and cardiovascular diseases.
- Contribute to SO<sub>2</sub> and NO<sub>x</sub> emissions, leading to acid rain and localized air pollution.
- Release VOCs, promoting photochemical smog and ozone formation.
- Affect nearby communities and ecological receptors, especially from smelting and roasting activities.

Smelting and roasting of gold ore are recognized under the WB EHSs as significant sources of mercury and heavy metals. Without mitigation, these activities could result in mercury vapor exposure to workers and communities, as well as soil and water contamination through deposition of airborne particulates.

In line with the World Bank Environmental, Health, and Safety Guidelines (EHSs) for Mining, specific attention is given to emissions from smelting and roasting of precious metals, which are recognized as significant sources of both gaseous and particulate pollutants. The EHSs recommend strict emission controls, proper fume capture, and safe handling of mercury and other heavy metals to minimize occupational and community exposure.

To mitigate these risks, the project will implement a comprehensive air pollution management strategy during operations, including:

- **Dust Suppression:** Crushers, conveyors, and ore drying areas will be fitted with enclosed dust hoods and water-spray systems to minimize particulate release.
- **Fugitive Dust Management:** Internal roads will be paved, and regular water spraying will be conducted to reduce ambient dust levels
- **Emission Control for Smelting/ Roasting:** Smelting and roasting chambers will include ventilation hoods, fume capture systems, and air scrubbers where applicable to reduce emissions of heavy metals, SO<sub>2</sub>, and other pollutants.
- **Use of Cleaner Technologies:** Mercury-free gravity concentration and borax smelting methods will be prioritized to minimize mercury emissions, in line with EHS recommendations.
- **Air Quality Monitoring:** Biannual monitoring of key parameters (PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>2</sub>, SO<sub>2</sub>, CO, and heavy metals) will be conducted at the facility perimeter, community boundaries, and downwind areas. Results will be compared against World Health Organization (WHO, 2021) and Tanzania Bureau of Standards (TBS 845:2003) thresholds.

Based on baseline data and anticipated emission sources, the project's air quality impacts are moderate and manageable with the proposed mitigation measures. Compliance with WB EHSs, including guidance on smelting and refining of precious metals, ensures that emissions will remain within acceptable limits, protecting both worker and community health while maintaining ecological integrity

### **6.4.3 Impact from increased levels of noise and vibration**

The operation of the proposed gold ore processing and washing facilities is expected to generate considerable levels of noise and vibration, posing potential challenges to both the surrounding environment and nearby communities. Key activities such as crushing, grinding, and heavy machinery operation are likely to elevate ambient noise levels, potentially disrupting local ecosystems by altering wildlife behavior and habitat conditions. In residential zones, increased noise may lead to discomfort, reduced quality of life, and heightened concerns regarding noise pollution. Prolonged exposure to elevated noise levels has been associated with adverse health outcomes, including stress, sleep disturbances, and other physiological effects.

Baseline assessments indicate that existing noise levels within the project area already exceed the permissible thresholds outlined in the Environmental Management (Standards for the Control of Noise and Vibration Pollution) Regulations, 2015. This underscores the importance of implementing comprehensive mitigation strategies to manage operational noise and vibration effectively.

To address these concerns, the project will adopt a combination of engineering controls, operational best practices, and landscape-based interventions. These measures aim to minimize emissions at the

source, reduce transmission, and safeguard both human and ecological receptors. Also due to the identified noise concerns, the following measures are recommended:

- Installation of acoustic enclosures around crushers and generators to contain mechanical noise.
- Scheduling of high-noise activities during daytime hours to limit disturbance during sensitive periods.
- Deployment of portable noise barriers or acoustic screens around key equipment.
- Routine maintenance of machinery to prevent excessive noise from worn or malfunctioning components.
- Traffic management measures, including speed limits and restrictions on engine idling, to reduce transport-related noise.
- Staff training on low-noise operational practices, such as careful handling of tools and equipment.
- Vegetative buffers, including trees and shrubs, planted around the facility to absorb and deflect sound.
- Designation of quiet zones near sensitive receptors such as schools and residential areas.
- Establishment of a minimum 50-meter buffer zone with vegetation to mitigate noise propagation.

Noise monitoring will be conducted quarterly at both the facility boundary and nearby community receptors. Monitoring results will be evaluated against the World Bank Group Environmental, Health, and Safety (EHS) Guidelines, which stipulate acceptable limits of 55 dB(A) during daytime and 45 dB(A) at night for residential areas, and 70 dB(A) for industrial zones.

#### **6.4.4 Disruption of soil quality**

The project's operational activities, including ore processing, and waste management, have the potential to disrupt the soil structure and quality. Given the varied soil compositions, the project may encounter challenges such as erosion, sedimentation, and disturbance of nutrient cycling in the soil. The loose and unconsolidated nature of certain soil types may make them more susceptible to erosion, especially in the event of severe weather conditions.

To address these potential impacts on soil quality, the project should implement effective soil conservation measures, including erosion control techniques tailored to the diverse soil types. Furthermore, proper waste management practices and re-vegetation efforts can contribute to mitigating soil disturbances.

Adhering to best practices in soil management and ongoing monitoring are essential to preserve soil quality and ensure the long-term sustainability of the surrounding environment. By understanding and adapting to the specific topographical and soil conditions, the project can minimize its environmental footprint and promote responsible and sustainable operations.

#### **6.4.5 Occupational health and safety risks**

The operation of the proposed gold ore processing and washing facilities brings inherent occupational health and safety risks for workers engaged in various stages of mining and processing. Exposure to chemicals, noise, vibration, ergonomic challenges, respiratory hazards, and machinery accidents are among the potential risks. It is imperative for the project to prioritize the safety of its workforce through comprehensive training programs, strict adherence to safety protocols, and the provision of personal protective equipment. Dust control measures, respiratory protection, and rigorous machinery safety guidelines must be implemented to mitigate risks.

Regular health and safety assessments, ongoing training initiatives, and active worker involvement in safety practices are essential to maintain a secure working environment throughout the project's operational phases.

#### **6.4.6 Road accidents from moving trucks**

The transportation of mined stones from various mines within the Town Council to the proposed site for extraction introduces notable road accident risks, encompassing factors such as heavy traffic congestion, inadequate road infrastructure, driver fatigue and stress, insufficient training, weather-related challenges, community interactions, and potential overloading or unsecured loads. These risks pose threats to both the safety of individuals involved in transportation and the broader community.

To address these concerns, effective mitigation measures are imperative. Measures should include the establishment of and adherence to speed limits, regular vehicle maintenance, comprehensive driver training programs, optimized transportation routes, community awareness initiatives, fatigue management strategies, technology-enabled monitoring, and collaboration with local authorities to enhance road infrastructure.

These measures aim to create a safer transportation environment, reduce potential accidents, and contribute to the overall well-being of the community and project stakeholders. Regular monitoring and adaptive implementation of measures based on evolving conditions are critical for the successful management of road safety throughout the transportation process.

#### **6.4.7 Impact on public health and safety risks**

The proposed gold ore processing and washing facilities, situated in the Mgusu area of Geita Town, present a comprehensive operational plan with potential environmental, health, and safety implications. The project involves the extraction of gold through leaching processes using sodium tetraborate, raising concerns about chemical exposure risks for workers.

The operation's substantial water usage, especially in leaching and washing stages, may strain local water resources. Additionally, potential air pollution, noise, and vibration resulting from mining and processing activities could impact both worker safety and public well-being. The collaborative engagement of other miners from surrounding areas further complicates the scenario, introducing challenges related to traffic safety, increased dust levels, and collective strain on resources.

To address these concerns, the project must prioritize stringent safety protocols, effective environmental monitoring, and transparent communication with both the local community and external miners to ensure a sustainable and safe operation.

#### **6.4.8 Increased environmental degradation and pollution from waste generation**

The operation of the proposed gold ore processing and washing facilities is anticipated to contribute to increased environmental degradation and pollution due to waste generation, both in solid and liquid forms. The extensive use of sodium tetraborate in smelting process raises concerns about the potential toxicity and environmental impact of chemical residues. The disposal of tailings and waste rock, if not properly managed, can lead to soil erosion, sedimentation in nearby water bodies, and contamination of surface and groundwater.

Wet tailings impoundments and the release of effluents during heavy rainfall events pose additional risks of water pollution. The proposed gold ore processing facility in the Mgusu area will generate solid tailings and process water effluent from ore washing, sluicing, and gravitational separation, necessitating careful waste management to prevent contamination of soil and water resources. With a projected throughput of 20–30 tonnes per day, the plant is expected to produce approximately 15–20 tonnes of tailings and 6–10 m<sup>3</sup> of effluent daily, with water largely recycled to minimize freshwater use.

A small Tailings Storage Facility (TSF) with a 10,000 m<sup>3</sup> capacity, HDPE-lined base, freeboard, stormwater diversion, decant system, and emergency spillway will contain the tailings, adhering to Good International Industry Practice. Effluent may contain suspended solids, silt, minor heavy metals, and traces of borax, and will undergo two-stage sedimentation before recycling or controlled release in compliance with WHO and TBS standards.

Regular monitoring including monthly inspections, quarterly water sampling, and annual engineering reviews will ensure structural integrity and water quality. Mitigation measures include liner installation, freeboard maintenance, sedimentation, recycling, and corrective action for heavy metal contamination.

Not only that but also adequate waste management strategies, including proper containment, treatment of effluents, and responsible disposal of solid waste, are crucial to mitigate the environmental impact and ensure the sustainable operation of the project.

#### **6.4.9 High costs of operation**

The operation of the proposed project may introduce high costs of operation for external small-scale miners who need to transport their stones to the proposed site for extraction. These costs can arise due to various factors, including transportation fees, processing charges, and compliance with project-specific regulations.

External miners may face increased financial burdens associated with transporting their mined stones to the processing facility, impacting their overall profitability. Additionally, the need for adherence to project standards and the use of specific processing methods may entail additional expenses for the miners.

It is crucial for the project to consider the economic implications for external small-scale miners and explore mechanisms to minimize their financial strain, such as providing transparent fee structures, offering support for transportation logistics, or establishing collaborative initiatives that ensure fair compensation for the miners' contributions. Balancing the economic considerations for external miners is essential for fostering a sustainable and mutually beneficial relationship between the project and the broader small-scale mining community.

#### **6.4.10 Conflicts over collection of revenues**

The operation of the proposed gold ore processing and washing facilities may lead to conflicts over the collection of revenues between the government and the group of miners who have provided the area for the project.

The allocation of areas for mining activities and the subsequent establishment of the project introduce complexities in revenue sharing and taxation. Disputes may arise regarding the distribution of financial benefits, royalties, and taxes between the government and the group of miners who have provided the area for the project.

Clear legal frameworks, transparent agreements, and effective communication channels are essential to preemptively address potential conflicts, ensuring a fair and equitable distribution of revenues and fostering a collaborative and sustainable mining environment.

#### **6.4.11 SEA/SH Risks for Women Working in Mgusu Mining Area**

Women working in the Mgusu small-scale mining area face high risks of Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH). These risks occur because mining environments are crowded, informal, and have limited supervision. Women miners and those working at washing facilities are vulnerable to unwanted sexual advances, pressure to provide sexual favors, verbal harassment, and even physical or sexual assault.

Female volunteers who work part-time in washing and processing areas are especially at risk due to their young age and limited protection. Perpetrators may include pit owners, male miners, supervisors, gold buyers, and other workers around the mining site.

Because reporting systems are weak and stigma is high, many cases go unreported. This makes the problem long-lasting and harmful to women's safety, health, and livelihoods. Overall, the SEA/SH risk in the Mgusu mining area is high, long-term, and requires strong prevention and response actions.



Table 6-5: Assessment of Negative Impacts Significant and Risks

S/N	Impact/Aspect Description	Nature	Magnitude	Extension	Duration	Significance of Impact
1	Deficiency of water in local area due to uses of water during operation of the gold ore processing plant and washing facilities specifically during the washing and cleaning operations	Direct	High	IIA	Long-term	Major
2	Improper storage of expired chemicals, chemical containers and mismanagement of sanitary waste and disposal of hazardous chemicals may result to water and soil contamination as the result poses risk to human health and aquatic organisms and decrease the soil fertility.	Direct	High	IIA	Long-term	Major
2	Improper management of effluent from the gold ore processing and washing facilities project, particularly during ore leaching and washing phases, poses a risk of contaminating surface water sources.	Direct	High	IIA	Long-term	Major
3	Excessive noise levels primarily from activities such as crushing, grinding, machinery operations, and transportation during operation of the gold ore and washing facilities establishment.	Direct	High	IIA	Medium-term	Major
4	Emissions from processes such as crushing, grinding, and smelting may release pollutants into the air, including particulate matter, heavy metals such as mercury, lead, cadmium, and arsenic, sulfur dioxide (SO <sub>2</sub> ), nitrogen oxides (NO <sub>x</sub> ), volatile organic compounds (VOCs), and borax compounds posing adverse effects on both the local environment and public health.	Direct	High	IIA	Long-term	Major
5	Activities such as excavation, ore processing, and waste disposal can disturb the soil structure, potentially leading to erosion and sedimentation in nearby areas.	Indirect	High	IIA	Long-term	Major
6	Exposure to chemicals, noise, vibration, ergonomic challenges, respiratory hazards, and machinery accidents are among the potential risks of the proposed establishment.	Direct	High	IIA	Long-term	Major
7	Notable road accident risks, encompassing factors such as heavy traffic congestion, inadequate road infrastructure, driver fatigue and stress, insufficient training, weather-related challenges, community interactions, and potential overloading or unsecured loads. These risks pose threats to both the safety of individuals involved in transportation and the broader community.	Indirect	Medium	IIA	Long-term	Major

S/N	Impact/Aspect Description	Nature	Magnitude	Extension	Duration	Significance of Impact
8	The extensive use of sodium tetraborate in smelting process raises concerns about the potential toxicity and environmental impact of chemical residues. The disposal of tailings and waste rock, if not properly managed, can lead to soil erosion, sedimentation in nearby water sources, and contamination of surface and groundwater. Wet tailings impoundments and the release of effluents during heavy rainfall events pose additional risks of water and soil pollution.	Direct	High	IIA	Long-term	Major
9	External miners may face increased financial burdens associated with transporting their mined stones to the processing facility, impacting their overall profitability.	Indirect	High	IIA	Long-term	Moderate
10	The allocation of areas for mining activities and the subsequent establishment of the project introduce complexities in revenue sharing and taxation. Disputes may arise regarding the distribution of financial benefits, royalties, and taxes between the government and the group of miners who have provided the area for the project.	Direct	High	DIA	Long-term	Moderate
11	Women working in the Mgusu small-scale mining area face high risks of Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH). These risks occur because mining environments are crowded, informal, and have limited supervision. Women miners and those working at washing facilities are vulnerable to unwanted sexual advances, pressure to provide sexual favors, verbal harassment, and even physical or sexual assault.	Indirect	Medium	IIA	Long-term	Major

## 6.5 Assessment of Anticipated Negative Environmental and Social Impacts during Decommissioning Phase

Decommissioning of the proposed project operations may have several impacts on the environment. During this phase, the removal of infrastructure, cessation of mining activities, and site restoration efforts will be undertaken. Potential impacts include changes in land use and vegetation patterns, which could affect local ecosystems. The restoration process, while aimed at returning the site to a more natural state, may initially disturb the environment. Soil quality and composition may be altered, and the removal of built structures could lead to visual changes in the landscape.

Additionally, decommissioning may generate waste materials, and their proper disposal or management will be crucial to prevent environmental contamination. Community involvement and consultation during the decommissioning phase are essential to address concerns, consider local perspectives, and implement effective mitigation measures for a sustainable transition from active operations to site closure.

## 6.6 Residual Impacts

The residual social and environmental impacts from the proposed project implementation may include lasting effects on both the community and the surrounding ecosystem. Socially, there could be lingering changes in local livelihoods, particularly for small-scale miners who may experience shifts in economic activities. The project's influence on local cultures and social dynamics might endure, and community cohesion could be affected. Additionally, long-term health and safety concerns, particularly related to potential exposure to chemicals during the project's operation, may persist.

Environmentally, the landscape may be altered, with changes in vegetation patterns and soil quality that could endure beyond the project's active phase. The potential release of contaminants during the mining and processing activities may have lasting effects on water quality in the area. The decommissioning phase might leave a footprint on the land, and if not properly managed, the residual impacts could include soil erosion, habitat disruption, and potential long-term consequences for local biodiversity.

To mitigate these residual impacts, a comprehensive environmental management plan, ongoing monitoring, and adaptive strategies are crucial. Continuous engagement with the local community, adherence to environmental regulations, and the implementation of sustainable practices are essential components of minimizing and addressing the residual social and environmental impacts of the proposed project.

## 6.7 Positive Impacts Associated with the Project during Mobilization/Construction phase

1. **Job Creation:** The construction phase will generate employment opportunities for local community members, including miners and skilled laborers, providing them with an additional source of income.
2. **Skills Development:** The project construction activities may involve training programs for local workers, enhancing their skills and knowledge in construction and mining-related processes, thereby promoting capacity building within the community.
3. **Income Generation:** The increased economic activity during the construction phase can boost local businesses, as workers and construction crews may require goods and services, contributing to income generation for local entrepreneurs.
4. **Infrastructure Development:** The construction of the VAT Leaching Process and Carbon In Column (CIC) Processing System may require the development or improvement of infrastructure such as roads and utilities, leading to lasting benefits for the community's overall infrastructure.
5. **Community Engagement:** Project construction provides an opportunity for active community engagement and collaboration. Local stakeholders may be involved in consultations, and their feedback could be considered, fostering a sense of participation and ownership in the project.

6. **Health and Safety Standards:** The project's commitment to health and safety standards during construction ensures a secure working environment, minimizing risks and promoting the well-being of the construction workforce and the local community.
7. **Environmental Mitigation:** The construction phase will include measures to mitigate environmental impacts, promoting responsible construction practices and demonstrating the project's commitment to environmental sustainability.
8. **Social Infrastructure Support:** The project may contribute to the improvement or establishment of social infrastructure, such as schools and healthcare facilities, as part of corporate social responsibility initiatives.
9. **Knowledge Transfer:** Collaboration with local communities during construction provides opportunities for knowledge transfer. Local workers may gain insights into modern construction and mining technologies, contributing to skills enhancement and potential future employment opportunities.
10. **Economic Diversification:** The construction phase injects funds into the local economy, supporting economic diversification beyond traditional mining activities and creating a more resilient and varied economic base for the community.

## 6.8 Positive Impacts Associated with the Project during Operation and Maintenance phase

1. **Environmental Sustainability:** The project aims to minimize the usage of mercury in gold extraction, contributing to reduced environmental pollution and the protection of water resources.
2. **Health Benefits:** By minimizing mercury usage, the project enhances the health and well-being of the local community and miners, mitigating the adverse health effects associated with mercury exposure.
3. **Technological Advancements:** The adoption of mercury-free gold extraction technologies showcases innovation and sets a precedent for sustainable mining practices, encouraging the use of cleaner and safer methods in the industry.
4. **Economic Empowerment:** The efficient and user-friendly technology implemented in the project promotes increased daily gold availability, positively impacting the economic survival of small-scale miners and the broader community.
5. **Community Collaboration:** The focus on technology that aligns with the needs of small-scale miners fosters positive relationships, contributing to a collaborative working environment and community engagement.
6. **Reduced Soil Erosion:** Proper waste management and containment strategies implemented by the project reduce the risk of soil erosion and sedimentation, minimizing the impact on the local ecosystem.
7. **Capacity Building:** The project may include training programs for small-scale miners on the use of mercury-free technologies, contributing to capacity building and skill development within the local workforce.
8. **Positive Socio-Economic Impacts:** The overall positive impacts of the project contribute to the socio-economic development of the region, creating a sustainable and responsible model for gold extraction in the community.

## 6.9 Risk Assessment

Conducting a risk assessment for the environmental and social impacts of implementation of the gold ore and washing facilities establishment in Machinjioni Mtaa, Geita Town Council involves a detailed analysis of the potential risks associated with the gold ore and washing facility activities. Here's an outline of how this assessment might be structured:

**Identification of Impacts:** done via a Leopold matrix () whereby a number of environmental and socioeconomic risks were identified throughout the lifespan of the project.

**Assessment of Impacts:** This was done by assessing, *Nature, Extension, Duration* and *Magnitude of each impact* (Table 6-2). *This is done on the backdrop of the site-specific baseline.*

**Probability Assessment:** Determine the likelihood of each risk, considering factors like gold ore extraction, regulatory compliance.

**Evaluation and Prioritization via Risk Matrix:** A 3x3 risk assessment matrix is a tool used to evaluate and prioritize risks based on their likelihood of occurrence and the severity of their impact. This matrix is particularly useful in assessing the environmental and social impacts of various projects or activities. It provides a structured and simple way to visualize and manage risks.

3x3 Matrix Layout:

Table 6-6: A 3 x3 Risk Matrix Layout

Likelihood \ Impact	Major	Moderate	Minor
Definite	High	Medium	Low
Probable	Medium	Medium	Low
Low	Low	Low	Low

Table 6-7: Risk Assessment for Identified Impacts during mobilization/construction

S/N	Impact/Aspect Description	Significance of Impact	Probability of Occurrence	Risk
1	Biodiversity loss, primarily attributed to site clearance activities required for project implementation preparation.	Moderate	Definite	Low Risk
2	Construction activities often require significant water for purposes such as dust suppression, concrete mixing, and general site maintenance. Increased water demand can strain local water resources, especially if the region is already facing water scarcity or if the available water sources are not managed efficiently.	Major	Definite	High Risk
3	Construction activities can disturb the existing soil structure, leading to compaction, erosion, and loss of topsoil. Excavation for foundations, road construction, and other infrastructure development may expose soil to erosion risks, especially during periods of heavy rainfall.	Moderate	Low	Low Risk
4	Increased vibration levels may occur as a result of heavy machinery, pile driving, and other construction activities. Vibrations can be transmitted through the ground, potentially impacting nearby structures, infrastructure, and the overall environment. Excessive vibrations have the potential to cause structural damage to buildings and homes, disrupt sensitive equipment, and create discomfort for residents in the vicinity.	Moderate	Low	Low Risk
5	Increased noise levels are anticipated as a consequence of various construction activities. The operation of heavy machinery, construction equipment, and vehicles can generate significant noise, potentially causing disturbances to the local environment and nearby communities. The continuous sound emissions may affect the overall acoustic environment and disrupt the daily activities of residents in the vicinity.	Major	Definite	High Risk
6	Dust emissions from earth-moving, excavation, and material transportation can lead to increased particulate matter in the air. Additionally, the operation of construction machinery and vehicles may release pollutants such as nitrogen oxides, sulfur dioxide, and volatile organic compounds, contributing to air pollution. Diesel-powered equipment can emit pollutants through exhaust fumes, further impacting local air quality.	Moderate	Definite	High Risk
7	Various occupational health and safety risks may occur. These include physical hazards such as falls, collisions, and crush injuries due to heavy machinery and equipment. Chemical exposure risks arise from construction materials and solvents, requiring proper handling to prevent health issues. Noise and vibration from construction activities can lead to hearing damage and musculoskeletal disorders, necessitating the use of personal protective equipment and monitoring. Ergonomic strain may result from repetitive tasks, awkward postures, or lifting heavy loads, and can be mitigated through ergonomic practices and training. Confined spaces pose risks of asphyxiation, exposure to harmful gases, or entrapment, requiring strict safety protocols for workers.	Major	Definite	High Risk

S/N	Impact/Aspect Description	Significance of Impact	Probability of Occurrence	Risk
8	Potential impacts on public health and safety, including traffic disruptions, accidents, dust and air quality concerns, noise and vibration issues, and visual disruptions. These impacts can lead to respiratory risks, safety hazards, and aesthetic concerns for the local community.	Moderate	Probable	Medium Risk

Table 6-8: Risk Assessment for Identified Impacts during operation

S/N	Impact/Aspect Description	Significance of Impact	Probability of Occurrence	Risk
1	Deficiency of water in local area due to uses of water during operation of the gold ore processing plant and washing facilities specifically during the washing and cleaning operations	Major	Definite	High Risk
2	Improper management of effluent from the gold ore processing and washing facilities project, particularly during ore leaching and washing phases, poses a risk of contaminating surface water sources.	Major	Probable	High Risk
3	Excessive noise levels primarily from activities such as crushing, grinding, machinery operations, and transportation during operation of the gold ore and washing facilities establishment.	Major	Definite	High Risk
4	Emissions from processes such as crushing, grinding, and smelting may release pollutants into the air, including particulate matter, heavy metals such as mercury, lead, cadmium, and arsenic, sulfur dioxide (SO <sub>2</sub> ), nitrogen oxides (NO <sub>x</sub> ), volatile organic compounds (VOCs), and borax compounds posing adverse effects on both the local environment and public health.	Major	Definite	High Risk
5	Activities such as excavation, ore processing, and waste disposal can disturb the soil structure, potentially leading to erosion and sedimentation in nearby areas.	Major	Probable	Medium Risk
6	Exposure to chemicals, noise, vibration, ergonomic challenges, respiratory hazards, and machinery accidents are among the potential occupational health and safety risks of the proposed establishment.	Major	Definite	High Risk
7	Notable road accident risks, encompassing factors such as heavy traffic congestion, inadequate road infrastructure, driver fatigue and stress, insufficient training, weather-related challenges, community interactions, and potential overloading or unsecured loads. These risks pose threats to both the safety of individuals involved in transportation and the broader community.	Major	Probable	High Risk

S/N	Impact/Aspect Description	Significance of Impact	Probability of Occurrence	Risk
8	The extensive use of sodium tetraborate in smelting process raises concerns about the potential toxicity and environmental impact of chemical residues. The disposal of tailings and waste rock, if not properly managed, can lead to soil erosion, sedimentation in nearby water sources, and contamination of surface and groundwater. Wet tailings impoundments and the release of effluents during heavy rainfall events pose additional risks of water and soil pollution.	Major	Probable	High Risk
9	External miners may face increased financial burdens associated with transporting their mined stones to the processing facility, impacting their overall profitability.	Moderate	Probable	Medium Risk
10	The allocation of areas for mining activities and the subsequent establishment of the project introduce complexities in revenue sharing and taxation. Disputes may arise regarding the distribution of financial benefits, royalties, and taxes between the government and the group of miners who have provided the area for the project.	Moderate	Probable	Medium Risk

## CHAPTER SEVEN

### 7 ANALYSIS OF ALTERNATIVES

#### 7.1 Introduction

Consideration of project alternatives is crucial in ensuring that the developer and decision-makers have a wider base from which they can choose the most appropriate option. An alternative can be defined as a possible course of action, in place of another, that would meet the same purpose and need.

According to the Environmental Management Act (EMA) of 2004 and the Environmental Impact Assessment and Audit Regulations, 2005 amended in 2018, analysis of alternatives should include project site, design and technologies and reasons for preferring the proposed site, design, and technologies. The following alternatives have been discussed.

#### 7.2 Alternative Site Location

Option	Description	Advantages	Disadvantages	Preferred
<b>A</b>	Machinjioni–Mgusu site (current proposal)	Located within existing PMLs; close to ore source; cooperative-owned land; avoids resettlement; minimal vegetation clearance	Moderate risk of cumulative impacts from nearby mining sites	Preferred
<b>B</b>	Alternative unmined area (~2 km south)	Provides greater buffer from existing mining pits	Requires new land acquisition, vegetation clearance, and access road construction	Not preferred

##### 7.2.1 Rationale

The Machinjioni–Mgusu site is already designated for mining under active Primary Mining Licenses (PMLs), minimizing new land disturbance and social displacement. It has existing access routes and infrastructure, making it the most practical and environmentally sustainable option.

#### 7.3 Technology Options for Ore Processing

Option	Description	Advantages	Disadvantages	Preferred
<b>A</b>	Conventional mercury-based amalgamation	Familiar to miners and low initial cost	Severe mercury pollution; health hazards; violates Minamata Convention	Not acceptable
<b>B</b>	Mercury-free gravity concentration (sluicing, panning, borax smelting)	Environmentally safe; higher gold recovery (≈70–80%); promotes technology transfer and aligns with EHPM Project	Requires training and equipment support	Preferred

##### 7.3.1 Rationale:

The mercury-free gravity concentration method offers a cleaner and safer approach, consistent with the **National Action Plan for Mercury Phase-Out (2020–2025)** and the objectives of the **Environmental Health and Pollution Management Project (EHPMP)**.

## 7.4 Water Supply Options

Option	Description	Environmental Impact	Reliability	Cost	Preferred
<b>A</b>	Groundwater abstraction from shallow boreholes (3–4 m <sup>3</sup> /hr yield)	Minimal ecological disturbance; renewable; groundwater quality within standards	Reliable throughout dry and wet seasons	Moderate	Preferred
<b>B</b>	Surface water abstraction from Mabubi River (~700 m away)	Potential for sedimentation, erosion, and aquatic disturbance	Seasonal flow variability	High (pipeline and pumping required)	Not preferred
<b>C</b>	Municipal supply (Geita Town water network)	Good quality and regulated	Distance >10 km; high connection cost	Very high	Not feasible

### 7.4.1 Rationale

Groundwater from on-site boreholes provides sufficient quantity and quality for operational use without significant ecological disturbance. This option ensures sustainability and avoids direct impacts on Mabubi River ecosystems.

## 7.5 Energy Supply Options

Option	Description	Environmental Impact	Reliability	Cost	Preferred?
<b>A</b>	TANESCO national grid connection	Clean and low emission source	Reliable; readily available near site	Moderate connection cost	Preferred
<b>B</b>	Diesel generator (standby)	Noise and air emissions (SO <sub>2</sub> , NO <sub>x</sub> , particulates)	Reliable for backup use	High operating cost	Supplementary only
<b>C</b>	Solar photovoltaic hybrid system	Renewable; near-zero emissions	High capital cost	Moderate	To be piloted in later expansion

### 7.5.1 Rationale

The primary energy source will be TANESCO grid power, with a diesel generator used only as backup during outages. Future integration of solar PV will be explored to further reduce carbon emissions and operational costs.

## 7.6 “No Project” Scenario

Under this scenario, the proposed facility would not be established, and artisanal miners would continue using unsafe, mercury-based gold recovery methods. This would perpetuate mercury pollution, land degradation, and occupational health risks, contrary to national environmental objectives and international obligations under the *Minamata Convention*.

### 7.6.1 Rationale

The “no project” alternative is environmentally and socially undesirable, as it would prevent the introduction of safer mercury-free processing technology and hinder ongoing national efforts to formalize and improve artisanal and small-scale gold mining (ASGM) practices.

### 7.7 Conclusion

After comparing all feasible alternatives, the preferred project design includes:

- **Location:** Machinjoni–Mgusu site (within existing PMLs)
- **Technology:** Mercury-free gravity concentration and borax smelting
- **Water Supply:** Groundwater abstraction from existing boreholes
- **Energy Source:** TANESCO grid with diesel backup and future solar integration

This combination offers the most sustainable, cost-effective, and environmentally responsible solution for the project, aligning with both national policy and World Bank Environmental and Social Standards (ESS1, ESS3, ESS4, ESS10).

## CHAPTER EIGHT

### 8 ENVIRONMENTAL AND SOCIAL MITIGATION MEASURES

#### 8.1 Overview

This chapter provides a summary of mitigation measures of those impacts which are considered of moderate to high significance, by matching the predicted impact, possible mitigation measure, the target levels, responsible entity and approximate cost. It also presents a detailed plan to monitor the implementation and success of the mitigation measures.

For each impact identified in this Scoping phase will be assessed during this study, mitigation measures will be proposed to reduce and/or avoid negative impacts and enhance positive impacts. Typical mitigation measures are detailed in Table 8-1.

Table 8-1: Impact Mitigation Measures

Approach	Example
Avoid	Change of site details, to avoid important ecological or archaeological features
Reduce	Filters, precipitators, noise proof, dust, enclosures, visual screening, wildlife corridors, and changed time of activities
Minimize	Minimize emissions and waste generation
Replace	Regenerate similar habitat of equivalent ecological value in different location
Restore	Site restoration after construction

These mitigation measures will be incorporated into an Environmental Management Plan (EMP) to facilitate implementation during the planning, construction, operational and decommissioning phases.

#### 8.2 Proposed mitigation measures

The mitigation measures are proposed against the impacts identified which will be assessed during the Environmental and Social Impact Assessment Study.

Table 8-2: Mitigation Measures

Phase	Potential Impacts	Management/Mitigation Measures
Site Selection	Accelerated erosion due to loss of ground cover	<ul style="list-style-type: none"> <li>▪ Where practicable all excavations will be backfilled, resurfaced and lightly compacted;</li> <li>▪ Progressive rehabilitation and re-vegetation of disturbed land surfaces and haul road shoulders will be ensured.</li> </ul>
	Loss/disturbance of biodiversity and threatened species	<ul style="list-style-type: none"> <li>▪ Minimum vegetation clearance will be ensured by clearing only those areas that are utilized for mining activities. A “permit to clear” procedure shall be established to control and monitor vegetation clearance.</li> <li>▪ All topsoil within the project area will be stockpiled for future use during rehabilitation.</li> <li>▪ Employees and subcontractors shall not be permitted to remove vegetation or fauna from site.</li> <li>▪ The project proponent will propose appropriate ways of harvesting and disposing of the wood such as allowing the villagers to take what they need.</li> <li>▪ Indigenous tree seeds will be collected and germinated to obtain seedlings for rehabilitation</li> <li>▪ Consultations with village leaders will be conducted to raise their awareness on the dangers and the importance of conservation of biodiversity.</li> <li>▪ The project proponent shall consult the experts for advice and for potential flora stocks for re generation of disturbed vegetation in mined areas.</li> </ul>
Mobilization/Construction Phase	Disturbance of air quality	<ul style="list-style-type: none"> <li>▪ Douse the surface with water to suppress excessive dust and whenever possible, water bowser should be used.</li> <li>▪ The contractor should use water spray systems during demolition to suppress dust.</li> <li>▪ Haul roads should be routinely maintained in good condition</li> <li>▪ Due care will be taken during site clearing and stripping of top soils during haul roads and in the project area.</li> <li>▪ Efficiently manage construction waste by segregating and disposing of it appropriately. This will minimize the potential for air pollution from debris and waste materials.</li> <li>▪ Enclose construction areas where feasible to minimize the dispersion of pollutants into the surrounding air. This can be done by installing temporary walls or fencing around the construction site to act as a physical barrier which can be made of wood, metal, or other suitable materials. Also, use of containment nets made of sturdy mesh or fabric to enclose the construction area so as to prevent debris and dust from escaping while allowing for ventilation.</li> <li>▪ The contractor should observe the standards for air quality by setting up monitoring stations and continuously monitoring air quality around the construction site to assess effectiveness of the proposed mitigation measures and identify areas where additional control is required.</li> <li>▪ Minimize truck movement, this means vehicles will be used only when it is necessary.</li> <li>▪ Using vehicles and machinery with good conditions. Regular servicing and maintenance checks can prevent excessive exhaust emissions.</li> <li>▪ The contractor should consider utilizing solar or electric power sources for on-site operations, reducing the need for diesel generators.</li> <li>▪ Provide protective gear (i.e. breathing masks) to workers working in dusty environment</li> </ul>

Phase	Potential Impacts	Management/Mitigation Measures
		<ul style="list-style-type: none"> <li>Responsible usage of trucks e.g. instead of using 3 tons track to carry loads twice is better to use 7 tons trucks which will only make one trip to reduce amount of carbon emissions.</li> </ul>
	Increased noise levels	<ul style="list-style-type: none"> <li>Installation of temporary noise barriers made of sound-absorbing materials like wood, foam, or reinforced plastic around construction zones. These barriers can significantly reduce noise propagation beyond the construction area.</li> <li>Implement specific working hours and construction schedules to limit noisy activities during sensitive times, such as early morning or late evening, when residents are likely to be affected.</li> <li>Ensure that all construction machinery and equipment are adequately maintained and lubricated to minimize noise generated by mechanical components.</li> <li>Conduct educational campaigns to inform the community about the construction schedule, expected noise levels, and measures being taken to minimize noise impacts.</li> <li>Position noisy equipment and machinery strategically within the construction site to direct noise away from sensitive receptors, such as residences.</li> <li>Establish buffer zones between the construction site and residential areas, utilizing empty plots or green spaces to act as a noise barrier.</li> <li>Minimize truck movement, this means vehicles will be used only when it is necessary.</li> <li>Using cars with good conditions, cars with good conditions have the potential of having less noise pollution.</li> <li>Responsible usage of tracks e.g. instead of using 3 tons track to carry loads twice is better to use 7 tons track which will only make one trip to minimize noise polluted.</li> <li>Provide protective gear (i.e. ear muffs) to workers working in noisy environment.</li> </ul>
	Destruction of the built environment due to increased vibration levels	<ul style="list-style-type: none"> <li>The Contractor implement real-time vibration monitoring using specialized sensors to track vibration levels during construction. Adjust construction activities to maintain vibrations within safe limits.</li> <li>Conduct regular maintenance and inspections of heavy machinery and equipment to ensure they are functioning correctly, reducing the likelihood of excessive vibrations.</li> <li>Limit high-vibration construction activities to specific hours during the day to minimize disturbance to residents and structures.</li> <li>Communicate with the community about the construction activities and potential vibrations, emphasizing safety measures being implemented to mitigate their impact.</li> <li>Involve structural engineers to assess nearby structures and recommend reinforcement or protective measures against potential vibration damage.</li> <li>Train operators to use construction equipment properly, avoiding unnecessary vibration-causing actions or overuse of machinery.</li> <li>A detailed analysis considering specific construction plans, vibration levels, and structural conditions should be conducted before beginning of construction activities.</li> </ul>
	Impacts on soil quality	<ul style="list-style-type: none"> <li>Where practicable all excavations should be backfilled, resurfaced and lightly compacted;</li> <li>Progressive rehabilitation and re-vegetation of disturbed land surfaces after construction activities.</li> <li>Store chemicals appropriately and handle them with care to prevent spills and leaks.</li> </ul>

Phase	Potential Impacts	Management/Mitigation Measures
	<p>Degradation of natural beauty, outbreak of diseases and injuries due to improper management of surrounding waste materials (Solid and Liquid Waste)</p>	<ul style="list-style-type: none"> <li>▪ Implement a strict waste management plan to ensure proper disposal of construction waste and hazardous materials, minimizing soil contamination risks.</li> <li>▪ Contractor should develop a detailed waste management plan that outlines waste segregation, recycling, and proper disposal procedures for both solid and liquid waste during construction activities. This plan should be communicated and enforced rigorously across all construction sites.</li> <li>▪ Contractor should implement a waste segregation system at source to separate different types of waste (e.g., construction debris, food waste, hazardous materials). Promote recycling initiatives for recyclable materials, reducing the volume of waste sent to landfills.</li> <li>▪ Regular training and awareness programs should be conducted to workers about proper waste handling, segregation, and disposal practices. Emphasis should be put on the importance of responsible waste management for the environment and public health.</li> <li>▪ Development of specific procedures for handling and disposing of hazardous waste generated during construction. Ensure that hazardous waste is securely stored, transported, and disposed of in compliance with safety regulations.</li> <li>▪ Contractor should establish a routine waste collection and transportation schedule to prevent waste accumulation at the construction sites. Coordinate with local waste management services to ensure timely waste removal.</li> <li>▪ Implement secure storage areas for waste, preventing unauthorized access and scavenging. Properly secure waste containers to prevent spillage and scattering.</li> <li>▪ Contractor should enforce stringent health and safety regulations to reduce the risk of accidents and injuries related to waste management. Provide workers with appropriate personal protective equipment (PPE) and training on safe waste handling.</li> </ul>
	<p>Impacts on water sources</p>	<ul style="list-style-type: none"> <li>▪ Siltation of down-slope streams and ditches will be prevented through the construction of run-off control systems around material stockpiles, waste dump</li> <li>▪ Ensure proper management and storage of chemicals used during construction activities to prevent spills and leaks that could contaminate water sources.</li> <li>▪ Properly manage the construction site to minimize disturbance to natural hydrology. Strategically plan the layout and construction sequence to minimize disruption to surface water flows.</li> <li>▪ Encourage efficient water use within the construction site by optimizing water use for construction purposes, ensuring equipment and tools are regularly maintained to minimize leaks, and using water-saving technologies.</li> </ul>
	<p>Public health and safety risks</p>	<ul style="list-style-type: none"> <li>▪ Enforce stringent health and safety regulations compliant with local laws and international standards. Regularly inspect and monitor construction activities to ensure compliance and promptly address any violations.</li> <li>▪ Implement strict waste management practices to control and dispose of waste properly. Monitor and regulate the disposal of hazardous waste to prevent environmental pollution and health risks.</li> <li>▪ Designate clearly marked zones for different activities within the construction site to prevent accidents and improve organization. Implement robust traffic management plans to reduce congestion and minimize the risk of vehicle-related incidents.</li> </ul>

Phase	Potential Impacts	Management/Mitigation Measures
		<ul style="list-style-type: none"> <li>▪ Provide alternative access to pedestrians.</li> <li>▪ Engage with the local community to create awareness about potential risks, safety measures, and emergency contact information. Encourage reporting of any safety concerns.</li> <li>▪ Conduct periodic safety audits to evaluate the effectiveness of implemented safety measures and identify areas for improvement.</li> </ul>
	Occupational health and safety risks	<ul style="list-style-type: none"> <li>▪ Provide thorough safety training for all personnel, focusing on specific risks related to heavy machinery operation, construction materials handling, electrical equipment use, and other relevant hazards.</li> <li>▪ Mandate the consistent use of appropriate PPE, including helmets, gloves, safety goggles, high-visibility vests, and steel-toe boots, to minimize the risk of injuries and accidents.</li> <li>▪ Implement a weather monitoring system to anticipate and respond to adverse wind conditions, allowing for temporary shutdowns or adjustments to operations when necessary.</li> <li>▪ Implement clear and visible safety signage, color-coding, and zoning within the construction site to guide workers and visitors and prevent accidents due to congestion and confusion.</li> <li>▪ Conduct regular safety briefings and toolbox talks to reinforce safety protocols, highlight potential hazards, and encourage active participation in maintaining a safe work environment.</li> <li>▪ Ensure that workers are trained to use machinery and equipment safely and perform routine maintenance checks to identify any faults or issues that could lead to accidents.</li> <li>▪ Establish and communicate detailed emergency response procedures, including evacuation plans, assembly points, and first aid stations, to swiftly respond to any accidents or emergencies.</li> <li>▪ Safe Material Handling Practices: Train workers on safe and proper handling of construction materials, emphasizing techniques to minimize strain and injury during lifting, moving, and storing.</li> <li>▪ Conduct periodic safety audits and inspections of the construction site to identify potential hazards, unsafe practices, and areas for improvement in safety protocols.</li> <li>▪ Encourage and facilitate immediate reporting of injuries or near misses, and conduct thorough investigations to identify the root causes and implement preventive measures.</li> <li>▪ Establish a health surveillance program to monitor the health of workers, especially those exposed to specific occupational risks, and provide necessary medical support and follow-ups.</li> <li>▪ Ensure proper erection, inspection, and safe use of scaffolds and ladders, with clear guidelines on weight limits, secure anchoring, and fall protection.</li> <li>▪ The contractor will document procedures for the control of substances hazardous to health</li> <li>▪ The contractor shall provide protective gear and ensure that they are used during construction.</li> </ul>
	Risk of SEA/SH against women and girls (workers and community members)	<ul style="list-style-type: none"> <li>• Conduct basic GBV/SEA/SH awareness sessions using local leaders, women groups, CDO, village government.</li> <li>• Display simple GBV reporting posters (Swahili) at mining washing points, shops, gathering areas.</li> <li>• Establish a confidential reporting channel through village GBV focal person or women's group leader.</li> <li>• Sensitize workers on zero-tolerance against harassment, sexual favors, and violence.</li> <li>• Require all workers to sign a simple Code of Conduct (CoC).</li> </ul>

Phase	Potential Impacts	Management/Mitigation Measures
		<ul style="list-style-type: none"> <li>• Avoid employing workers with known history of violence or misconduct.</li> <li>• Ensure lighting in public areas and pathways around mining and washing points.</li> <li>▪ Provide separate sanitation and bathing areas for men and women.</li> </ul>
	Gender inequality in job allocation and wages	<ul style="list-style-type: none"> <li>• Encourage recruitment of women in roles suitable for their skills (sorting, crushing, administrative work, first aid assistants).</li> <li>• Ensure equal pay for equal work.</li> <li>• Prohibit discrimination in job assignment and promotion.</li> <li>• Conduct short training for women (basic mining safety, ore washing, equipment handling).</li> <li>▪ Engage women's groups during hiring to ensure transparency.</li> </ul>
Operation	Air pollution	<ul style="list-style-type: none"> <li>▪ Douse the surface with water to suppress excessive dust and whenever possible, water Bowser shall be used.</li> <li>▪ Integrate state-of-the-art emission control technologies, such as dust collectors, scrubbers, and filters, into crushing, grinding, and smelting processes to capture and reduce particulate matter and heavy metal emissions.</li> <li>▪ Implement operational best practices to minimize the generation of pollutants. This includes optimizing process parameters, maintaining equipment regularly, and adopting efficient material handling techniques to reduce dust and emissions.</li> <li>▪ Engage with local communities to raise awareness about potential air quality impacts and the measures in place to mitigate them. Encourage community participation in monitoring and reporting air quality concerns.</li> <li>▪ Ensure strict compliance with local and national environmental standards for air quality. Regularly monitor emissions to verify adherence to prescribed limits.</li> <li>▪ Collaborate with air quality monitoring experts to strategically review and assess the existing air quality monitoring stations. Identify if new monitoring stations are needed to adequately cover the areas impacted by the introduced activities, especially those associated with the proposed gold ore processing and washing facilities.</li> <li>▪ Develop an emergency response plan specifically tailored for air quality incidents. This plan should include procedures for rapid containment and resolution of any unexpected air quality issues.</li> <li>▪ Explore the use of cleaner energy sources, such as renewable energy, to power project operations. This can contribute to reducing emissions associated with energy consumption.</li> <li>▪ Provide protective gear (i.e. breathing masks) to workers working in dusty environment.</li> <li>▪ Conduct periodic environmental audits to assess the effectiveness of air quality mitigation measures. Identify areas for improvement and implement necessary changes based on audit findings.</li> </ul>
	Impact on water sources	<ul style="list-style-type: none"> <li>• Implement a robust chemical management plan to ensure the safe handling, storage, and containment of sodium tetraborate used in smelting process.</li> <li>• Introduce a water recycling system within the processing facilities to minimize the demand for fresh water. Treated water from the leaching and washing stages can be recycled for subsequent use.</li> <li>• Construct sediment retention ponds as part of the water management infrastructure to capture sediments and contaminants, preventing their entry into natural water bodies (as suggested by the Basin Water Board).</li> </ul>

Phase	Potential Impacts	Management/Mitigation Measures
		<ul style="list-style-type: none"> <li>• Engage with local stakeholders, community members, and water management authorities to establish collaborative water management practices. This ensures that water resources are used responsibly and that the project's water demands are well-balanced.</li> <li>• Install sedimentation and filtration systems to prevent runoff from entering water sources.</li> <li>• Maintain buffer zones with vegetation around mine tailings and waste storage areas.</li> <li>• Avoid direct discharge of untreated process water into surface or groundwater.</li> <li>• Ensure proper storage and handling of chemicals used in mining processes.</li> <li>• Educate workers and communities about safe water use and risks of contamination.</li> <li>• Ensure that water quality analyses for all relevant parameters, both physical and chemical, are conducted for borehole and process/mine water, followed by regular and periodic monitoring to maintain water safety and compliance with applicable standards.</li> <li>• Establish monitoring boreholes around the tailing's storage facility or pond to regularly assess groundwater quality and detect potential contamination from mining activities.</li> </ul>
	Noise pollution and vibration	<ul style="list-style-type: none"> <li>▪ Integrate advanced soundproofing technologies in equipment and machinery to minimize noise emissions during crushing, grinding, and other operations. Implement operational controls, such as optimizing machinery settings and scheduling noisy activities during specific timeframes, to reduce overall noise and vibration levels.</li> <li>▪ Restrict noisy activities during daytime such that noise levels to the surrounding communities does not exceed 55 dB(A) day and 45 dB(A) night as per EHSGs respectively.</li> <li>▪ Designate buffer zones between the project site and residential areas to act as a physical barrier against noise propagation. Implement landscape design features, such as natural barriers and green spaces, to further absorb and mitigate noise and vibration impacts.</li> <li>▪ Establish a comprehensive monitoring program to regularly assess noise and vibration levels. Actively engage with the local community to gather feedback, address concerns, and incorporate community input into mitigation strategies.</li> <li>▪ Ensuring workers are not exposed to noise level above 85dBA for more than 8hours continuously.</li> <li>▪ Provide protective gear and ensure that they are used.</li> </ul>
	Impacts from disruption of soil quality	<ul style="list-style-type: none"> <li>▪ Develop and adhere to robust waste management practices to prevent the disposal of mining waste materials in a manner that could negatively impact soil quality.</li> <li>▪ Implement proper containment and disposal methods for tailings and waste rock.</li> <li>▪ Cover disturbed areas with appropriate materials or vegetation to stabilize the soil and prevent wind or water erosion.</li> <li>▪ Establish soil monitoring programs to regularly assess changes in soil quality and identify potential issues promptly.</li> <li>▪ Conduct soil tests to measure nutrient levels, pH, and other relevant parameters, adjusting management practices accordingly.</li> <li>▪ Develop emergency response plans to address unforeseen events, such as extreme weather conditions or accidental spills, to minimize the potential impact on soil quality.</li> </ul>

Phase	Potential Impacts	Management/Mitigation Measures
	Increased environmental degradation and pollution from waste generation	<ul style="list-style-type: none"> <li>• Implement advanced waste management systems to handle both solid and liquid waste generated during the gold ore processing and washing operations. Utilize technologies that allow for the efficient containment, treatment, and disposal of waste materials, minimizing environmental impact.</li> <li>▪ Establish robust containment measures for tailings and waste rock to prevent soil erosion, sedimentation, and the release of contaminants into water sources. Implement engineered solutions, such as lined tailings impoundments, to enhance containment effectiveness.</li> <li>▪ Develop and implement effective effluent treatment systems to treat liquid waste before discharge. Establish a robust monitoring program to continuously assess effluent quality and ensure compliance with environmental standards.</li> <li>▪ Establish protocols for the responsible disposal of solid waste generated during the gold ore processing. This includes proper landfilling, recycling, or reusing materials where feasible.</li> <li>▪ Engage with local communities, stakeholders, and workers to raise awareness about the project's waste management practices. Provide education and training programs to promote responsible waste handling and environmental conservation.</li> </ul>
	Road accidents from moving trucks	<ul style="list-style-type: none"> <li>▪ Develop and implement comprehensive transportation safety protocols for the movement of mined stones from various mines to the proposed extraction site. This includes speed limits, route planning, and adherence to traffic regulations;</li> <li>▪ Only the designated roads will be used during the project.</li> <li>▪ Road humps will be constructed in all populated areas along the road stretch to control traffic speed;</li> <li>▪ Traffic sign warning drivers of road humps, pedestrian crossings, animal crossings, sharp bends and other accident-prone areas will be posted along the road stretch.</li> <li>▪ Vehicles to be installed with speed control devices, e.g., speed governors as a way of limiting drivers from over-speeding;</li> <li>▪ Ensure that all drivers involved in the transportation of mined stones undergo comprehensive training on safe driving practices. Certify drivers based on their proficiency and adherence to safety standards.</li> <li>▪ Engage with the local community to raise awareness about transportation activities and potential risks. Foster a sense of shared responsibility for road safety.</li> </ul>
	Occupational Health and Safety Risks	<ul style="list-style-type: none"> <li>▪ Develop and implement thorough training programs for workers, emphasizing the potential occupational hazards associated with mining and processing activities.</li> <li>▪ Provide specialized training on the safe handling of chemicals, proper use of machinery, and adherence to safety protocols.</li> <li>▪ Enforce strict compliance with established safety protocols and procedures at all stages of processing.</li> <li>▪ Conduct regular safety drills and simulations to ensure that workers are well-prepared to respond to emergencies.</li> <li>▪ Supply adequate and appropriate personal protective equipment (PPE) to all workers, including respiratory protection, hearing protection, safety goggles, gloves, and other necessary gear.</li> <li>▪ Implement a mandatory policy requiring the consistent use of PPE in designated work areas.</li> </ul>

Phase	Potential Impacts	Management/Mitigation Measures
		<ul style="list-style-type: none"> <li>▪ Implement effective dust control measures, such as water spraying, dust suppression systems, or dust barriers, to minimize airborne particulate matter and protect workers from respiratory hazards.</li> <li>▪ Regularly monitor and assess dust levels to ensure the effectiveness of control measures.</li> <li>▪ Provide respiratory protection equipment to workers operating in areas with potential respiratory hazards, such as dust or chemical fumes.</li> <li>▪ Develop and communicate clear machinery safety guidelines, including proper operation and maintenance procedures.</li> <li>▪ Install safety features on machinery to prevent accidents, such as emergency shut-off switches, guards, and warning systems.</li> <li>▪ Establish continuous training initiatives to keep workers informed about the latest safety procedures and best practices.</li> <li>▪ Encourage a safety culture through regular safety meetings, workshops, and communication channels for reporting safety concerns.</li> <li>▪ Develop and regularly update comprehensive emergency response plans to address potential accidents or incidents promptly.</li> <li>▪ Conduct regular emergency drills to ensure that workers are familiar with evacuation procedures and emergency contacts.</li> </ul>
	High costs of operation	<ul style="list-style-type: none"> <li>• Establish clear and transparent fee structures that outline all associated costs for external small-scale miners.</li> <li>• Provide detailed information on processing charges, transportation fees, and any other relevant expenses.</li> <li>• Conduct regular reviews and consultations with external miners to ensure fee structures remain fair and reflective of economic conditions.</li> <li>• Explore the possibility of shared transportation services to minimize individual transport expenses.</li> <li>• Collaborate with local transport providers to negotiate favorable rates for bulk transportation of mined stones.</li> <li>• Encourage the formation of mining associations to negotiate collectively with the project and share operational costs.</li> <li>• Explore opportunities for financial assistance or micro-financing programs to alleviate immediate financial burdens.</li> <li>• Collaborate with financial institutions to create tailored financial solutions for small-scale miners.</li> <li>• Maintain open channels of communication with external miners to understand their concerns and challenges.</li> <li>• Establish a feedback mechanism to receive input on the economic impact of the project on external miners.</li> <li>• Conduct regular community meetings or forums to address queries and adapt mitigation measures based on community feedback.</li> </ul>
	Conflicts related to restricted access and trespassing	<ul style="list-style-type: none"> <li>▪ Awareness raising and education to the communities including posting banners and warning signs at appropriate places.</li> <li>▪ Memorandum of understanding between the village leaders and the project proponent</li> <li>▪ Village governments with support from project proponent strive to find alternative means and ways to help affected people e.g. women access to dead wood in the PML</li> </ul>

Phase	Potential Impacts	Management/Mitigation Measures
		<ul style="list-style-type: none"> <li>▪ Project proponent support the village governments to develop village-managed forests of indigenous tree species as well as planting of woodlots of fast-growing exotic species with the aim of easing pressure on resources found in the gold mining area</li> </ul>
	Conflicts over collection revenues	<ul style="list-style-type: none"> <li>▪ Develop clear and transparent revenue-sharing agreements between the government and the group of miners providing the project area.</li> <li>▪ Ensure that the terms of revenue distribution, including financial benefits, royalties, and taxes, are explicitly outlined and agreed upon by all parties.</li> <li>▪ Ensure that the project operates in compliance with existing laws and regulations, minimizing ambiguities that could lead to disputes.</li> <li>▪ Establish community benefit programs funded by the project's revenues to directly contribute to the welfare of the local community.</li> <li>▪ Ensure that a portion of the revenue is allocated to initiatives that promote local development, education, healthcare, and infrastructure.</li> <li>▪ Maintain transparent communication channels to keep all stakeholders informed about financial transactions, revenue distributions, and project developments.</li> <li>▪ Publish regular reports on revenue allocation and utilization, fostering trust and accountability.</li> </ul>
	Public health and safety risks	<ul style="list-style-type: none"> <li>• Implement rigorous chemical exposure management protocols to safeguard workers involved in gold extraction processes using sodium tetraborate.</li> <li>• Provide comprehensive training to workers on the safe handling, storage, and use of chemicals, emphasizing the importance of personal protective equipment (PPE).</li> <li>• Develop and implement sustainable water resource management practices to minimize the strain on local water resources.</li> <li>• Invest in water recycling and treatment facilities to reduce the overall demand for fresh water, mitigating potential impacts on water quality.</li> <li>• Install advanced emission control technologies to minimize air pollution from mining and processing activities.</li> <li>• Regularly monitor air quality in and around the project site to promptly address any deviations from established standards.</li> <li>• Implement soundproofing technologies and operational controls to minimize noise and vibration emissions.</li> <li>• Establish buffer zones between the project site and residential areas to mitigate potential disturbances to nearby communities.</li> <li>• Establish transparent and open communication channels with the local community to address concerns, provide regular updates, and gather feedback.</li> <li>• Conduct public awareness campaigns on the project's environmental and health measures to enhance understanding and cooperation.</li> <li>• Collaborate with local authorities to develop and implement traffic safety management plans, especially considering increased activity from other miners in the area.</li> </ul>

Phase	Potential Impacts	Management/Mitigation Measures
		<ul style="list-style-type: none"> <li>• Enhance road infrastructure, implement speed limits, and employ traffic control measures to reduce the risk of accidents during transportation.</li> <li>• Establish an environmental monitoring program to track key indicators and assess the effectiveness of mitigation measures.</li> <li>• Share monitoring results with relevant authorities, the local community, and external miners to maintain transparency.</li> </ul>
	Continued risk of SEA/SH at mining pits, washing facilities, and trading areas	<ul style="list-style-type: none"> <li>• Maintain active GBV focal persons in each mining cluster.</li> <li>• Install solar lights along common footpaths and washing sites to reduce night-time harassment.</li> <li>• Deploy trained female marshals/supervisors at washing areas.</li> <li>• Strengthen community reporting systems in collaboration with village government and local CSOs.</li> <li>• Conduct GBV/SEA/SH awareness and sensitization sessions every 3–6 months.</li> <li>• Enforce zero-tolerance against exploitation of women, including sexual favors for access to ore, washing points, or financial support.</li> <li>• Coordinate with local police gender desk for rapid response to reported cases.</li> </ul>
	Gender inequity in access to mining benefits and resources	<ul style="list-style-type: none"> <li>• Allocate specific workstations or washing stations for women miners to minimize conflict and male dominance.</li> <li>• Provide women miners with PPE, tools, or small grants through cooperative/women groups.</li> <li>• Support and encourage the creation of women-led mining groups (e.g., VICOBA).</li> <li>• Offer continuous training in business management, financial literacy, safety, and ore valuation to empower women.</li> </ul>

## CHAPTER NINE

### 9 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

#### 9.1 Introduction

The Environmental and Social Management Plan (ESMP) for the Mgusu Gold Ore Processing and Washing Facilities Project has been prepared in full compliance with the Mining Act, 2010, the Environmental Management Act (EMA), 2004, and their associated regulations, guidelines, and subsidiary legislation. The ESMP operationalizes the mitigation and management measures identified in the ESIA and translates statutory environmental and social obligations into implementable actions across all phases of the Project.

In accordance with the Mining Act, 2010, the ESMP ensures that mineral processing activities are conducted in a manner that prevents environmental degradation, protects occupational health and safety, and safeguards surrounding communities. The Plan addresses statutory requirements related to mine health and safety, waste and tailings management, pollution prevention, rehabilitation, and closure obligations, as required under mining license conditions.

Consistent with the Environmental Management Act (EMA), 2004, the ESMP provides a framework for preventing, minimizing, mitigating, and monitoring adverse environmental and social impacts arising from Project activities. It establishes clear institutional responsibilities, monitoring mechanisms, reporting procedures, and corrective actions in line with national environmental standards and permit conditions issued by the National Environment Management Council (NEMC).

In addition, the ESMP has been structured to align with Good International Industry Practice (GIIP) and the World Bank Environmental and Social Framework (ESF), particularly ESS1 (Assessment and Management of Environmental and Social Risks and Impacts), ESS2 (Labor and Working Conditions), ESS3 (Resource Efficiency and Pollution Prevention), ESS4 (Community Health and Safety), and ESS10 (Stakeholder Engagement and Information Disclosure). Where national legislation and World Bank requirements differ, the more stringent standard shall apply.

Accordingly, the ESMP serves as the primary environmental and social management instrument for the Mgusu Project, ensuring regulatory compliance, promoting sustainable mineral processing practices, and providing a basis for continuous environmental and social performance improvement throughout the Project lifecycle.

#### 9.2 Objectives of the ESMP

The objectives of the ESMP are to:

- i. Ensure compliance with applicable national laws and regulations, including EMA (2004), mining-related regulations, and World Bank ESF requirements.
- ii. Promote effective environmental and social management and communicate ESMP obligations to all Project personnel and stakeholders.
- iii. Integrate environmental and social considerations into Project design, construction, operation, and decommissioning activities.
- iv. Ensure contractors, operators, and workers comply with environmental, occupational health and safety, and labor standards.
- v. Address concerns raised during stakeholder consultations and incorporate them into Project management measures.
- vi. Provide a clear and actionable framework for implementing mitigation measures identified in the ESIA.
- vii. Establish monitoring, reporting, and corrective action mechanisms for environmental and social performance.
- viii. Ensure adverse impacts are managed effectively throughout all phases of the Project.

### 9.3 Management Policies and Procedures

The Project Proponent, Mgusu Miners Cooperative Society, shall establish and implement documented management policies to guide Project implementation. These policies are intended to:

- Maintain transparent and constructive engagement with stakeholders;
- Protect the health, safety, and welfare of workers and surrounding communities;
- Ensure systematic monitoring of environmental and social performance; and
- Demonstrate commitment to responsible, sustainable, and mercury-reduced gold processing practices.

The core management policies and procedures include:

- Environmental Management Policy
- Occupational Health and Safety (OHS) Policy
- Community Relations and Stakeholder Engagement Policy
- Chemical Management Procedures
- Chance find procedures
- Traffic Management Procedures

#### 9.3.1 Environmental Management Policy

The Environmental Management Policy commits the Project Proponent to conducting all Project activities in an environmentally responsible manner consistent with national legislation and GIIP. Key principles include:

- Compliance with EMA (2004), applicable environmental regulations, permit conditions, and World Bank ESF requirements;
- Pollution prevention and control, particularly in relation to air emissions, effluents, tailings, and solid waste;
- Sustainable use of water and other natural resources;
- Protection of surrounding land, surface water, and groundwater from contamination;
- Promotion of environmental awareness among workers and local communities, particularly regarding mercury risks and environmental protection; and
- Continuous improvement of environmental performance through monitoring and adaptive management.

#### 9.3.2 Occupational Health and Safety Policy

The Occupational Health and Safety (OHS) Policy aims to safeguard the health and safety of Project workers and nearby communities during all Project phases. The policy provides for:

- Pre-employment and periodic medical examinations for workers;
- Provision of adequate sanitation, hygiene, and welfare facilities;
- Safe handling and storage of chemicals, including mercury and processing reagents;
- Emergency preparedness, fire prevention, and response planning;
- Provision, use, and maintenance of appropriate Personal Protective Equipment (PPE);
- Safe operation of crushers, washing facilities, generators, and ancillary equipment;
- Measures to prevent accidents, injuries, and occupational diseases; and
- Regular training and awareness programs on workplace safety and emergency response.

Risk prevention and control measures shall follow the hierarchy of controls:

1. Elimination of hazards where practicable;
  - i. Engineering controls to isolate or reduce risks at source;
  - ii. Administrative controls, including procedures and supervision; and
  - iii. Use of PPE as a last line of defense.

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### 9.3.3 Community Relations and Stakeholder Engagement Policy

The Community Relations Policy establishes a framework for continuous, inclusive, and culturally appropriate engagement with affected communities and stakeholders. The policy emphasizes:

- Coordination with local leaders, artisanal miners, and government authorities;
- Transparent and timely disclosure of Project information;
- Mechanisms for community feedback and grievance redress;
- Promotion of local employment and business opportunities, where feasible; and
- Support for community awareness on environmental protection, health, and safety.

### 9.3.4 Chemical Management Procedures

These procedures aimed to to prevent occupational exposure, accidental spills, soil contamination, and pollution of surface and groundwater arising from the use of chemicals during ore processing, smelting, maintenance, and ancillary activities.

- A Chemical Management Procedure shall be developed and implemented prior to commencement of operations.
- All chemicals shall be stored in designated, secured, and clearly marked storage areas with impermeable floors and secondary containment (bundling capacity  $\geq 110\%$  of the largest container) and adequate ventilation and restricted access.
- An up-to-date chemical inventory and Safety Data Sheets (SDS) shall be maintained on site at all times.
- Incompatible chemicals shall be stored separately in accordance with SDS requirements.
- Handling of chemicals shall be undertaken only by trained personnel using appropriate Personal Protective Equipment (PPE).
- Spill prevention and response measures, including spill kits and emergency procedures, shall be available at all chemical storage and use locations.
- Waste chemicals and contaminated containers shall be collected, stored temporarily in labelled hazardous waste areas, and disposed of through NEMC-licensed hazardous waste handlers, in accordance with EMA (2004) and its subsidiary regulations.

### 9.3.5 Tailings and Effluent Management Procedures

The proposed Mgusu gold ore processing facility will generate both solid tailings and liquid effluent as a by-product of ore washing, sluicing, and gravity separation processes. Tailings are estimated at 15–20 tonnes per day, while process water effluent is expected to reach 6–10 m<sup>3</sup> per day. If not properly managed, these wastes have the potential to impact soil, surface water, groundwater, and air quality, particularly through wind-blown dust and metal-laden effluent.

Solid tailings will be deposited in an engineered containment facility located within the project boundary. The containment will feature:

- A HDPE-lined base (1.5 mm) to prevent seepage into the subsurface.
- Embankments below 3 m height with a minimum freeboard of 0.5–1.0 m to accommodate stormwater.
- Perimeter drainage to divert clean runoff away from the containment area.
- An internal decant system to allow clarified water recycling back into the plant.
- Emergency spillways to direct excess water into a sedimentation pond, capturing solids prior to any controlled discharge.

To mitigate particulate emissions, tailings surfaces will be periodically wetted, progressively covered with inert material as deposition reaches design height, and vegetative stabilization or temporary

tarpaulin covers will be applied. Windbreaks along exposed edges will further reduce fugitive dust, in line with the World Bank Environmental, Health, and Safety Guidelines (EHSGs) for Mining.

Process effluent contains suspended solids, residual silt, traces of metals (e.g., iron, manganese, zinc, mercury, arsenic), and residual borax. Effluent will be treated using a two-stage sedimentation system comprising a primary tailings pond and a polishing pond. Settled solids will be returned to the tailings facility, while clarified water, meeting Tanzanian regulatory standards under EMA (2004) Regulation 45, may be discharged in limited controlled quantities. Regular monitoring and maintenance are integral to environmental and operational compliance:

- Monthly inspections of embankments, liners, drainage channels, and dust control measures.
- Quarterly water quality sampling at the tailings ponds, polishing pond, adjacent wells, and the Mabubi River upstream and downstream. Parameters include pH, turbidity, total suspended solids, total dissolved solids, electrical conductivity, boron, and selected heavy metals.
- Annual engineering assessments to verify facility stability, containment capacity, and the effectiveness of dust and effluent management measures.

These measures ensure that tailings and effluent are managed in accordance with Good International Industry Practice (GIIP), Tanzanian environmental regulations, and the World Bank EHSGs for Mining. Through combined liquid and particulate control strategies, the facility minimizes risks to soil, water, air quality, and public health while maintaining operational efficiency.

### **9.3.6 Traffic Management and Road Safety Procedures**

These procedures are prepared with aim of minimizing traffic-related accidents, ensuring the safety of the community and workers, preventing damage to public and project infrastructure, and maintaining smooth operations during the construction and operational phases of the Mgusu Gold Ore Processing Facility

- A comprehensive TMP shall be developed prior to the commencement of any construction or ore transport activities.
- The TMP will outline all traffic routes, schedules, and safety measures to ensure minimal disruption to the surrounding community and the environment.
- Specific routes shall be designated for the movement of trucks and heavy equipment to minimize interaction with public roads and community areas.
- Delivery and transport schedules will be staggered to avoid peak hours and reduce congestion in residential or sensitive areas.
- Maximum speed limits shall be enforced within and around the project site, particularly near community areas and pedestrian zones.
- Temporary traffic control measures, such as barricades, warning cones, and designated pedestrian crossings, will be established as needed.
- All drivers and vehicle operators shall receive training on safe driving practices, emergency procedures, and load management.
- Vehicles shall undergo regular maintenance and inspections to ensure safe and reliable operation.
- Warning signs, speed limit signs, and directional indicators will be installed at key locations along haulage routes and within the project site
- Road safety awareness campaigns shall be conducted in collaboration with local authorities and community leaders to promote safe behavior and reduce risks to the public.
- All traffic incidents, near-misses, or violations shall be recorded in a dedicated log.
- Investigations shall be conducted promptly to identify causes and implement corrective measures to prevent recurrence.
- Lessons learned shall be incorporated into periodic updates of the TMP.

### **9.3.7 Cultural Heritage Chance Finds Procedure**

The procedures aimed at preventing damage to unknown cultural heritage resources during project activities. The proposed procedures include:

- All work in the area must stop immediately upon discovery of suspected cultural, historical, or archaeological materials.
- Secure and cordon off the discovery site to prevent disturbance or theft.
- Limit access to authorized personnel only.
- Notify relevant authorities, such as the Ministry of Natural Resources and Tourism (Antiquities Unit) and local government officials, within 24 hours.
- Authorities or qualified archaeologists will assess the significance of the find.
- Agree on mitigation measures, which may include documentation, salvage, or preservation in situ.
- Work can only resume in the affected area after written clearance is provided by the authorities and agreed mitigation measures are implemented.

#### **9.4 Personnel Responsible for the Implementation of the ESMP**

The client through the site management team will be responsible for ensuring implementation of the ESMP. The NEMC who is the proponent will also ensure that a procedure is developed such that all senior positions on site have their environmental responsibilities and accountabilities clearly outlined. These descriptions will form part of the contractual obligations upon which individual employees are engaged.

Table 9-1: Environmental and Social Management Plan

Phase	Potential Impacts	Management/Mitigation Measures	Target Standard	Level/	Responsibility	Estimated Costs [TZS]
Site Selection	Accelerated erosion due to loss of ground cover	<ul style="list-style-type: none"> <li>Where practicable all excavations will be backfilled, resurfaced and lightly compacted;</li> <li>Progressive rehabilitation and re-vegetation of disturbed land surfaces and haul road shoulders will be ensured.</li> </ul>	As previously	As minimum disturbance, as possible	Ministry of Minerals (to monitor)	11,000,000
	Loss/disturbance of biodiversity and threatened species	<ul style="list-style-type: none"> <li>Minimum vegetation clearance will be ensured by clearing only those areas that are utilized for mining activities. A “permit to clear” procedure shall be established to control and monitor vegetation clearance.</li> <li>All topsoil within the project area will be stockpiled for future use during rehabilitation.</li> <li>Employees and subcontractors shall not be permitted to remove vegetation or fauna from site.</li> <li>The project proponent will propose appropriate ways of harvesting and disposing of the wood such as allowing the villagers to take what they need.</li> <li>Indigenous tree seeds will be collected and geminated to obtain seedlings for rehabilitation</li> <li>Consultations with village leaders will be conducted to raise their awareness on the dangers and the importance of conservation of biodiversity.</li> <li>The project proponent shall consult the experts for advice and for potential flora stocks for re generation of disturbed vegetation in mined areas.</li> </ul>	As previously before the project	As minimum disturbance, as possible	Town Council, Ministry of Minerals (to monitor)	15,000,000
Mobilization/Construction Phase	Disturbance of air quality	<ul style="list-style-type: none"> <li>Douse the surface with water to suppress excessive dust and whenever possible, water bowser should be used.</li> <li>The contractor should use water spray systems during demolition to suppress dust.</li> <li>Haul roads should be routinely maintained in good condition</li> <li>Due care will be taken during site clearing and stripping of top soils during haul roads and in the project area.</li> <li>Efficiently manage construction waste by segregating and disposing of it appropriately. This will minimize the potential for air pollution from debris and waste materials.</li> </ul>	WHO Standards		Contractor	7,000,000
			Tanzania Standards for air quality- TZS 845:2005 Air Quality – Specification			

Phase	Potential Impacts	Management/Mitigation Measures	Target Standard	Level/ Responsibility	Estimated Costs [TZS]
		<ul style="list-style-type: none"> <li>▪ Enclose construction areas where feasible to minimize the dispersion of pollutants into the surrounding air. This can be done by installing temporary walls or fencing around the construction site to act as a physical barrier which can be made of wood, metal, or other suitable materials. Also, use of containment nets made of sturdy mesh or fabric to enclose the construction area so as to prevent debris and dust from escaping while allowing for ventilation.</li> <li>▪ The contractor should observe the standards for air quality by setting up monitoring stations and continuously monitoring air quality around the construction site to assess effectiveness of the proposed mitigation measures and identify areas where additional control is required.</li> <li>▪ Minimize truck movement, this means vehicles will be used only when it is necessary.</li> <li>▪ Using vehicles and machinery with good conditions. Regular servicing and maintenance checks can prevent excessive exhaust emissions.</li> <li>▪ The contractor should consider utilizing solar or electric power sources for on-site operations, reducing the need for diesel generators.</li> <li>▪ Provide protective gear (i.e. breathing masks) to workers working in dusty environment</li> <li>▪ Responsible usage of trucks e.g. instead of using 3 tons track to carry loads twice is better to use 7 tons trucks which will only make one trip to reduce amount of carbon emissions.</li> </ul>			
	Increased noise levels	<ul style="list-style-type: none"> <li>▪ Installation of temporary noise barriers made of sound-absorbing materials like wood, foam, or reinforced plastic around construction zones. These barriers can significantly reduce noise propagation beyond the construction area.</li> <li>▪ Implement specific working hours and construction schedules to limit noisy activities during sensitive times, such as early morning or late evening, when residents are likely to be affected.</li> <li>▪ Ensure that all construction machinery and equipment are adequately maintained and lubricated to minimize noise generated by mechanical components.</li> </ul>	WHO Standards Tanzania  Environmental Management (Quality standards for Control of Noise and Vibration Pollution) Regulation 2011 EHSG Noise Standards	Contractor	8,000,000

Phase	Potential Impacts	Management/Mitigation Measures	Target Standard	Level/	Responsibility	Estimated Costs [TZS]
		<ul style="list-style-type: none"> <li>▪ Conduct educational campaigns to inform the community about the construction schedule, expected noise levels, and measures being taken to minimize noise impacts.</li> <li>▪ Position noisy equipment and machinery strategically within the construction site to direct noise away from sensitive receptors, such as residences.</li> <li>▪ Establish buffer zones between the construction site and residential areas, utilizing empty plots or green spaces to act as a noise barrier.</li> <li>▪ Minimize truck movement, this means vehicles will be used only when it is necessary.</li> <li>▪ Using cars with good conditions, cars with good conditions have the potential of having less noise pollution.</li> <li>▪ Responsible usage of tracks e.g. instead of using 3 tons track to carry loads twice is better to use 7 tons track which will only make one trip to minimize noise polluted.</li> <li>▪ Provide protective gear (i.e. ear muffs) to workers working in noisy environment.</li> </ul>				
	Destruction of the built environment due to increased vibration levels	<ul style="list-style-type: none"> <li>▪ The Contractor implement real-time vibration monitoring using specialized sensors to track vibration levels during construction. Adjust construction activities to maintain vibrations within safe limits.</li> <li>▪ Conduct regular maintenance and inspections of heavy machinery and equipment to ensure they are functioning correctly, reducing the likelihood of excessive vibrations.</li> <li>▪ Limit high-vibration construction activities to specific hours during the day to minimize disturbance to residents and structures.</li> <li>▪ Communicate with the community about the construction activities and potential vibrations, emphasizing safety measures being implemented to mitigate their impact.</li> <li>▪ Involve structural engineers to assess nearby structures and recommend reinforcement or protective measures against potential vibration damage.</li> <li>▪ Train operators to use construction equipment properly, avoiding unnecessary vibration-causing actions or overuse of machinery.</li> </ul>	Environmental Management Act, Cap.191, Environmental Management Standards for Controlling Noise and Vibration Pollution) Regulations, 2011		Contractor,	3,000,000

Phase	Potential Impacts	Management/Mitigation Measures	Target Standard	Level/	Responsibility	Estimated Costs [TZS]
		<ul style="list-style-type: none"> <li>A detailed analysis considering specific construction plans, vibration levels, and structural conditions should be conducted before beginning of construction activities.</li> </ul>				
	Impacts on soil quality	<ul style="list-style-type: none"> <li>Where practicable all excavations should be backfilled, resurfaced and lightly compacted;</li> <li>Progressive rehabilitation and re-vegetation of disturbed land surfaces after construction activities.</li> <li>Store chemicals appropriately and handle them with care to prevent spills and leaks.</li> <li>Implement a strict waste management plan to ensure proper disposal of construction waste and hazardous materials, minimizing soil contamination risks.</li> <li>A Waste Management Plan (WMP) will be developed before construction to prevent soil contamination and ensure site integrity, outlining procedures for waste segregation, storage, transport, recycling, and disposal in line with 2021 hazardous waste regulations.</li> <li>Hazardous and non-hazardous wastes will be stored separately, with hazardous materials placed on impermeable, bunded platforms and handled by licensed collectors; all site staff will receive training on waste handling and spill response.</li> </ul>	Environmental Management (Solid Waste Management) Regulations, 2009 as amended in 2016, Environmental Management (Hazardous Waste Control and Management)		Contractor	5,000,000
	Degradation of natural beauty, outbreak of diseases and injuries due to improper management of surrounding waste materials (Solid and Liquid Waste)	<ul style="list-style-type: none"> <li>Contractor should develop a detailed waste management plan that outlines waste segregation, recycling, and proper disposal procedures for both solid and liquid waste during construction activities. This plan should be communicated and enforced rigorously across all construction sites.</li> <li>Contractor should implement a waste segregation system at source to separate different types of waste (e.g., construction debris, food waste, hazardous materials). Promote recycling initiatives for recyclable materials, reducing the volume of waste sent to landfills.</li> <li>Regular training and awareness programs should be conducted to workers about proper waste handling, segregation, and disposal practices. Emphasis should be put on the importance of responsible waste management for the environment and public health.</li> </ul>	Environmental Management (Solid Waste Management) Regulations, 2009 as amended in 2016, Environmental Management (Hazardous Waste Control and Management) and Environmental Management (Control and Management of Electrical and Electronic Equipment Waste) Regulations, 2021		Contractor	10,000,000

Phase	Potential Impacts	Management/Mitigation Measures	Target Standard	Level/	Responsibility	Estimated Costs [TZS]
		<ul style="list-style-type: none"> <li>Development of specific procedures for handling and disposing of hazardous waste generated during construction. Ensure that hazardous waste is securely stored, transported, and disposed of in compliance with safety regulations.</li> <li>Contractor should establish a routine waste collection and transportation schedule to prevent waste accumulation at the construction sites. Coordinate with local waste management services to ensure timely waste removal.</li> <li>Implement secure storage areas for waste, preventing unauthorized access and scavenging. Properly secure waste containers to prevent spillage and scattering.</li> <li>Contractor should enforce stringent health and safety regulations to reduce the risk of accidents and injuries related to waste management. Provide workers with appropriate personal protective equipment (PPE) and training on safe waste handling.</li> </ul>				
	Impacts on water sources	<ul style="list-style-type: none"> <li>Siltation of down-slope streams and ditches will be prevented through the construction of run-off control systems around material stockpiles, waste dump</li> <li>Ensure proper management and storage of chemicals used during construction activities to prevent spills and leaks that could contaminate water sources.</li> <li>Properly manage the construction site to minimize disturbance to natural hydrology. Strategically plan the layout and construction sequence to minimize disruption to surface water flows.</li> <li>Encourage efficient water use within the construction site by optimizing water use for construction purposes, ensuring equipment and tools are regularly maintained to minimize leaks, and using water-saving technologies.</li> </ul>	Environmental Management (Water Quality Standards) Regulations, 2007, Environmental Management (Solid Waste Management) Regulations, 2009 as amended in 2016 and Environmental Management (Hazardous Waste Control and Management) Regulations, 2021		Contractor	5,000,000
	Public health and safety risks	<ul style="list-style-type: none"> <li>Implement strict waste management practices to control and dispose of waste properly. Monitor and regulate the disposal of hazardous waste to prevent environmental pollution and health risks.</li> <li>Designate clearly marked zones for different activities within the construction site to prevent accidents and improve</li> </ul>	Public Health Act, Cap.242, Environmental Management (Solid Waste Management) Regulations, 2009 as		Environmental Officer, Health and Safety Officer Contractor	10,000,000

Phase	Potential Impacts	Management/Mitigation Measures	Target Standard	Level/	Responsibility	Estimated Costs [TZS]
		<p>organization. Implement robust traffic management plans to reduce congestion and minimize the risk of vehicle-related incidents.</p> <ul style="list-style-type: none"> <li>▪ Provide alternative access to pedestrians.</li> <li>▪ Engage with the local community to create awareness about potential risks, safety measures, and emergency contact information. Encourage reporting of any safety concerns.</li> <li>▪ Conduct periodic safety audits to evaluate the effectiveness of implemented safety measures and identify areas for improvement.</li> <li>▪ A Traffic Management Plan will be implemented to reduce risks to the public and project personnel through designated transport routes, speed limits, and scheduled off-peak material movement.</li> <li>▪ Safety measures include signage near sensitive areas, regular vehicle maintenance, driver training, and community awareness programs to enhance pedestrian safety.</li> </ul>	amended in 2016, Environmental Management (Control and Management of Electrical and Electronic Equipment Waste) Regulations, 2021 and Environmental Management (Hazardous Waste Control and Management) Regulations, 2021			
	Occupational health and safety risks	<ul style="list-style-type: none"> <li>▪ Provide thorough safety training for all personnel, focusing on specific risks related to heavy machinery operation, construction materials handling, electrical equipment use, and other relevant hazards.</li> <li>▪ Mandate the consistent use of appropriate PPE, including helmets, gloves, safety goggles, high-visibility vests, and steel-toe boots, to minimize the risk of injuries and accidents.</li> <li>▪ Implement a weather monitoring system to anticipate and respond to adverse wind conditions, allowing for temporary shutdowns or adjustments to operations when necessary.</li> <li>▪ Implement clear and visible safety signage, color-coding, and zoning within the construction site to guide workers and visitors and prevent accidents due to congestion and confusion.</li> <li>▪ Conduct regular safety briefings and toolbox talks to reinforce safety protocols, highlight potential hazards, and encourage active participation in maintaining a safe work environment.</li> <li>▪ Ensure that workers are trained to use machinery and equipment safely and perform routine maintenance checks to identify any faults or issues that could lead to accidents.</li> </ul>	Occupational Health and Safety Act, 2003		Environmental Officer, Health and Safety Officer contractor	15,000,000

Phase	Potential Impacts	Management/Mitigation Measures	Target Standard	Level/	Responsibility	Estimated Costs [TZS]
		<ul style="list-style-type: none"> <li>▪ Establish and communicate detailed emergency response procedures, including evacuation plans, assembly points, and first aid stations, to swiftly respond to any accidents or emergencies.</li> <li>▪ Safe Material Handling Practices: Train workers on safe and proper handling of construction materials, emphasizing techniques to minimize strain and injury during lifting, moving, and storing.</li> <li>▪ Conduct periodic safety audits and inspections of the construction site to identify potential hazards, unsafe practices, and areas for improvement in safety protocols.</li> <li>▪ Encourage and facilitate immediate reporting of injuries or near misses, and conduct thorough investigations to identify the root causes and implement preventive measures.</li> <li>▪ Establish a health surveillance program to monitor the health of workers, especially those exposed to specific occupational risks, and provide necessary medical support and follow-ups.</li> <li>▪ Ensure proper erection, inspection, and safe use of scaffolds and ladders, with clear guidelines on weight limits, secure anchoring, and fall protection.</li> <li>▪ The contractor will document procedures for the control of substances hazardous to health</li> <li>▪ The contractor shall provide protective gear and ensure that they are used during construction.</li> </ul>				
	Risk of SEA/SH against women and girls (workers and community members)	<ul style="list-style-type: none"> <li>• Conduct basic GBV/SEA/SH awareness sessions using local leaders, women groups, CDO, village government.</li> <li>• Display simple GBV reporting posters (Swahili) at mining washing points, shops, gathering areas.</li> <li>• Establish a confidential reporting channel through village GBV focal person or women's group leader.</li> <li>• Sensitize workers on zero-tolerance against harassment, sexual favors, and violence.</li> <li>• Require all workers to sign a simple Code of Conduct (CoC).</li> <li>• Avoid employing workers with known history of violence or misconduct.</li> </ul>	No reported GBV/SEA/SH incident		NEMC, Contractor / Local NGOs	3,000,000

Phase	Potential Impacts	Management/Mitigation Measures	Target Standard	Level/	Responsibility	Estimated Costs [TZS]
		<ul style="list-style-type: none"> <li>Ensure lighting in public areas and pathways around mining and washing points.</li> <li>Provide separate sanitation and bathing areas for men and women.</li> </ul>				
	Gender inequality in job allocation and wages	<ul style="list-style-type: none"> <li>Encourage recruitment of women in roles suitable for their skills (sorting, crushing, administrative work, first aid assistants).</li> <li>Ensure equal pay for equal work.</li> <li>Prohibit discrimination in job assignment and promotion.</li> <li>Conduct short training for women (basic mining safety, ore washing, equipment handling).</li> <li>Engage women's groups during hiring to ensure transparency.</li> </ul>	Equal access to jobs, fair pay, and safe facilities		NEMC, Contractor / Local NGOs	3,000,000
	Traffic-related accidents, disturbance to the community, damage to infrastructure	<ul style="list-style-type: none"> <li>Prepare and implement a Traffic Management Plan (TMP).</li> <li>Include signage, barriers, and warning systems.</li> <li>Ensure traffic diversions are clearly marked.</li> <li>Train workers on road safety and safe driving.</li> <li>Regular monitoring of traffic flows and incidents.</li> <li>Liaise with local authorities for compliance.</li> </ul>	OSHA 2003, Tanzania Road Regulations	Safety	Site Manager / Safety Officer	5,000,000
	Damage or destruction of unknown cultural heritage resources	<ul style="list-style-type: none"> <li>Immediately stop work if suspected cultural materials are found.</li> <li>Secure the site to prevent unauthorized access.</li> <li>Notify relevant authorities promptly.</li> <li>Resume work only after written clearance and agreed mitigation from authorities.</li> </ul>	Tanzania Act, 1979	Antiquities	Site Manager / Environmental Specialist	2,000,000
	Risk associated with Chemical Handling, Storage, and Use	<ul style="list-style-type: none"> <li>Store chemicals in designated, labeled, and ventilated areas.</li> <li>Use bunded storage and secondary containment for liquid chemicals.</li> <li>Maintain Material Safety Data Sheets (MSDS) on site.</li> <li>Train workers on proper handling, PPE use, and emergency procedures.</li> <li>Avoid storing chemicals near water sources or drains.</li> <li>Immediate containment and clean-up in case of spills.</li> <li>Regular inspection and monitoring of chemical storage and handling practices.</li> </ul>	OSHA Environmental Management (Hazardous Waste Control) Regulations	2003, Waste	Site Manager / Safety Officer / Environmental Officer	6,000,000

Phase	Potential Impacts	Management/Mitigation Measures	Target Standard	Level/	Responsibility	Estimated Costs [TZS]
	Risk associated with chemical waste management	<ul style="list-style-type: none"> <li>Segregate hazardous and non-hazardous waste.</li> <li>Use labeled containers for chemical waste.</li> <li>Dispose of chemical waste according to Tanzanian regulations and keep records of chemical waste generation and disposal.</li> </ul>	Environmental Management (Hazardous Waste Control) Regulations, OSHA 2003		Site Manager / Safety Officer / Environmental Officer	3,000,000
Operation	Air pollution	<ul style="list-style-type: none"> <li>Douse the surface with water to suppress excessive dust and whenever possible, water Bowser shall be used.</li> <li>Integrate state-of-the-art emission control technologies, such as dust collectors, scrubbers, and filters, into crushing, grinding, and smelting processes to capture and reduce particulate matter and heavy metal emissions.</li> <li>Implement operational best practices to minimize the generation of pollutants. This includes optimizing process parameters, maintaining equipment regularly, and adopting efficient material handling techniques to reduce dust and emissions.</li> <li>Engage with local communities to raise awareness about potential air quality impacts and the measures in place to mitigate them. Encourage community participation in monitoring and reporting air quality concerns.</li> <li>Ensure strict compliance with local and national environmental standards for air quality. Regularly monitor emissions to verify adherence to prescribed limits.</li> <li>Collaborate with air quality monitoring experts to strategically review and assess the existing air quality monitoring stations. Identify if new monitoring stations are needed to adequately cover the areas impacted by the introduced activities, especially those associated with the proposed gold ore processing and washing facilities.</li> <li>Develop an emergency response plan specifically tailored for air quality incidents. This plan should include procedures for rapid containment and resolution of any unexpected air quality issues.</li> <li>Explore the use of cleaner energy sources, such as renewable energy, to power project operations. This can contribute to reducing emissions associated with energy consumption.</li> </ul>	WHO Standards, TZS 845:2005 Air Quality – Specification		NEMC	40,000,000

Phase	Potential Impacts	Management/Mitigation Measures	Target Standard	Level/ Responsibility	Estimated Costs [TZS]
		<ul style="list-style-type: none"> <li>▪ Provide protective gear (i.e. breathing masks) to workers working in dusty environment.</li> <li>▪ Conduct periodic environmental audits to assess the effectiveness of air quality mitigation measures. Identify areas for improvement and implement necessary changes based on audit findings.</li> </ul>			

Phase	Potential Impacts	Management/Mitigation Measures	Target Standard	Level/	Responsibility	Estimated Costs [TZS]
	Impact on water sources	<ul style="list-style-type: none"> <li>• Implement a robust chemical management plan to ensure the safe handling, storage, and containment of sodium tetraborate used in smelting process.</li> <li>• Introduce a water recycling system within the processing facilities to minimize the demand for fresh water. Treated water from the leaching and washing stages can be recycled for subsequent use.</li> <li>• Construct sediment retention ponds as part of the water management infrastructure to capture sediments and contaminants, preventing their entry into natural water bodies (as suggested by the Basin Water Board).</li> <li>• Engage with local stakeholders, community members, and water management authorities to establish collaborative water management practices. This ensures that water resources are used responsibly and that the project's water demands are well-balanced.</li> <li>• Implement a comprehensive water quality monitoring program to regularly assess the impact of the project on local water sources. This involves regular testing for pollutants, including Mercury, to ensure adherence to environmental standards.</li> <li>• Explore the feasibility of sourcing water from alternative, less-stressed water bodies to reduce the strain on existing sources.</li> <li>• Develop a comprehensive emergency response plan to address and contain any unforeseen water-related incidents promptly.</li> </ul>	Zero Contamination of Water Sources.	Released water to adhere with Environmental Management (Water Quality standards) Regulation 2011	Management, Environmental Officer, Health and Safety Officer	150,000,000

Phase	Potential Impacts	Management/Mitigation Measures	Target Standard	Level/	Responsibility	Estimated Costs [TZS]
	Noise pollution and vibration	<ul style="list-style-type: none"> <li>Integrate advanced soundproofing technologies in equipment and machinery to minimize noise emissions during crushing, grinding, and other operations. Implement operational controls, such as optimizing machinery settings and scheduling noisy activities during specific timeframes, to reduce overall noise and vibration levels.</li> <li>Restrict noisy activities during daytime such that noise levels to the surrounding communities does not exceed 55 dB(A) day and 45 dB(A) night as per EHSGs respectively</li> <li>Designate buffer zones between the project site and residential areas to act as a physical barrier against noise propagation. Implement landscape design features, such as natural barriers and green spaces, to further absorb and mitigate noise and vibration impacts.</li> <li>Establish a comprehensive monitoring program to regularly assess noise and vibration levels. Actively engage with the local community to gather feedback, address concerns, and incorporate community input into mitigation strategies.</li> <li>Ensuring workers are not exposed to noise level above 85dBA for more than 8hours continuously.</li> <li>Provide protective gear and ensure that they are used.</li> </ul>	WHO Standards  Environmental Management (Quality standards for Control of Noise and Vibration Pollution) Regulation 2011 EHSG Noise Standards		Environmental Officer, Health and Safety Officer	40,000,000
	Impacts from disruption of soil quality	<ul style="list-style-type: none"> <li>Develop and adhere to robust waste management practices to prevent the disposal of mining waste materials in a manner that could negatively impact soil quality.</li> <li>Implement proper containment and disposal methods for tailings and waste rock.</li> <li>Cover disturbed areas with appropriate materials or vegetation to stabilize the soil and prevent wind or water erosion.</li> <li>Establish soil monitoring programs to regularly assess changes in soil quality and identify potential issues promptly.</li> <li>Conduct soil tests to measure nutrient levels, pH, and other relevant parameters, adjusting management practices accordingly.</li> <li>Develop emergency response plans to address unforeseen events, such as extreme weather conditions or accidental spills, to minimize the potential impact on soil quality.</li> </ul>	Environmental Management (Solid Waste Management) Regulations, 2009 as amended in 2016 and Environmental Management (Hazardous Waste and Control Management) Regulations, 2021		Environmental Officer, Health and Safety Officer	10,000,000

Phase	Potential Impacts	Management/Mitigation Measures	Target Standard	Level/	Responsibility	Estimated Costs [TZS]
	Increased environmental degradation and pollution from waste generation	<ul style="list-style-type: none"> <li>• Implement advanced waste management systems to handle both solid and liquid waste generated during the gold ore processing and washing operations. Utilize technologies that allow for the efficient containment, treatment, and disposal of waste materials, minimizing environmental impact.</li> <li>▪ Establish robust containment measures for tailings and waste rock to prevent soil erosion, sedimentation, and the release of contaminants into water sources. Implement engineered solutions, such as lined tailings impoundments, to enhance containment effectiveness.</li> <li>▪ Develop and implement effective effluent treatment systems to treat liquid waste before discharge. Establish a robust monitoring program to continuously assess effluent quality and ensure compliance with environmental standards.</li> <li>▪ Establish protocols for the responsible disposal of solid waste generated during the gold ore processing. This includes proper landfilling, recycling, or reusing materials where feasible.</li> <li>▪ Engage with local communities, stakeholders, and workers to raise awareness about the project's waste management practices. Provide education and training programs to promote responsible waste handling and environmental conservation.</li> </ul>	EMA Regulation on Waste Management and Hazardous Waste Management and No haphazard dumping, As minimum as possible		Environmental Officer, Health and Safety Officer	10,000,000
	Road accidents from moving trucks	<ul style="list-style-type: none"> <li>▪ Develop and implement comprehensive transportation safety protocols for the movement of mined stones from various mines to the proposed extraction site. This includes speed limits, route planning, and adherence to traffic regulations;</li> <li>▪ Only the designated roads will be used during the project.</li> <li>▪ Road humps will be constructed in all populated areas along the road stretch to control traffic speed;</li> <li>▪ Traffic sign warning drivers of road humps, pedestrian crossings, animal crossings, sharp bends and other accident-prone areas will be posted along the road stretch.</li> <li>▪ Vehicles to be installed with speed control devices, e.g., speed governors as a way of limiting drivers from over-speeding;</li> </ul>	Zero accident		Environmental Officer, Health and Safety Officer, Fleet supervisor	10,000,000

Phase	Potential Impacts	Management/Mitigation Measures	Target Standard	Level/	Responsibility	Estimated Costs [TZS]
		<ul style="list-style-type: none"> <li>▪ Ensure that all drivers involved in the transportation of mined stones undergo comprehensive training on safe driving practices. Certify drivers based on their proficiency and adherence to safety standards.</li> <li>▪ Engage with the local community to raise awareness about transportation activities and potential risks. Foster a sense of shared responsibility for road safety.</li> </ul>				
	Occupational Health and Safety Risks	<ul style="list-style-type: none"> <li>▪ Develop and implement thorough training programs for workers, emphasizing the potential occupational hazards associated with mining and processing activities.</li> <li>▪ Provide specialized training on the safe handling of chemicals, proper use of machinery, and adherence to safety protocols.</li> <li>▪ Enforce strict compliance with established safety protocols and procedures at all stages of processing.</li> <li>▪ Conduct regular safety drills and simulations to ensure that workers are well-prepared to respond to emergencies.</li> <li>▪ Supply adequate and appropriate personal protective equipment (PPE) to all workers, including respiratory protection, hearing protection, safety goggles, gloves, and other necessary gear.</li> <li>▪ Implement a mandatory policy requiring the consistent use of PPE in designated work areas.</li> <li>▪ Implement effective dust control measures, such as water spraying, dust suppression systems, or dust barriers, to minimize airborne particulate matter and protect workers from respiratory hazards.</li> <li>▪ Regularly monitor and assess dust levels to ensure the effectiveness of control measures.</li> <li>▪ Provide respiratory protection equipment to workers operating in areas with potential respiratory hazards, such as dust or chemical fumes.</li> <li>▪ Develop and communicate clear machinery safety guidelines, including proper operation and maintenance procedures.</li> <li>▪ Install safety features on machinery to prevent accidents, such as emergency shut-off switches, guards, and warning systems.</li> </ul>	<p>Zero Incidence on Chemical hazards (Occupational Health and Safety Act, 2003)</p> <p>Appropriate disposal of all chemicals (Environmental Management Hazardous Waste Management) Regulation 2009</p> <p>Mining (Safety, Occupational Health and Environment Protection) Regulation 2009</p>		Environmental Officer, Health and Safety Officer	20,000,000

Phase	Potential Impacts	Management/Mitigation Measures	Target Standard	Level/	Responsibility	Estimated Costs [TZS]
		<ul style="list-style-type: none"> <li>▪ Establish continuous training initiatives to keep workers informed about the latest safety procedures and best practices.</li> <li>▪ Encourage a safety culture through regular safety meetings, workshops, and communication channels for reporting safety concerns.</li> <li>▪ Develop and regularly update comprehensive emergency response plans to address potential accidents or incidents promptly.</li> <li>▪ Conduct regular emergency drills to ensure that workers are familiar with evacuation procedures and emergency contacts.</li> </ul>				
	High costs of operation	<ul style="list-style-type: none"> <li>• Establish clear and transparent fee structures that outline all associated costs for external small-scale miners.</li> <li>• Provide detailed information on processing charges, transportation fees, and any other relevant expenses.</li> <li>• Conduct regular reviews and consultations with external miners to ensure fee structures remain fair and reflective of economic conditions.</li> <li>• Explore the possibility of shared transportation services to minimize individual transport expenses.</li> <li>• Collaborate with local transport providers to negotiate favorable rates for bulk transportation of mined stones.</li> <li>• Encourage the formation of mining associations to negotiate collectively with the project and share operational costs.</li> <li>• Explore opportunities for financial assistance or micro-financing programs to alleviate immediate financial burdens.</li> <li>• Collaborate with financial institutions to create tailored financial solutions for small-scale miners.</li> <li>• Maintain open channels of communication with external miners to understand their concerns and challenges.</li> <li>• Establish a feedback mechanism to receive input on the economic impact of the project on external miners.</li> <li>• Conduct regular community meetings or forums to address queries and adapt mitigation measures based on community feedback.</li> </ul>	As high operation efficiency, as possible		Project Manager	20,000,000

Phase	Potential Impacts	Management/Mitigation Measures	Target Standard	Level/	Responsibility	Estimated Costs [TZS]
	Conflicts related to restricted access and trespassing	<ul style="list-style-type: none"> <li>▪ Awareness raising and education to the communities including posting banners and warning signs at appropriate places.</li> <li>▪ Memorandum of understanding between the village leaders and the project proponent</li> <li>▪ Village governments with support from project proponent strive to find alternative means and ways to help affected people e.g. women access to dead wood in the PML</li> <li>▪ Project proponent support the village governments to develop village-managed forests of indigenous tree species as well as planting of woodlots of fast-growing exotic species with the aim of easing pressure on resources found in the gold mining area</li> </ul>	Zero Conflict between the project and the small-scale miners community		Management	20,000,000
	Conflicts over collection revenues	<ul style="list-style-type: none"> <li>▪ Develop clear and transparent revenue-sharing agreements between the government and the group of miners providing the project area.</li> <li>▪ Ensure that the terms of revenue distribution, including financial benefits, royalties, and taxes, are explicitly outlined and agreed upon by all parties.</li> <li>▪ Ensure that the project operates in compliance with existing laws and regulations, minimizing ambiguities that could lead to disputes.</li> <li>▪ Establish community benefit programs funded by the project's revenues to directly contribute to the welfare of the local community.</li> <li>▪ Ensure that a portion of the revenue is allocated to initiatives that promote local development, education, healthcare, and infrastructure.</li> <li>▪ Maintain transparent communication channels to keep all stakeholders informed about financial transactions, revenue distributions, and project developments.</li> <li>▪ Publish regular reports on revenue allocation and utilization, fostering trust and accountability.</li> </ul>	Zero Conflict between the project and Irasanilo Mining Group.		Management	30,000,000
	Public health and safety risks	<ul style="list-style-type: none"> <li>• Develop and implement sustainable water resource management practices to minimize the strain on local water resources.</li> </ul>	Public Health Act, Cap.242, Environmental Management	Act, (Solid	Environmental Officer, Health and Safety	20,000,000

Phase	Potential Impacts	Management/Mitigation Measures	Target Standard	Level/	Responsibility	Estimated Costs [TZS]
		<ul style="list-style-type: none"> <li>Install advanced emission control technologies to minimize air pollution from mining and processing activities.</li> <li>Regularly monitor air quality in and around the project site to promptly address any deviations from established standards.</li> <li>Implement soundproofing technologies and operational controls to minimize noise and vibration emissions.</li> <li>Establish buffer zones between the project site and residential areas to mitigate potential disturbances to nearby communities.</li> <li>Establish transparent and open communication channels with the local community to address concerns, provide regular updates, and gather feedback.</li> <li>Conduct public awareness campaigns on the project's environmental and health measures to enhance understanding and cooperation.</li> <li>Collaborate with local authorities to develop and implement traffic safety management plans, especially considering increased activity from other miners in the area.</li> <li>Enhance road infrastructure, implement speed limits, and employ traffic control measures to reduce the risk of accidents during transportation.</li> <li>Establish an environmental monitoring program to track key indicators and assess the effectiveness of mitigation measures.</li> <li>Share monitoring results with relevant authorities, the local community, and external miners to maintain transparency.</li> <li>A Traffic Management Plan will be implemented to reduce risks to the public and project personnel through designated transport routes, speed limits, and scheduled off-peak material movement. <ul style="list-style-type: none"> <li>Safety measures include signage near sensitive areas, regular vehicle maintenance, driver training, and community awareness programs to enhance pedestrian safety.</li> </ul> </li> </ul>	Waste Management) Regulations, 2009 as amended in 2016, Environmental Management (Control and Management of Electrical and Electronic Equipment Waste) Regulations, 2021 and Environmental Management (Hazardous Waste Control and Management) Regulations, 2021		Officer, Fleet supervisor	
	Continued risk of SEA/SH at mining pits, washing	<ul style="list-style-type: none"> <li>Maintain active GBV focal persons in each mining cluster.</li> <li>Install solar lights along common footpaths and washing sites to reduce night-time harassment.</li> </ul>	No reported cases	SEA/SH	Mgusu Mining Cooperative /	3,000,000

Phase	Potential Impacts	Management/Mitigation Measures	Target Standard	Level/	Responsibility	Estimated Costs [TZS]
	facilities, and trading areas	<ul style="list-style-type: none"> <li>Deploy trained female marshals/supervisors at washing areas.</li> <li>Strengthen community reporting systems in collaboration with village government and local CSOs.</li> <li>Conduct GBV/SEA/SH awareness and sensitization sessions every 3–6 months.</li> <li>Enforce zero-tolerance against exploitation of women, including sexual favors for access to ore, washing points, or financial support.</li> <li>Coordinate with local police gender desk for rapid response to reported cases.</li> </ul>			Local Authorities	
	Gender inequity in access to mining benefits and resources	<ul style="list-style-type: none"> <li>Allocate specific workstations or washing stations for women miners to minimize conflict and male dominance.</li> <li>Provide women miners with PPE, tools, or small grants through cooperative/women groups.</li> <li>Support and encourage the creation of women-led mining groups (e.g., VICOBA).</li> <li>Offer continuous training in business management, financial literacy, safety, and ore valuation to empower women.</li> </ul>	Equal access to resources, empowerment of women		Mgusu Cooperative / Local Authorities	2,500,000
	Risk associated with Chemical Handling, Storage, and Use	<ul style="list-style-type: none"> <li>Store chemicals in designated, labeled, and ventilated areas.</li> <li>Use bunded storage and secondary containment for liquid chemicals.</li> <li>Maintain Material Safety Data Sheets (MSDS) on site.</li> <li>Train workers on proper handling, PPE use, and emergency procedures.</li> <li>Avoid storing chemicals near water sources or drains.</li> <li>Immediate containment and clean-up in case of spills.</li> <li>Regular inspection and monitoring of chemical storage and handling practices.</li> </ul>	OSHA Environmental Management (Hazardous Waste Control) Regulations	2003,	Site Manager / Safety Officer / Environmental Officer	6,000,000
	Risk associated with chemical waste management	<ul style="list-style-type: none"> <li>Segregate hazardous and non-hazardous waste.</li> <li>Use labeled containers for chemical waste.</li> <li>Dispose of chemical waste according to Tanzanian regulations.</li> <li>Keep records of chemical waste generation and disposal.</li> </ul>	Environmental Management (Hazardous Waste Control) Regulations, OSHA 2003		Site Manager / Safety Officer / Environmental Officer	3,000,000

Phase	Potential Impacts	Management/Mitigation Measures	Target Standard	Level/ Responsibility	Estimated Costs [TZS]
Total					494,500,000

To mitigate the impacts associated with the decommissioning phase of the project, a detailed decommissioning plan that outlines procedures for dismantling infrastructure, waste management, habitat restoration, and erosion control should be developed. This plan should be environmentally sensitive and consider the potential impacts on the surrounding ecosystem.

## CHAPTER TEN

### 10 ENVIRONMENTAL AND SOCIAL MONITORING PLAN

#### 10.1 Introduction

This chapter presents the Environmental and social monitoring plan that will be carried out throughout the project to mitigate the impacts and enhance the benefits of the project. This plan outlines the specific actions that shall be undertaken to ensure that the project complies with all applicable laws and regulations related to environmental impacts and impact mitigation. The plan deals with all mitigation required for the physical, biological and socio-economic impacts and focuses on the impacts of higher significance as provided in Chapter six.

This monitoring plan applies to, and will be implemented throughout, all phases of the project: site selection, mobilization, construction, operation, and decommissioning. The objective of this plan is to set out clearly the key components of environmental and socio-economic management for the Project and thereby ensure that the following concepts are realized throughout the construction, operation, and decommissioning.

- Negative impacts on the physical, biological and socio-economic environments are mitigated;
- Benefits that will arise from the development of the mine activities are enhanced;
- Compliance and guided by National, International laws, standards and guidelines e.g. effluents standards, noise level standards, occupational and safety standards etc. and best practice is achieved; and
- Good will and good relations with communities, and governments at local and national levels are maintained.

#### 10.2 Parameters to be monitored

Detailed on parameter to be monitored have been considered along with costs estimates and responsible institution (s). The Project will endeavor to ensure that resources are available to implement the EMP throughout all phases of Project development and decommissioning. The EMP will be subject to the principle of continuous improvement. NEMC is committed to protect environment.

Table 10-1: summarizes key environmental and social monitoring issues of the project to be monitored and the estimated cost for the parameter to be monitored is indicated.

Table 10-1: Environmental and Social Monitoring Plan

Phase	Potential Impacts	Parameter to be monitored	Monitoring Frequency	Sampling Area	Target Level/Standard	Responsibility	Estimated Costs [Tshs]
Mobilization Phase	Atmospheric emissions from engine of vehicles	CO, CO <sub>2</sub> , VOC, O <sub>3</sub> , SO <sub>2</sub> , NO <sub>x</sub> , SO <sub>x</sub> , Co <sub>2</sub> , PM 2.5, PM <sub>10</sub> , TSP	Twice during Mobilization	Ambient air in the vicinity of the project	CO ≤10 ppm, NO <sub>2</sub> ≤0.2 ppm, SO <sub>2</sub> ≤0.125 ppm, O <sub>3</sub> ≤0.1 ppm (8hr), PM <sub>2.5</sub> ≤0.075 ppm, PM <sub>10</sub> ≤0.15 ppm, TSP ≤0.2 ppm (EHSGs & TZS 845:2007)	Contractor	2,000,000
	Noise and Vibration pollution from vehicles and machinery	Noise and vibration level	Daily	Project site Sensitive receptors in communities	≤ 85 dB(A) (8-hour TWA), ≤120 dB peak; vibration per EHSGs	Contractor	4,000,000
	Loss/disturbance of biodiversity and threatened species	Biodiversity	Before commissioning and once every three months	Within the project site	As minimum disturbance as possible	Town Council, Ministry of Minerals (to monitor)	10,000,000
	Accelerated erosion due to loss of ground cover	Soil erosion tendencies	Before commissioning and once per year	Within Project Site	As minimum as possible	Town Council, Ministry of Minerals (to monitor)	5,000,000
Construction Phase	Atmospheric emissions from engine of vehicles	CO, CO <sub>2</sub> , VOC, O <sub>3</sub> , SO <sub>2</sub> , NO <sub>x</sub> , SO <sub>x</sub> , Co <sub>2</sub> , PM 2.5, PM <sub>10</sub> , TSP	Every three weeks	Ambient air in the vicinity of the project and in the community	CO ≤10 ppm, NO <sub>2</sub> ≤0.2 ppm, SO <sub>2</sub> ≤0.125 ppm, O <sub>3</sub> ≤0.1 ppm (8hr), PM <sub>2.5</sub> ≤0.075 ppm, PM <sub>10</sub> ≤0.15 ppm, TSP ≤0.2 ppm	Contractor	2,000,000

Phase	Potential Impacts	Parameter to be monitored	Monitoring Frequency	Sampling Area	Target Level/Standard	Responsibility	Estimated Costs [Tshs]
					(EHSGs & TZS 845:2007)		
	Noise pollution from construction vehicles and machinery	Noise pollution	daily	At the machine or vehicle location and in the community	≤ 85 dB(A) (8-hour TWA), ≤120 dB peak, ≤ 55 dB(A) (community) daytime	Contractor	4,000,000
	Waste generation	Quantity and type of waste generated, waste disposal and recycling rates	Every week	Within the project site	100% proper disposal & recycling per EMA Regulations	Contractor	5,000,000
	Occupational Health and Safety Risks	Health status of the workers Safety records	Once every six months	All project areas	OSHA, 2003	Contractor	10,000,000
	Public health hazards and safety from construction of supportive infrastructure, livelihood and economic impacts, cultural and societal impacts	Level of community involvement in project activities, Feedback and grievances from the community	Before commissioning and once per year	Surrounding communities	As minimum as possible	Contractor	5,000,000
	Land disturbance	Land disturbance tendencies	Once every year	Project area	No land disturbances	Contractor	2,000,000
	GBV/SEA/SH related incidences	GBV Incident	Once per Month	Project area	No GBV incident	Contractor, GBV Specialist	200,000
	Gender inequity in employment		Once per Month	Project area	≥30% female or equitable employment	Contractor. Social Expert	200,000

Phase	Potential Impacts	Parameter to be monitored	Monitoring Frequency	Sampling Area	Target Level/Standard	Responsibility	Estimated Costs [Tshs]
	Damage to unknown cultural heritage resources	Cultural heritage chance finds procedures	Immediately upon discovery	Throughout construction area	No damage to heritage; written clearance obtained from authorities	Site Manager / Environmental Specialist	200,000
Operation Phase	Air pollution	Presence of CO, SO <sub>2</sub> , NO <sub>x</sub> , SOX, CO <sub>2</sub>	Quarterly	Near washing bay, nearby community	CO ≤10 ppm, NO <sub>2</sub> ≤0.2 ppm, SO <sub>2</sub> ≤0.125 ppm, PM <sub>2.5</sub> ≤0.075 ppm, PM <sub>10</sub> ≤0.15 ppm, VOC ≤0.125 ppm (EHSGs & TZS 845:2007)	Environmental Health and Safety Officer	2,000,000
	Noise emissions	Noise pollution	Daily	Plant Premises and in the nearby community	≤ 85 dB(A) (8-hour TWA) ≤120 dB peak, ≤ 55 dB(A) (community) daytime	Environmental Health and Safety Officer	2,000,000
	Surface water contamination from discharged effluents from gold ore washing facilities	pH levels, Dissolved oxygen (DO), Heavy metals (Mercury, Boron)	Monthly	WSP and Water sources	pH 6–9, DO ≥5 mg/L, Hg ≤0.002 mg/L, Boron ≤1 mg/L, TSS ≤50 mg/L (TZS 860 & EHSGs)	Environmental Health and Safety Officer	15,000,000
	Spread of diseases	Number of HIV cases	Once every six months	Confidential file	As low as possible	Environmental Health and Safety Officer	10,000,000

Phase	Potential Impacts	Parameter to be monitored	Monitoring Frequency	Sampling Area	Target Level/Standard	Responsibility	Estimated Costs [Tshs]
	Road accidents from moving trucks	Number of injured people	Continuously during operation	Project area and nearby Community Areas	No injury	Environmental Health and Safety Officer	1,000,000
	Waste Management (waste rock and other solid waste)	Quantity and types of waste generated (waste rock, general and hazardous waste); waste segregation, storage, reuse/recycling and disposal practices; dust emissions from waste storage areas	Every Week	All plant premises, including waste storage and disposal areas	100% of waste properly segregated, labelled, and stored in designated areas as Environmental Management (Solid Waste Management) Regulations, 2009 (as amended)	Environmental Health and Safety Officer	5,000,000
	Structural instability of tailings impoundment	Embankment cracks and erosion, Seepage or leakage, Freeboard height, Condition of spillways and decant structures	Embankment crest, slopes and toe, Spillway and decant structures	Weekly visual inspection, Quarterly detailed inspection and after heavy rainfall events	No visible cracks or slope failure, Freeboard $\geq 0.5-1.0$ m No uncontrolled seepage	Environmental Health & Safety Officer (EHSO)	10,000,000
	Overtopping and loss of storage capacity	Tailings deposition rate, Available storage capacity, Sediment accumulation	Tailings pond	Monthly	Storage within approved design capacity, No overtopping risk	EHSO / Plant Manager	
	Surface water contamination from tailings pond	pH, TSS, Electrical Conductivity (EC), Boron, Heavy	Tailings pond, Polishing pond	Monthly	pH: 6.5–8.5 TSS $\leq 100$ mg/L, Hg $\leq 0.01$	EHSO / Plant Manager	12,000,000

Phase	Potential Impacts	Parameter to be monitored	Monitoring Frequency	Sampling Area	Target Level/Standard	Responsibility	Estimated Costs [Tshs]
		metals (Hg, As, Fe, Mn, Zn)			mg/L, Boron $\leq$ 1 mg/L		
	Groundwater contamination	pH, TDS, EC, Mercury (Hg), Arsenic (As)	Monitoring boreholes, Nearby community wells	Quarterly	Hg $\leq$ 0.001 mg/L, As $\leq$ 0.01 mg/L, TDS $\leq$ 1,000 mg/L	EHSO / Plant Manager	
	Surface water quality degradation	pH, Turbidity, Dissolved Oxygen (DO), TSS, Heavy metals (Hg, As)	Mabubi River (upstream & downstream)	Quarterly	DO $\geq$ 5 mg/L, Turbidity $\leq$ 30 NTU, Hg $\leq$ 0.002 mg/L	EHSO / Plant Manager	
	Dust emissions from dry tailings	PM <sub>10</sub> , PM <sub>2.5</sub> , Visible dust plumes	Tailings surface, Downwind community boundary	Quarterly instrumental monitoring, Daily visual checks (dry season)	PM <sub>10</sub> $\leq$ 50 $\mu\text{g}/\text{m}^3$ (24-hr), PM <sub>2.5</sub> $\leq$ 25 $\mu\text{g}/\text{m}^3$ (24-hr)	EHSO / Plant Manager	
	Failure of emergency controls / spill risk	Functionality of spillways, Emergency equipment readiness, Staff preparedness	Tailings facility	Quarterly checks, Annual emergency drills	Zero uncontrolled release, Functional emergency systems	EHSO / Plant Manager	

Phase	Potential Impacts	Parameter to be monitored	Monitoring Frequency	Sampling Area	Target Level/Standard	Responsibility	Estimated Costs [Tshs]
	Occupational Health and Safety	Health status of the workers, Safety records, Lost Time Injury Frequency Rate (LTIFR), Total Recordable Incidents (TRI), Near Miss Reports, Safety Training Attendance, PPE Utilization Compliance Rate, Safety Audit Findings	Once every six months	All Plant Premises	OSHA, 2003	Environmental Health and Safety Officer	7,000,000
	Pressure on natural/social service resources	Rate of resource utilization, water extraction	Once every month	Production plant and its supporting facilities	Maximize reuse; water extraction ≤ permit limits	NEMC	5,000,000
	Soil and water contamination, health risks, fire hazards	Proper handling, storage, and use of chemicals	Daily	Chemical storage areas, construction zones	Storage in designated areas; MSDS available; PPE used; OSHA 2003 compliance	Site Manager / Safety Officer / Environmental Officer	600,000
	Chemical spills leading to pollution	Chemical spill prevention and containment	Daily	Chemical storage and use areas	Zero chemical spills; containment measures in place; immediate clean-up if spill occurs	Site Manager / Environmental Officer	400,000

Phase	Potential Impacts	Parameter to be monitored	Monitoring Frequency	Sampling Area	Target Level/Standard	Responsibility	Estimated Costs [Tshs]
	Pollution of land, water, and air from improper waste disposal	Chemical waste segregation and disposal	Weekly	Waste storage areas, disposal points	Hazardous and non-hazardous waste segregated; disposal according to EM (Hazardous Waste) Regulations	Environmental Officer / Contractor	300,000
	Risk of SEA/SH	Incidents	Every 6 months	Project Area	Zero incidents	NEMC	200,000
	Complaints from community and workers	Number of Grievance	Weekly	Project area	100% grievances resolved within 7 days	NEMC	2,000,000

## CHAPTER ELEVEN

### 11 COSTS AND BENEFIT ANALYSIS

#### 11.1 Overview

A cost-benefit analysis is more often conducted as part of a feasibility study that incorporates the environmental, social, and economic costs and benefits of a particular undertaking.

The aim is to inform the proponent and the environmental authorities of the main environmental and socio-economic costs to weigh in decision making.

#### 11.2 Overall Cost Implications

The costs for the Gold ore processing and washing facilities as well as its ancillary facilities i.e. internal roads and parking area and storage include the actual investment cost, the costs on the environment and the socio-economic costs.

##### 11.2.1 Investment Costs

Preliminary estimates of the project are of the order of Sixty-two million four hundred forty-eight thousand nine hundred ninety (62,448,990) Tanzanian Shillings. This includes:

- Expenditure on materials and equipment,
- Operational and maintenance costs (for waste treatment plants and ancillary facilities),
- Personnel costs (employed staff and consultants) and
- Health, Safety and Environment management.

##### 11.2.2 Environmental Costs

The main environmental costs are related to moderate and large impacts identified in chapter six. These impacts are primarily a result of the risk related to a potential release of water during the mobilization of the equipment and the accidental leakages or spills during operation.

The monetary costs of such impacts are difficult to quantify depending on the costs to clean up pollution. However, the estimated budget for the implementation of the environmental and Social Management Plan is Four hundred and ninety four Million five hundred thousand only (494,500,000/=) Tanzanian Shillings.

##### 11.2.3 Socio-Economic Costs

The social costs of potential impacts during planned operations are negligible. The financial resources needed to mitigate the impacts from planned activities are minimal in comparison to the investment costs. Large socio-economic costs are only expected if an accidental spillage occurs. These costs will be related to

- Impacts on economic activities such as agriculture, fishing, mining etc.
- Injury or more severe fatalities to crew and compensation to be paid,
- The economic cost of operational down time depending the severity of the damage to the equipment,
- Any damages to the plant and Storage Facilities or fire that have to be repaired or re-built the facility.

## **11.3 Overall Potential Benefits**

### **11.3.1 Environmental Benefits**

Governmental of Tanzania through NEMC has already invested in social facilities renovation and support such as water supply and health centres as well as for improvement projects which are currently taking place in various sites.

This information is not only beneficial for Mgusu mine and Geita Town but also for Geita Region as construction materials will be purchased within the locality.

### **11.3.2 Socio-Economic Benefits**

The immediate socio-economic benefit from project activities is employment and the procurement of local supplies and services. This will contribute positively to the local economy in Geita Town and Geita Region as a whole.

The long-term benefits to the community are many exchange and local benefits from vending foods and fluids. The availability of water will have a multiplier effect on the wellbeing of the surrounding community. Furthermore, the government will also earn more income through levy and tariffs from the proposed project operations.

## CHAPTER TWELVE

### 12 GRIEVANCE REDRESS MECHANISM (GRM)

#### 12.1 Overview

The Grievance Redress Mechanism (GRM) provides a formal, accessible, and transparent process through which project-affected people, workers, and other stakeholders can raise concerns, complaints, or suggestions related to project activities and receive timely, fair, and consistent resolution. In line with World Bank Environmental and Social Standards (ESS10 and ESS2), the GRM ensures that stakeholders have a safe platform to express grievances without fear of retaliation.

The mechanism supports effective two-way communication, enables early identification and resolution of issues, reduces the risk of conflict, and strengthens accountability throughout the project cycle. By promoting trust and constructive engagement, the GRM contributes to improved project performance and socially responsible implementation.

#### 12.2 Purpose of GRM

Grievances may occur in any project, and as a result, there must be a process in place to resolve them, and therefore GRM has its own purposes, which are as follows:

##### 12.2.1 Enhances Accountability

A GRM establishes a clear and accountable process for handling complaints. It ensures that project stakeholders, including affected communities, have a way to voice their concerns and seek resolution.

##### 12.2.2 Maintains Stakeholder Trust

Projects often impact various stakeholders, including local communities, government agencies, and NGOs. An effective GRM helps maintain trust by showing that the project team is responsive to concerns and committed to addressing them.

##### 12.2.3 Early Problem Identification

By providing a channel for reporting issues, a GRM helps in the early identification of problems or potential conflicts. This allows project managers to take corrective actions promptly, preventing issues from escalating.

##### 12.2.4 Conflict Prevention and Resolution

Disputes and conflicts can arise in any project. A GRM provides a structured approach to resolve these issues through negotiation, mediation, or other conflict resolution techniques. This can prevent disruptions to project activities.

##### 12.2.5 Improves Decision-Making

The feedback and complaints received through the GRM can provide valuable insights into the project's impact on stakeholders. This data can inform project decisions, helping to adjust strategies or mitigate negative consequences.

### 12.2.6 Legal and Ethical Compliance

In some cases, compliance with laws, regulations, and ethical standards may require the establishment of a GRM. Having such a mechanism in place demonstrates a commitment to compliance and responsible project management.

### 12.2.7 Community Engagement

A GRM promotes engagement with affected communities and stakeholders. It creates a dialogue between project implementers and those impacted by the project, fostering a sense of ownership and participation.

### 12.2.8 Learning and Improvement

Project teams can learn from the grievances raised and use this feedback to improve project design and implementation. This iterative process can lead to better outcomes in subsequent project phases.

## 12.3 Scope of GRM

The Grievance Redress Mechanism will be open to community, workers and other stakeholders, allowing them to submit questions, comments, recommendations, or grievances, and offer any feedback regarding project activities that might lead beneficiaries to perceive unfair treatment.

The efficient Grievance Redress Mechanism (GRM) will assist stakeholders in achieving multiple goals during both the readiness and Implementation stages:

- a) **Identify and fix issues with how things are being done quickly and without spending too much money:** A good GRM helps catch and deal with possible problems early so they don't become big and costly arguments later on.
- b) **Identify broader problems:** Details from GRM cases can point out repeating, more common, or growing complaints, which can reveal deeper, ongoing issues linked to how things are carried out and the capacity for implementation, highlighting areas that require attention.
- c) **By swiftly solving issues and challenges,** the GRM will help advance the project's timely accomplishment, which aims to support economic growth and resilience in the region, potentially leading to improved outcomes.
- d) **Encourage responsibility:** A well-functioning GRM fosters increased accountability towards stakeholders, influencing individual activities as well as the broader governance within the sector in a positive manner

## 12.4 Management of the GRM

The management of the Grievance Redress Mechanism (GRM) will be jointly coordinated by the Mghusu Cooperative and the National Environment Management Council (NEMC). These institutions will provide overall oversight to ensure that the GRM operates effectively, transparently, and in full compliance with World Bank Environmental and Social Standards.

Qualified Social and Environmental Specialists will support the process by ensuring that all grievances related to environmental and social impacts including those arising from sub-projects are properly assessed, addressed, and documented.

In addition, each project component will designate a GRM Focal Person responsible for receiving, registering, and managing grievances at the operational level. These focal persons will serve as easily identifiable points of contact, ensuring timely response, proper coordination, and consistent application of GRM procedures throughout the project lifecycle.

## 12.4.1 Grievances Mechanism Procedures

### 12.4.1.1 Steps of Grievance Redress

The first step in setting up a GRM will be to appoint a committee to handle grievances. At the Ward level. The members of this committee will be the following

1. The Ward Executive Office	Chairperson
2. Chairperson for Mgusu Cooperative	Secretary
3. Village chairmen (within Mgusu ward)	Members
4. 1 Representative from NEMC	Members
5. Community development officers in the respective ward	Members
6. Reputable NGO working in the ward	Member
7. Representatives District Council	Member
8. Religious representative from Islamic and Christianity group	Member

In addition, the project will establish a dedicated Workers' Grievance Redress Committee (WGRC), comprising representatives of the contractor, subcontractors, workers' elected representatives, the Occupational Health and Safety (OHS) Officer, the Human Resources (HR) Officer, and a Social/Environmental Safeguards Specialist.

The committee will ensure that all workers' grievances are received, recorded, assessed, and resolved promptly, transparently, and in accordance with the World Bank's Environmental and Social Standard (ESS2) on Labor and Working Conditions.

A verbal or a written complaint from aggrieved person will be received by a person assigned in the project as the Grievance Officer (GO)/Counsellor/ Grievance Redress Committee (GRC) and recorded in a grievance log/book. Grievances can be lodged at any time. The following steps will be followed;

- i. Registration of the complaint;
- ii. Verification to determine eligibility undertaken by the Grievance Officer (GO) Grievance Redress Committee (GRC);
- iii. Processing, including hearings and resolutions;
- iv. Implementation and case closing and the overall monitoring of the effectiveness of the GRM is crucial for a successful project.

### 12.4.1.2 Complaints Procedure

The GRC ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the Ward Dispute Resolution Committee.

Complaints may be submitted at any time after concerns have been brought directly to the Mgusu Mining Cooperative Society's attention, and Management has been given an opportunity to respond. Complaints in may also be lodged using mobile phone and email to be shared to community and workers.

### 12.4.1.3 Confidentiality and Conflict of Interest

Complaints may be made anonymously and confidentiality will be ensured in all instances, including when the person making the complaint is known. For this reason, multiple channels to make a complaint have been established and conflicts of interest will be avoided.

Specific procedures for Gender Based Violence/Sexual Exploitation and Abuse including confidential reporting with safe and ethical documentation of GBV/SEA cases will be handled by the neutral person/committee designed outside the GRM system.

#### 12.4.1.4 Collection/Receiving Receipt of Complaints



The designated person receiving the complaint will complete a grievance form or make the form available to the complainant to fill out directly, and submit to the respective addresses

The complaints will be collected/received and compiled by the designated grievance focal person in the respective level (Mtaa/Village, Ward, District, Municipal, and Mgusu Miners or NEMC) on need basis or daily basis until the project construction completed and during operation.

Grievances and complaints may be received through a variety of channels which may include:

- Project / Community Liaison Offices;
- Ward leaders;
- Sub-project Community Liaison Officers who hold responsibility for community stakeholder engagement and who visit the communities within the project area of operations on a regular basis; and/or
- Ward Dispute Resolution Committee

When a complaint or grievance is presented, the complaint must be noted and recorded in writing using a Grievance Registration Form A (in appendix V). The Grievance Officer/focal person must read and explain what has been recorded to the complainant to confirm the complaint or grievance has been recorded properly.

Where the grievance has been received by someone other than the Grievance Officer/Focal Personal, all forms must be handed over to the Grievance Officer/Focal Personal within 24 hours. Each complainant must receive a Grievance Acknowledgement Form.

#### 12.4.1.5 Recording/Register



Upon classification of the complaint, the designated GRM focal individual will record its specifics into the monitoring system, which might be either manual (paper-based). To ensure security, GRM records must be kept in a safe environment, either a password-protected IT database or a securely locked storage cabinet for physical copies.

After registration and organization of the complaint, the GRM focal person then forwards the case to the Grievance Redress Committee, instructing the Committee to investigate the complaint within a set timeframe to achieve resolution and agreement on the necessary course of action.

The investigation procedure is established according to the type and importance of the complaint, detailed as follows:

- a) Resettlement-related grievances, irrespective of complexity, will engage the Safeguard Specialist from the PIU and an appointed Investigation Officer in the inquiry. The Grievance Redress Committee may assist in assessing and validating the case if needed within a seven-day timeframe.
- b) Regarding other complaints linked to project activities, investigations will involve the Grievance Focal person and/or the Community Liaison Staff under the contractor.

When selecting the investigating officer, the GRM Committee will ensure a lack of conflict of interest. This means that individuals involved in the investigation must not possess any personal, professional, or material stake in the outcome, nor should they have personal or professional ties with complainants or witnesses.

After finalizing the investigation procedure, the designated GRM manager will document and input data and details into the log book (appendix V- Sample grievance log ).

Recording and reporting the quantity and nature of suggestions and inquiries is crucial for analysis, aiding in enhancing project communications.

For grievances handled during the initial evaluation, certain conditions must be fulfilled: Grievances addressed at the initial stage, the resolution should align with the Grievance Focal Point's authorized mandate, project protocols, agreed-upon positions, lead to probable closure, and receive the complainant's prompt written confirmation of satisfaction.

#### 12.4.1.6 Investigation



The appointed investigator will collect information to understand the situation surrounding the grievance, usually involving site visits, document reviews, meetings with the complainant (if available and willing), and discussions with relevant parties, including formal and informal community leaders.

For resettlement or asset valuation grievances, multiple valuations may occur until a mutually accepted valuation is reached by both parties. Independent valuers can conduct these valuations, with the expenses covered by the disagreeing party until a mutual agreement is achieved.

After verifying the findings and suggesting a response to the complainant, the Grievance Committee will review and decide on the course of action. The Investigating Officer then outlines the planned actions in the grievance form, including investigation details and conclusions, and submits it to the GRM Committee.

### 12.4.1.7 Response to Complainant



The GRM focal individual will convey the intended action to the complainant through written and verbal communication and outline the procedure for appealing the initial decision. Feedback will be sought from the complainant regarding their satisfaction with the action taken, recorded alongside the complaint details and the response in the Grievance Resolution Form

### 12.4.1.8 Appeal

If the complainant remains dissatisfied, further discussions, involving senior management officers, will occur either collectively or individually to clarify positions. A final decision on actions will be reached during these meetings.

Appeals will be heard by the Grievance Committee (GRC), consisting of at least five members: three from the Mgusu Miners or NEMC and two independent individuals unrelated to the project authorities or the Government. The terms of reference for this Committee will be established prior to its formation. If unsatisfied with the proposed response, the complainant can appeal beyond the project's GRM Committee.

## 12.5 Capacity building

Regular training will be provided annually or as scheduled for staff and stakeholders, including onboarding sessions for new staff, covering comprehensive GRM aspects, emphasizing principles, procedures, and accountability to complainants.

The focus initially will be shifting from informal complaint resolution to systematically logging all feedback. Targeted training will be given to staff engaging with beneficiaries, system handlers, and management overseeing the process.

## 12.6 Transparency, Monitoring and Reporting

### 12.6.1 Transparency

Information about the GRM, such as complaints, resolutions, and policies, will be accessible online and on notice boards, regularly updated every quarter for viewing.

### 12.6.2 Regular Internal Monitoring

The GRM focal individual will evaluate the GRM's performance and conduct random checks during routine supervision visits. They will collaborate with the M&E Specialist to:

Ensure precise input of GRM information into the designated system, generate compiled reports in the agreed format with the Project Manager/Coordinator, provide regular summaries of GRM outcomes to both the project team and management, and assess pending complaints for necessary follow-up actions.

During annual/bi-annual general meetings, the project team shall discuss and review the effectiveness and use of the GRM and gather suggestions on how to improve it.

### **12.6.3 Reporting Mechanism**

Monthly, quarterly, semi-annual, and annual progress reports will contain GRM segments with current details regarding the following:

- Status of GRM establishment (processes, staffing, training, awareness, budgeting, etc.)
- Quantitative data: complaint count, relevant complaints, resolved cases
- Qualitative data: complaint types, responses, unresolved issues
- Complaint resolution time
- Grievances resolved at different levels
- Satisfaction with actions taken
- Specific issues with procedures, staffing, or implementation
- Factors impacting GRM/beneficiary feedback system usage
- Implemented corrective actions

## **12.7 Oversight, Review and Budgeting**

Semi-annual/annual portfolio meetings will cover the GRM's development status, beneficiary/citizen engagement, and implementation challenges, while an independent audit before the Project's mid-term review will evaluate its effectiveness, suggesting improvements. An allocated budget will cover GRM-related costs for specified activities.

### **12.7.1 Complaints Handling:**

- i. Establishment and management of the channels selected for making complaints
- ii. Management of complaints collection
- iii. GRM Committee meetings
- iv. Complaints recording and categorization
- v. Complaint investigation
- vi. Communication with complainant
- vii. The appeals process
- viii. Publication of responses to complaints (if agreed)

Table 12-1: Grievance Redress Mechanism (GRM) Framework for the Proposed Project

GRM Component	Description / Procedures	Responsible Party	Timeline / SLA	Tools Resources Required	Monitoring Indicators
GRM Access Channels	<ul style="list-style-type: none"> <li>Multiple reporting channels established to ensure inclusivity: Toll-free hotline, WhatsApp/SMS line and Email</li> <li>Suggestion/complaint boxes at the site &amp; village office</li> <li>Community Liaison Officer (CLO)</li> <li>Workers through HR/OSH reps</li> <li>Anonymous submissions allowed</li> </ul>	Project Manager, CLO, HR Officer	Continuous	Hotline, complaint boxes, posters, email, signage	<ul style="list-style-type: none"> <li>Number of complaints per channel</li> <li>Accessibility to vulnerable groups</li> </ul>
Receipt and Registration of Complaints	<ul style="list-style-type: none"> <li>Complaints received verbally or in writing</li> <li>GRM Officer logs into GRM Register (digital + hardcopy)</li> <li>Anonymous cases recorded without identity</li> <li>Acknowledgment provided to complainant</li> </ul>	GRM Officer / CLO	Within 3 days	GRM Register, forms, logbook	<ul style="list-style-type: none"> <li>% grievances acknowledged within 3 days</li> <li>Completeness of register</li> </ul>
Screening and Classification	<ul style="list-style-type: none"> <li>Complaints classified into: Level 1 (simple), Level 2 (moderate), Level 3 (serious — includes GBV/SEA/SH, major environmental harm)</li> <li>Determine if issue needs immediate action</li> </ul>	GRM Officer, Environmental & Social Specialist	Day 3–5	Screening matrix, checklist	<ul style="list-style-type: none"> <li>% grievances correctly classified</li> <li>Number of urgent cases</li> </ul>
Investigation and Verification	<ul style="list-style-type: none"> <li>Review facts, conduct site visits, interview complainant/witnesses</li> <li>For labour issues: engage HR</li> <li>For environmental issues: involve E&amp;S team for community issues: involve local authorities</li> <li>GBV/SEA/SH cases handled confidentially by trained GBV focal point without investigation by project staff</li> </ul>	GRM Committee, E&S Specialist, HR Officer, Local Government, GBV Focal Point	Day 5–14	Interview guides, investigation forms, transport, PPE	<ul style="list-style-type: none"> <li>% grievances investigated in time</li> <li>Number of GBV cases referred</li> </ul>
Resolution and Response	<ul style="list-style-type: none"> <li>GRM Committee meets, agrees on corrective actions</li> <li>Outcome communicated to complainant verbally or in writing</li> <li>GBV/SEA/SH survivors referred immediately (24 hrs) to service provider for medical, legal, psychosocial support</li> </ul>	GRM Committee, Project Manager, GBV Focal Point	Day 14–21	Minutes, resolution forms, referral pathway	<ul style="list-style-type: none"> <li>% grievances resolved</li> <li>Survivor satisfaction (GBV cases)</li> </ul>

GRM Component	Description / Procedures	Responsible Party	Timeline / SLA	Tools Resources Required	Monitoring Indicators
Implementation of Corrective Actions	<ul style="list-style-type: none"> <li>Implement agreed remedy (e.g., water spraying, boundary clarification, worker reassignment, safety improvement)</li> <li>Monitoring to ensure effectiveness</li> </ul>	Project Manager, Contractors, E&S Specialist	Day 21–30	Budget for actions, contractors, equipment	<ul style="list-style-type: none"> <li>% corrective actions completed</li> <li>Time taken for implementation</li> </ul>
Feedback and Closure	<ul style="list-style-type: none"> <li>Issue closed once complainant agrees resolution is satisfactory</li> <li>If dissatisfied, complainant can escalate appeal</li> <li>All cases must be documented and signed</li> </ul>	GRM Officer, Project Manager	30 days	Closure forms, appeals register	<ul style="list-style-type: none"> <li>% grievances closed with full satisfaction</li> <li>Number of appeals</li> </ul>
Appeals Mechanism	<ul style="list-style-type: none"> <li>If complainant is not satisfied: 1. Appeal to Project Manager 2. Appeal to District Authorities 3. Access judicial system GRM does not restrict legal rights</li> </ul>	Project Manager, District Council	Up to 45 days	Appeals forms, legal advisory support	<ul style="list-style-type: none"> <li>Number of escalated cases</li> <li>% appeals resolved</li> </ul>
Worker-Specific GRM (ESS2 Compliance)	<ul style="list-style-type: none"> <li>Confidential workers' channel through HR/OHS</li> <li>Covers wages, overtime, discrimination, SH, safety issues</li> <li>Resolved within 7–14 days</li> <li>No retaliation policy enforced</li> </ul>	HR Manager, OHS Committee	7–14 days	HR records, worker committees	<ul style="list-style-type: none"> <li>No. of worker grievances</li> <li>Retaliation cases (should be zero)</li> </ul>
GBV/SEA/SH Handling (Confidential)	<ul style="list-style-type: none"> <li>Separate, survivor-centered pathway</li> <li>No written details recorded without consent</li> <li>Immediate referral within 24 hours</li> <li>All project workers sign Code of Conduct</li> <li>Mandatory monthly awareness training</li> </ul>	GBV Officer, Social Welfare Office, Accredited Service Providers	Immediate (0–24 hours)	GBV referral pathway, secure confidential reporting channels	<ul style="list-style-type: none"> <li>No. of cases reported + responded (no narratives)</li> <li>% staff trained</li> </ul>
Communication and Awareness	<ul style="list-style-type: none"> <li>GRM disseminated through barazas, notice boards, site inductions, posters in Kiswahili</li> <li>Special sessions for women, youth, and vulnerable groups</li> </ul>	CLO, Communications Officer	Monthly	Posters, brochures, PPE, community meetings	<ul style="list-style-type: none"> <li>Awareness sessions conducted</li> <li>% community members who understand GRM</li> </ul>
Monitoring and Reporting	<ul style="list-style-type: none"> <li>Monthly GRM updates</li> <li>Quarterly ESMP reports to client and regulators</li> <li>Annual independent audit</li> <li>GBV cases reported numerically only</li> </ul>	E&S Specialist, Project Manager	Monthly / Quarterly / Annually	GRM database, audit reports	<ul style="list-style-type: none"> <li>Trends in complaints</li> <li>Recurrence of issues</li> <li>GRM performance score</li> </ul>
Budget for GRM Implementation	<ul style="list-style-type: none"> <li>Cost items: hotline, printing, grievance boxes, transport, meetings, GBV referrals, training. Estimated: TZS 25–30 million per year</li> </ul>	Project Manager, Finance Unit	Annual	Approved GRM budget	<ul style="list-style-type: none"> <li>Budget utilization rate</li> <li>Adequacy of funds</li> </ul>

## CHAPTER THIRTEEN

### 13 CONCEPTUAL CLOSURE PLAN

#### 13.1 Introduction

Decommissioning is the last phase of project life. It involves terminating project activities and operations and rehabilitating site to or close to its original state. It is anticipated that the project shall continue if there is a demand for a project, however, individual components of the processing and washing facilities shall be decommissioned as needed.

The proposed project will be implemented in an area that had farming and other regular activities for the past decade. The investor is intending to prepare a closure plan although it is not a requirement for PML holders.

To ensure that the closure plan takes into consideration the priorities of the surrounding communities and those of the country, the project proponent will establish the Mine Closure Committees. It is the Mine Closure Committee that reviews from time to time the implementation of the plan and sets priorities of the future use of the various mine infrastructures.

The choice of whether the pit should be filled after mining or be used as fish pond, or whether the mine building should be demolished or used by the locals for other purposes and other closure priorities, are usually decided by the closure committees. This is the set-up and implementation procedure of the closure plan that will be followed at this proposed project.

Upon permanent cessation of mining, the plant and associated infrastructure will be decommissioned and removed from site and the rehabilitation of the access road, plant and infrastructure areas shall then commence. The disturbed areas will be progressively reclaimed and rehabilitated in a manner that will allow re-establishment of a self-sustaining ecosystem and post-mining land use that is capable of full integration with adjacent natural vegetation areas for management purposes.

#### 13.2 Management Objectives

The principal closure objectives for the proposed project are the following:

- Prevent or minimize adverse long- term social and environmental impacts of the mine;
- Create a self-sustaining ecosystem or alternate land use based on an agreed set of objectives.
- Enable all stakeholders to have their interests considered during mine closure.
- Ensure the process of closure occurs in an orderly, cost-effective and timely manner.
- Ensure the cost of closure is adequately represented in company accounts; and
- Ensure there is clear accountability and sufficient resources, for the implementation of the closure plan.

#### 13.3 Closure Planning and Approvals

A decommissioning and closure plan will be submitted to the Mines Commission as per the project conditions of operation. The plan will provide a strategic planning framework for the decommissioning and rehabilitation of the project. The plan shall seek to ensure that the project proponent:

- Fulfils the requirements of the Mining Act and the respective regulations related to closure of the project.
- Identifies those aspects relating to decommissioning and closure that may impact on the environment, health and safety, and develop management strategies to minimize this impact.
- Provides details of the management strategies to be implemented, to the appropriate regulatory agencies associated with the closure of the project.
- Identifies those aspects relating to decommissioning and closure that will require determination and/or input by appropriate regulatory agencies prior to rehabilitation,
- Provides a basis for communication for the project and wider community regarding the longer-term land uses of the areas.

### 13.3.1 Closure Plan

To ensure that the project proponent management, government agencies, community members and the closure and rehabilitation team have a clear understanding of the closure and rehabilitation plan, objectives will be developed and signed off with proponent senior management. The objectives to be agreed upon will, guarantee that:

- Proponent's safety and environmental management standards are maintained during the decommissioning and closure phase.
- Rehabilitation achieves the specifically completion criteria to be agreed.
- Planning for future land uses, which are consistent with Project Proponent's primary business interests within the project facility, do involve the local community and other interested parties.
- The site is left in a condition that is safe, self-sustaining and suitable for the agreed alternative land uses.
- The amount of waste disposed off at the site is minimized by commercial disposal and recycling.
- and
- The site represents no long-term liability to the Project Proponent or the project area.
- Components of the closure plan are:
- Maintenance of fencing around the pit to prevent inadvertent entry by terrestrial wildlife or unauthorized persons.
- Re-contouring of the waste rock dump slopes, as necessary, to facilitate re-vegetation.
- Monitoring, management and (if necessary) treatment of water in the pit.
- Monitoring and, if necessary, treatment of run-off and seepage from the waste rock dump.
- Re-establishment of site drainage patterns by modifying ditches, removing redundant culverts and similar activities.
- Removal of the plant equipment and structures to their foundations and the areas backfilled covered and contoured with native materials. A short list of structures and infrastructure will be provided to the local governing agency for its ongoing use.
- Re-vegetation of disturbed areas using local species to deter erosion and restore terrestrial habitat.
- Verification that the project has not had an impact on the aquatic environment.

### 13.3.2 Machinery and Equipment

Prior to shut down, the processing and washing facilities will be cleaned and any materials that may contain HM will be run through the circuit. An inventory will be made of equipment that can be re-used. Equipment that can be sold will be cleaned and prepared for shipment. Metal goods that cannot be sold for re-use will be recovered and sold for scrap. Non-hazardous materials that do not have scrap value will be dismantled and placed in the on-site landfill.

Hazardous materials will be disposed of in the appropriate manner. Following removal of the equipment and structures to their foundations, the area of the facilities will be backfilled, covered and contoured with native materials.

### 13.3.3 Petroleum Products, Chemicals and Waste

Small - inventories will be maintained of those chemicals, such as water - treatment reagents, that will be required for post-closure use. To the extent possible, inventories of petroleum products and other chemicals will be consumed prior to shut down, returned to the supplier or sold. Non-re-usable chemicals will be disposed of in the appropriate manner.

Combustible materials will be incinerated on site where it is safe to do so. Solid, non-hazardous chemicals will be placed in the on-site landfill. Any hazardous materials will be disposed of in the appropriate manner.

### 13.3.4 Potentially Contaminated Soils

All facilities where chemicals, fuels, oils and solvents were used or stored will be checked for soil contamination. Any soils contaminated with hydrocarbons will be remediated. If justified, a bio-

remediation pad will be set up on-site. Alternatively, the soil will be shipped off-site for treatment or disposal.

### **13.3.5 Well Water Pipeline**

The pipeline from the water supply wells will be maintained in operation after closure to continue supply of potable water in the accommodation camp. Once there is no longer a requirement for fresh water, the pipeline will be cut into sections and hauled away for sale or may be provided to supply water to the Villagers.

### **13.3.6 Site Roads**

At closure, the on-site roads will remain in use after closure, including the access to the accommodation camp, the pit, the storm water management pond. Other on-site roads and parking areas will be decommissioned. Natural drainage patterns will be restored by removing culverts and/or by trenching. The road surfaces will be re-vegetated.

### **13.3.7 Buildings and Other Facilities**

All buildings and other infrastructure facilities will be decommissioned and demolished, apart from the following:

- Well water supply system.
- camp;
- Sewage treatment system;
- Security fences and gatehouse; and
- Recreational area.

Demolition will include removal of the building superstructures. Non-hazardous waste material will be placed in the on-site landfill. Concrete floor slabs will be broken up. The resulting rubble will be covered with 500 mm or more of soil and re-vegetated.

### **13.3.8 Site Re-vegetation**

Re-vegetation of disturbed areas will be required to prevent soil erosion and to establish conditions like the pre-development environment on-site given the goldy surficial soils and seasonally dry climate. Re-vegetation will be required in the areas listed below.

Processing facilities including:

- All areas associated with the buildings and stockpiles.
- Waste management facilities:
- The non-hazardous waste landfill;
- Area of the breached water storage dam;
- The top and side slopes of the tailings storage facility (herbaceous plants only);
- Top and side slopes of the waste rock dump; and
- Area of the storm water management pond once it has been breached.

Disturbed areas comprise the water storage dam, storm water management pond, ROM stockpile area, process plant, and the fuel and lube management facilities, powerhouse and electrical substation. These areas will be re-vegetated.

Re-vegetation will typically involve application of 0.15m of topsoil and seeding with native species. Where it can be demonstrated that this will be successful, re-vegetation may be achieved through application of mulch and fertilizer and seeding with native species. During the project, discussions will be held with the Ministry of Natural Resources, Department of Forestry and Beekeeping to finalize plans for relinquishing the Project site to the Ministry.

Re-vegetation to restore wildlife habitat will use local native species and plans will be developed in consultation with the Department of Forestry and Beekeeping to ensure that re-vegetation proceeds in accordance acceptable practice.

This will include seeding of the area for ground cover, such as grasses, as well as the planting of seedlings for some species, particularly for trees. Re-vegetation will be carried out as soon as areas are decommissioned to reduce the potential for soil erosion. The services of a local botanist will be enlisted to assist with developing the re-vegetation plan.

#### **13.3.9 Post-Closure Monitoring**

Physical monitoring of the closed Project site will include periodic visual inspection of the following:

- The integrity of the rehabilitated mining pit.
- The integrity of the re-vegetated tailings storage facility.
- The absence of erosion in the tailings storage facility spillway channels, the spillway prior to breaching and other water conveyance facilities,
- The health of the vegetation in re-vegetated areas
- The stability of embankments around the tailings storage facility and, until it is breached, the storm water management pond

These inspections will be carried out at least on an annual basis, and more frequently for certain areas if so determined in the final plan for closure. In addition to regular inspections, additional inspections will also be carried out immediately following any severe storms, earthquake events or floods.

The cover of the tailings storage facility will be examined for signs of liquefaction of tailings or underlying sediments. If significant slumping or differential settlement is evident, an assessment will be made as to whether slope stability or water quality has been compromised. If so, repairs will be undertaken.

#### **13.3.10 Expected Post-Closure Conditions**

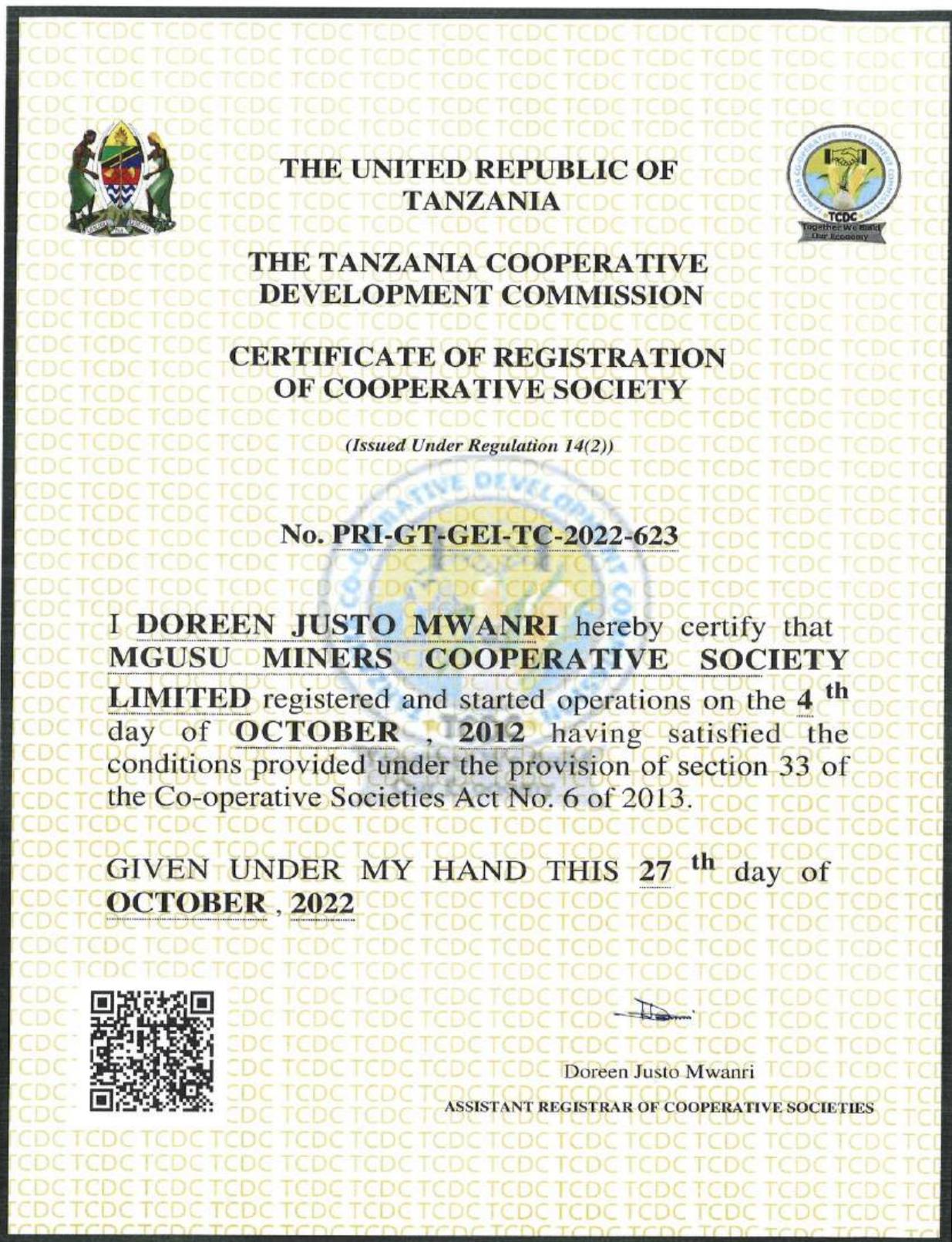
Project activities that are the primary source of noise, air, emissions and vibrations will cease on closure of the project. Since in the case of the Project, it will not be possible to achieve a complete, walk-away situation, a certain minimum level of activity will be required including:

- Maintenance and periodic replacement of the fence around the pit
- Possible treatment of water in the pit.
- Possible treatment of shallow groundwater down-gradient of the tailings storage facility and waste dump.

## REFERENCES

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2. Mining (Local Content) Regulations, 2018
3. Mining (Mineral Rights) (Amendment) Regulations, 2020
4. Socio-economic Profile of Geita Town Council Council
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7. United Republic of Tanzania, Tanzania Development Vision 2025
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9. United Republic of Tanzania, The Environmental Management Act No. 20 of 2004
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14. United Republic of Tanzania, The National Land Act, No. 4 of 1999
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21. United Republic of Tanzania. (2007). *Environmental Management (Soil Quality Standards) Regulations*. Dar es Salaam: Government Printers.
  
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APPENDIX I: RELEVANTS PERMITS



CTIN:

1091245



## TANZANIA REVENUE AUTHORITY

### CERTIFICATE OF REGISTRATION FOR TAXPAYER IDENTIFICATION NUMBER (TIN)

(ISSUED UNDER SECTION 23 OF THE TAX ADMINISTRATION ACT 2015)

**THIS IS TO CERTIFY THAT**

**MGUSU MINERS CO-OPERATIVE SOCIETY LIMITED**

HAS BEEN REGISTERED WITH THE TANZANIA REVENUE AUTHORITY  
AND ASSIGNED THE TAXPAYER IDENTIFICATION NUMBER

122-541-096

WITH EFFECT FROM: 21 NOVEMBER 2013

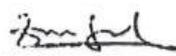
TRA LOCATION: GEITA

TAX OFFICE: GEITA

PHYSICAL LOCATION:

STREET / AREA: MGUSU



  
ALFRED T. MREGI  
COMMISSIONER FOR DOMESTIC REVENUE

NOTE: THE REQUIREMENTS UNDER WHICH THIS CERTIFICATE IS ISSUED ARE STATED OVERLEAF

REQUIREMENTS OF THIS CERTIFICATE

1. The taxable person must show his TIN registration number in any return, statement, notice of appeal or other document used for the purpose of all tax laws.
2. This Certificate should be displayed in a conspicuous position at the place of business

THE UNITED REPUBLIC OF TANZANIA  
MINISTRY OF MINERALS  
MINING COMMISSION

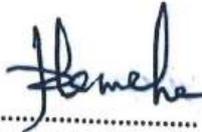
**RENEWAL OF PRIMARY MINING LICENCE PML000437LZ**  
*The Mining Act, Cap. 123*

I, **Resident Mines Office, for Geita Region**, pursuant to Section 56(2) of the Mining Act, Cap.123 hereby renew the Primary Mining Licence **PML000437LZ** granted to **M/S Mgusu Miners co-operative society Limited of P.O.Box 44, Geita** to prospect and mine for **Gold**, for a period of **7 years** effective from **22/11/2019**.

The description of the renewed Primary Mining License is provided overleaf.

This licence is being renewed under the same terms and conditions of Primary Mining License **PML000437LZ**.

Signed this ..... <sup>09<sup>th</sup></sup> day of ..... <sup>April</sup> ..... 2020.



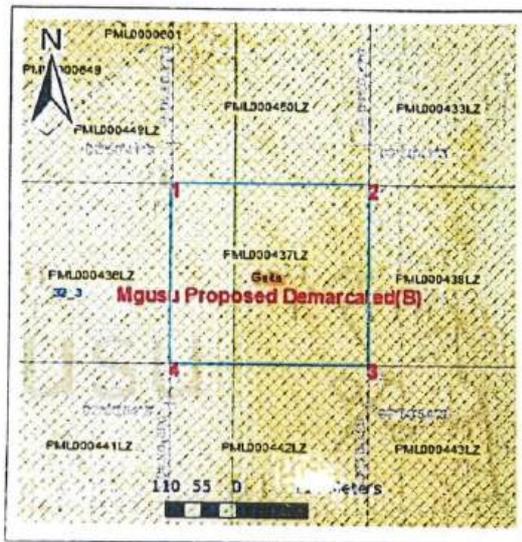
.....  
Daniel L. Mapunda  
For: **EXECUTIVE SECRETARY**

**ANNEX A**

**DESCRIPTION OF THE PRIMARY MINING LICENCE AREA**

The Primary Mining Licence is at Mgusu and in Geita District, QDS 32/3 defined by the following corner co-ordinates (Arc 17.0):

Corner	Latitude	Longitude
1	- 02 deg. 50 min. 43.00 sec.	32 deg. 03 min. 40.00 sec.
2	- 02 deg. 50 min. 43.00 sec.	32 deg. 03 min. 50.00 sec.
3	- 02 deg. 50 min. 52.00 sec.	32 deg. 03 min. 50.00 sec.
4	- 02 deg. 50 min. 52.00 sec.	32 deg. 03 min. 40.00 sec.



Legend	
Licensed area	
License Number	<b>PML000437LZ</b>
District	Geita
Direction	

An area of approximately 8.53 Hectares.

**ANNUAL RENT PAYMENTS**

Year	ERV	Amount (TShs/USD)	Date	Signature & Stamp
2020/21	1. 99038758862	767,700.00	21.02.2020	
2021/22	2. 921123045531395	767,700.00	03.05.2021	KNY AELISA MADINI MKAZI RESIDENT MINES OFFICER GEITA
2022/23	3. 995020554142	767,700.00	17/01/2023	KNY AELISA MADINI MKAZI RESIDENT MINES OFFICER GEITA
2023/24	4. 99502073397	767,700.00	09.01.2024	KNY AELISA MADINI MKAZI RESIDENT MINES OFFICER GEITA
5.	.....	.....	.....	.....
6.	.....	.....	.....	.....
7.	.....	.....	.....	.....



Jamhuriya Muunganowa Tanzania  
WIZARA YA MALIASILI NA UTALII  
WAKALA WA HUDUMA ZA MISITU TANZANIA



Address : "TFS" Geita  
E-mail: dfmgelta@tfs.go.tz

P.O.Box 191,  
GEITA.  
15/03/2024.

Ref, No, DA, 110/170/01A/84

**PERMIT FOR MINERAL MINING IN THE FOREST RESERVE**

Issued under Forest Act No. 14 of 2002 section 49 (1), regulation 33 (2) GN 324 of 2015 Part II item 15 (Not transferable)

1. Name of Institution/Company: MGUSU M.C.S LTD, MOBILE NO. 0767100581, GEITA
2. Representative of Company (as per power of Attorney): MASABILE MODEST MASABILE
3. License Number: PML000432LZ, PML000434LZ, PML000439LZ, PML000433LZ, PML000444LZ
4. Area (s) of Concern: GEITA FOREST RESERVE,
5. Representative (S) of Tanzania Forest Service (s): ALMAS K. MGGALU (DFC – GEITA C/o TFS LAKE ZONE)

This permit is granted to above named Institution/Company (here referred to as the Licensee) for a period of ONE YEAR with effect from 15/03/2024 to ENTER AND CARRY OUT MINING WORK within Geita Forest Reserve, Geita district under Primary Mining License No. PML000432LZ, PML000434LZ, PML000439LZ, PML000433LZ, PML000444LZ issued on 09<sup>th</sup> APRIL 2020 subject to the following condition:-

- a. Each licensee must pay mining fees equivalent to 1,600,000/= (i.e. Tshs 800,000/= per year/ha or part of) to Tanzania Forest (TFS) Agency;
- b. The Licensee must pay mining fees royalty at current rate for any forest produce obtained or damaged in the connection with the operation;
- c. Paying all other charges inclusion of entry fee for personnel and vehicles or per eighty and fourteenth schedule made under regulation 18<sup>th</sup> Item D and Part II (C) item 5 respectively;
- d. The licensee must rehabilitate all areas destroyed or otherwise disturbed;
- e. Paying Royalty at current rate for any forest produce obtained damaged in connection with the operations;
- f. Taking all such necessary precaution to prevent the occurrence or spread of fire within or adjacent to the permitted area;
- g. Taking all reasonable precaution not to unnecessarily destroy or damage vegetation on the permitted area;
- h. All waste materials (rubbish, plastics) removed from the permit area prior to or at the termination of the operations and;
- i. The permit shall expire on 30<sup>th</sup> June 2024.

A.K. Mggalu  
District Forest Conservator

**APPENDIX II: LIST OF THE STAKEHOLDERS CONSULTED**

**GEITA**

SN	Name/Jina	Title/Jina	Contacts/Mawasiliano	Date/Tarehe	Signature/Sahihi
1.	DR. UMARI SUKARI	AGAS	0754465828	16/10/2023	[Signature]
2.	SF HANNISI BAWA	RFO	0752583065	16/10/2023	[Signature]

**GEITA**

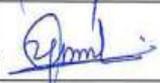
SN	Name/Jina	Title/Jina	Contacts/Mawasiliano	Date/Tarehe	Signature/Sahihi
1.	BINGILE CHARLES WASHIMA	EMO	0693266352	16/10/23	[Signature]
2.	S/SGT LUGODISHA BM	AG FURE MARSHALL	0755467279	16/10/23	[Signature]
3.	ELIAS M. GALILO	WED	0752044746	14/10/23	[Signature]

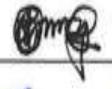
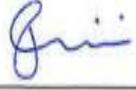
**PROVISION OF CONSULTANCY SERVICES FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE CONSTRUCTION OF GOLD ORES PROCESSING AND WASHING FACILITIES IN MWANZA, GEITA AND MARA REGIONS.**

SN	Name/Jina	Title/Jina	Contacts/Mawasiliano	Date/Tarehe	Signature/Sahihi
1.	Renshaw Shindhu	BWD	0752220162	20/10/2023	[Signature]

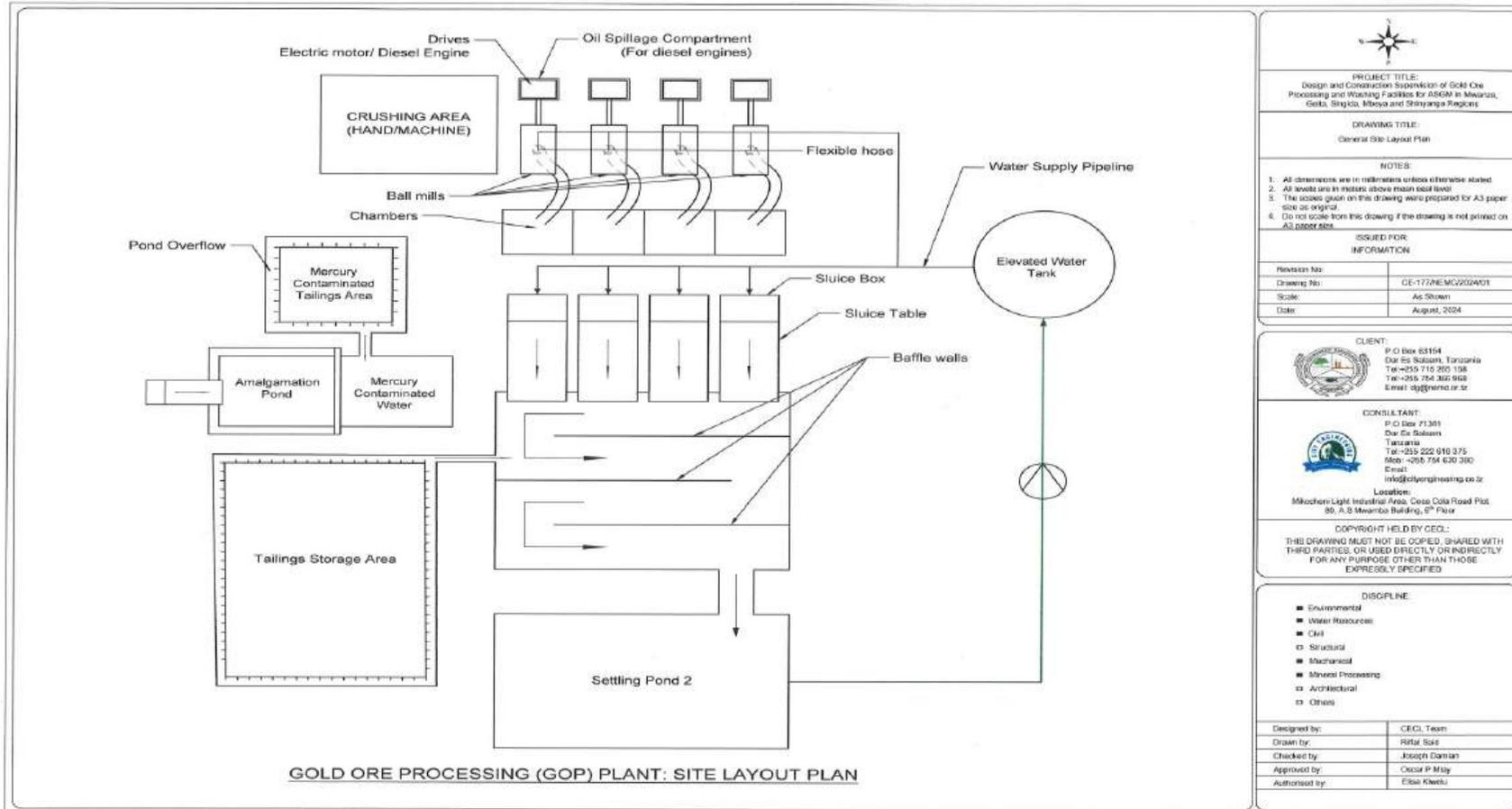
5.	MUSA KUZWILA	MANAGER GELA-MZ	075483203	11/10/23	[Signature]
6.	ELISHA D. KEMBO	OSHA INSPECTOR	0763-351447	11/10/2023	[Signature]
7.	EMMANUEL MICHESE	OSHA INSPECTOR	0716536304	11/10/2023	[Signature]

5.	RESEARCHER	MIGUSU MINE	0747637032	14/10/2023	[Signature]
6.	MASABILE MODEST	MIGUSU MINE M/WG-UYUKA	0787918702	14/10/2023	[Signature]
7.	ISMAILI LWAMBWA	MIGUSU MINE M/BOB	0745821871	14/10/2023	[Signature]
8.	PHILIP ANDREA	MIGUSU MINE M/HASIBU	0762474425	14/10/2023	[Signature]

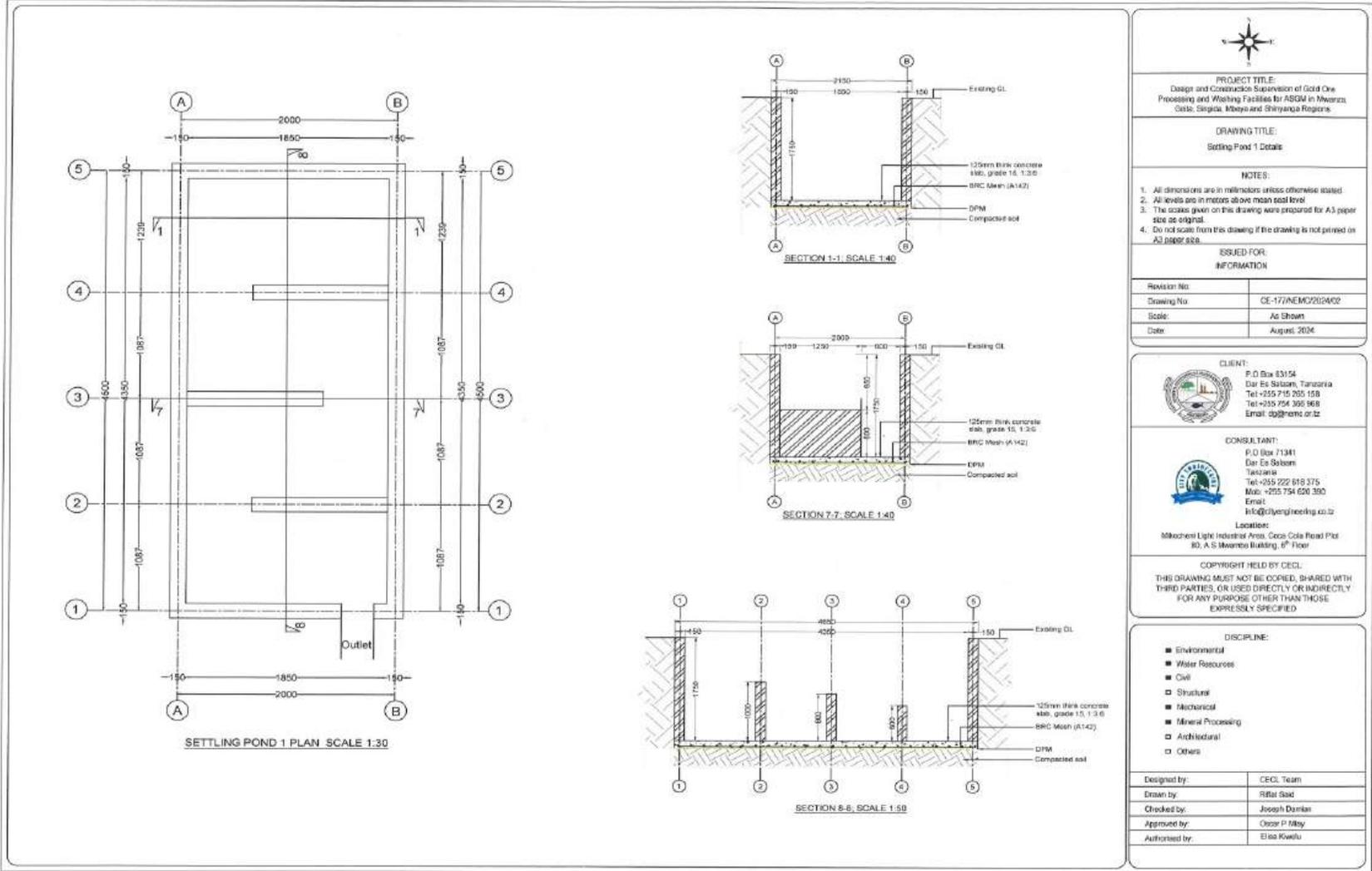
4	CESTANTINO DAVID TEMBA	MKENIA	GELA-LAKEZONE OFFICE-MWANZA	0674762899	10/12/2024	
5	VERONICA MATENBO	MKENIA	GELA-L20	0737374896	10/12/2024	

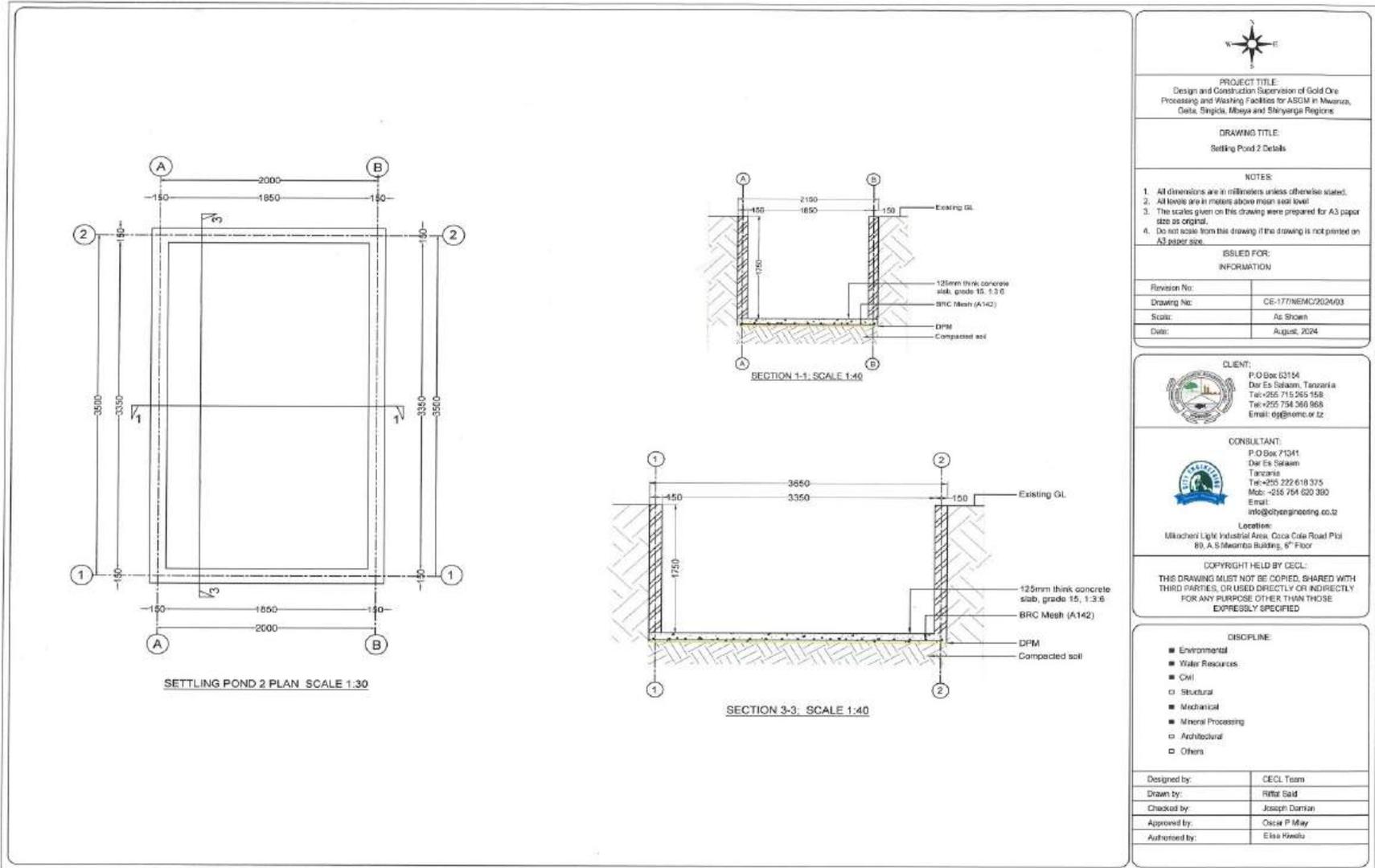
7	Renatus J. Shinku	Mkurugenzi	MWANZA	LVWB 0752220442	11/12/2024	
8	Eng. Jene Mrossu	Manager-Env.	LVWB	0713771930	11/12/2024	

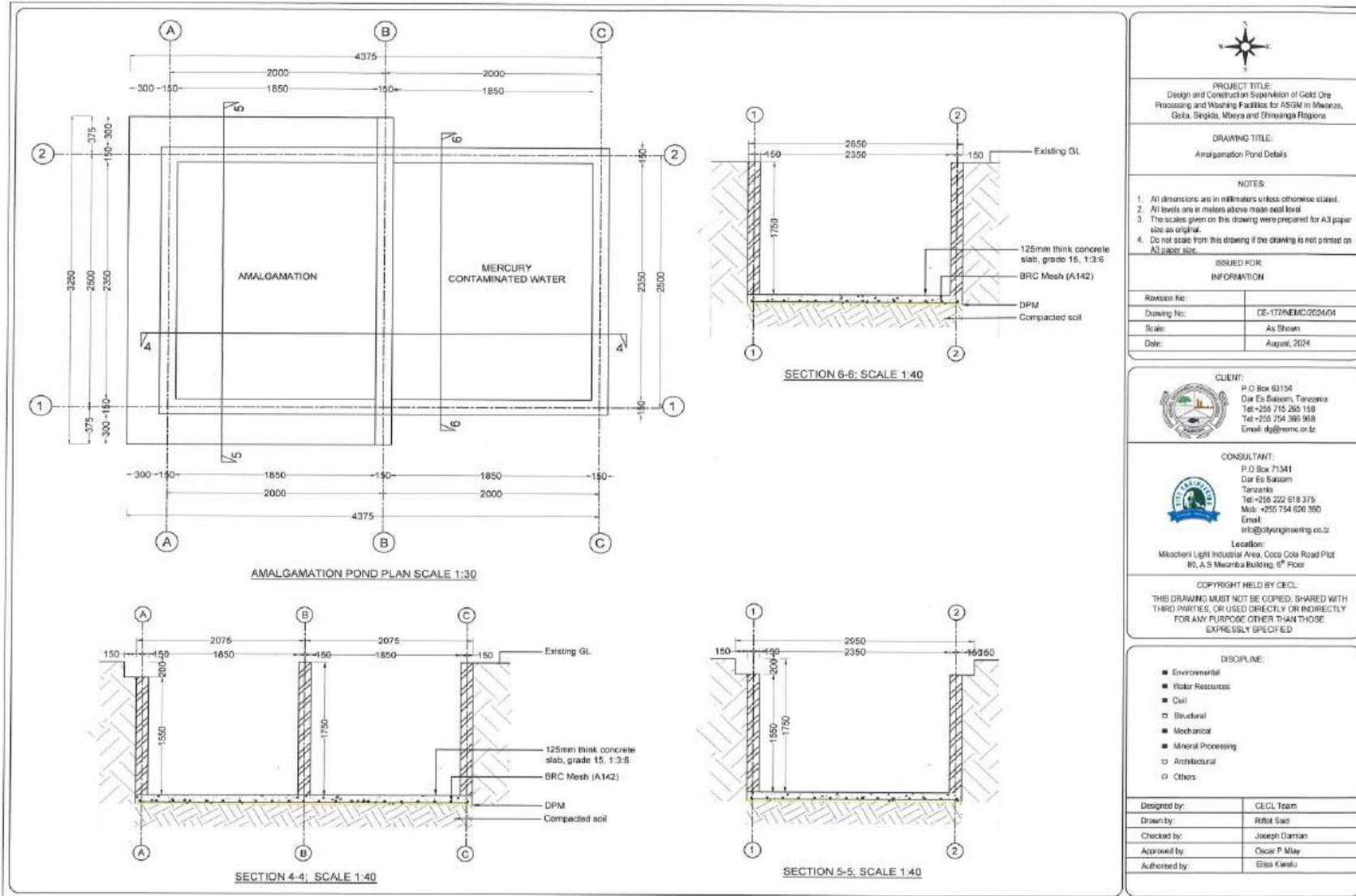
### APPENDIX III: DESIGN FOR PROCESSING AND WASHING FACILITIES



<b>PROJECT TITLE:</b> Design and Construction Supervision of Gold Ore Processing and Washing Facilities for ASGM in Mwanza, Geita, Singida, Mbeya and Shinyanga Regions	
<b>DRAWING TITLE:</b> General Site Layout Plan	
<b>NOTES:</b> 1. All dimensions are in millimeters unless otherwise stated. 2. All levels are in meters above mean sea level. 3. The scales given on this drawing were prepared for A3 paper size as original. 4. Do not scale from this drawing if the drawing is not printed on A3 paper size.	
<b>ISSUED FOR INFORMATION</b>	
Revision No:	CE-177/NE/MC/2024/01
Drawing No:	As Shown
Scale:	August, 2024
Date:	
<b>CLIENT:</b> P.O. Box 63104 Dar Es Salaam, Tanzania Tel: +255 715 200 198 Tel: +255 754 362 968 Email: dgg@mgusu.co.tz	
<b>CONSULTANT:</b> P.O. Box 71301 Dar Es Salaam Tanzania Tel: +255 222 616 375 Mob: +255 754 620 300 Email: info@ceclgroup.tz Location: Mkoani Light Industrial Area, Cango Cango Road Plot 85, A.S. Mwanza Building, 0 <sup>th</sup> Floor	
COPYRIGHT HELD BY CECL: THIS DRAWING MUST NOT BE COPIED, SHARED WITH THIRD PARTIES, OR USED DIRECTLY OR INDIRECTLY FOR ANY PURPOSE OTHER THAN THOSE EXPRESSLY SPECIFIED.	
<b>DISCIPLINE:</b> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Environmental</li> <li><input checked="" type="checkbox"/> Water Resources</li> <li><input checked="" type="checkbox"/> Civil</li> <li><input type="checkbox"/> Structural</li> <li><input type="checkbox"/> Mechanical</li> <li><input type="checkbox"/> Mineral Processing</li> <li><input type="checkbox"/> Architectural</li> <li><input type="checkbox"/> Others</li> </ul>	
Designed by:	CECL Team
Drawn by:	Rifal Saka
Checked by:	Joseph Daman
Approved by:	Oscar P. Mlay
Authorised by:	Elsa Kweku







**PROJECT TITLE:**  
Design and Construction Supervision of Gold Ore Processing and Washing Facilities for ASGM in Merizo, Geta, Singda, Mbeya and Shinyanga Regions

**DRAWING TITLE:**  
Amalgamation Pond Details

**NOTES:**

1. All dimensions are in millimeters unless otherwise stated.
2. All levels are in meters above mean sea level.
3. The scales given on this drawing were prepared for A3 paper size as original.
4. Do not scale from this drawing if the drawing is not printed on **A3 paper size**.

**ISSUED FOR INFORMATION**

Revision No:	
Drawing No:	CE-177/NEMC/2024/04
Scale:	As Shown
Date:	August, 2024

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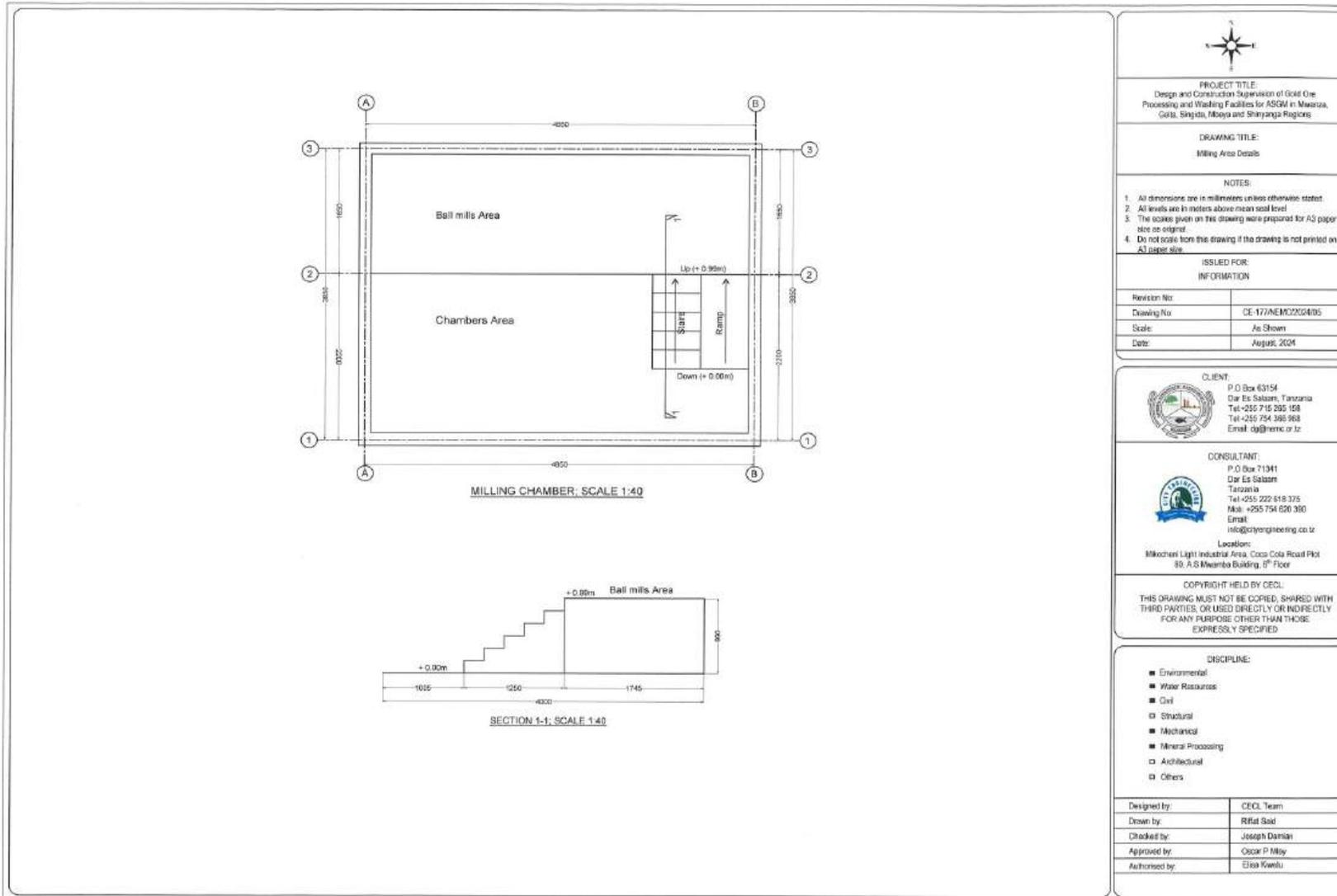
Location:  
Mikocheni Light Industrial Area, Coca Cola Road Plot 80, A/S Mwamba Building, 6<sup>th</sup> Floor

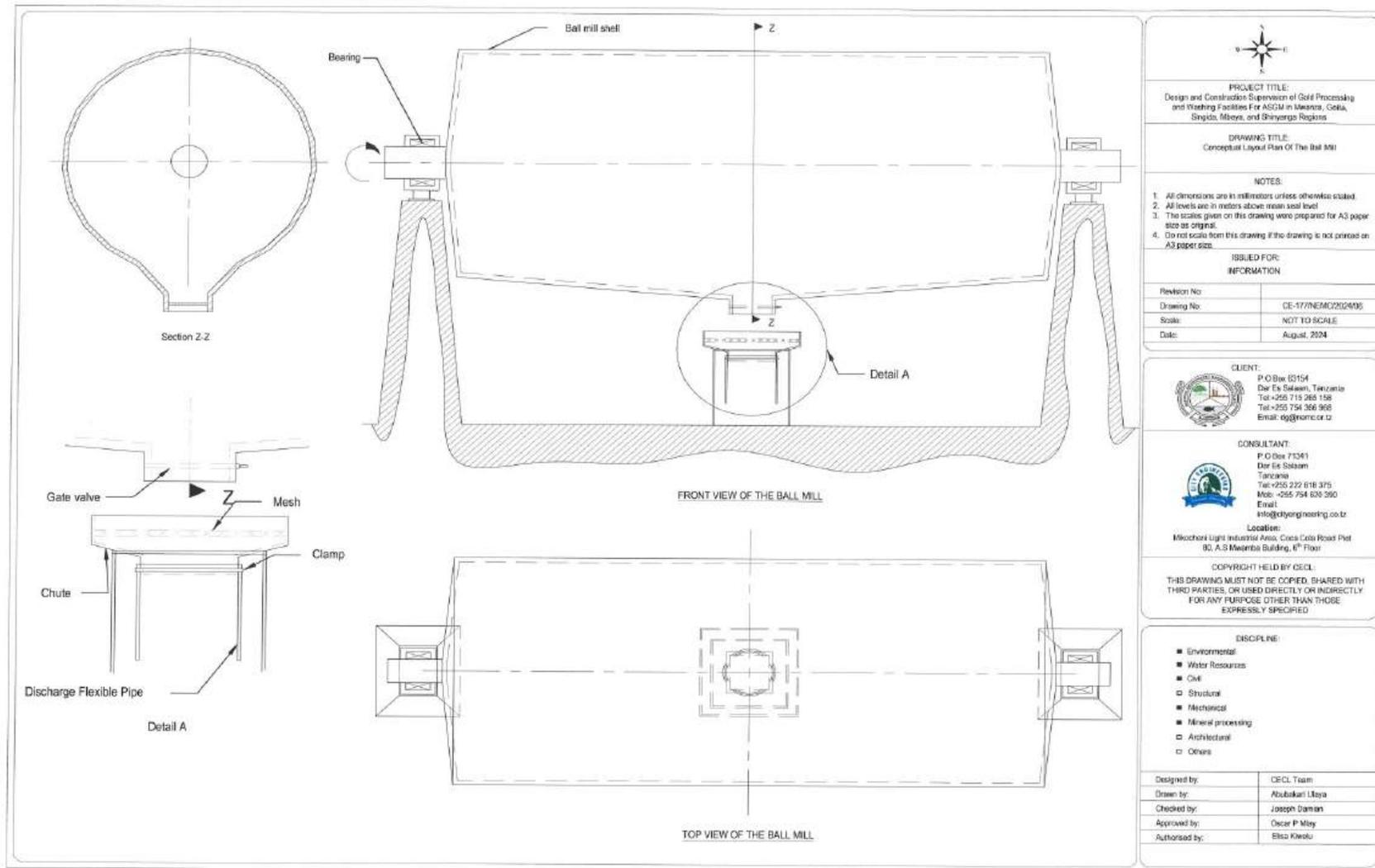
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- Environmental
- Water Resources
- Civil
- Structural
- Mechanical
- Mineral Processing
- Architectural
- Others

Designed by:	CECL Team
Drawn by:	Rifkat Saif
Checked by:	Joseph Darrian
Approved by:	Clare F. May
Authorised by:	Eliak Kikuku





**PROJECT TITLE:**  
Design and Construction Supervision of Gold Processing and Refining Facilities For ASGM in Siwarua, Celia, Singoto, Mbevu, and Shinyanga Regions

**DRAWING TITLE:**  
Conceptual Layout Plan Of The Ball Mill

- NOTES:**
- All dimensions are in millimeters unless otherwise stated.
  - All levels are in meters above mean sea level.
  - The scales given on this drawing were prepared for A3 paper size as original.
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INFORMATION

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Date:	August, 2024

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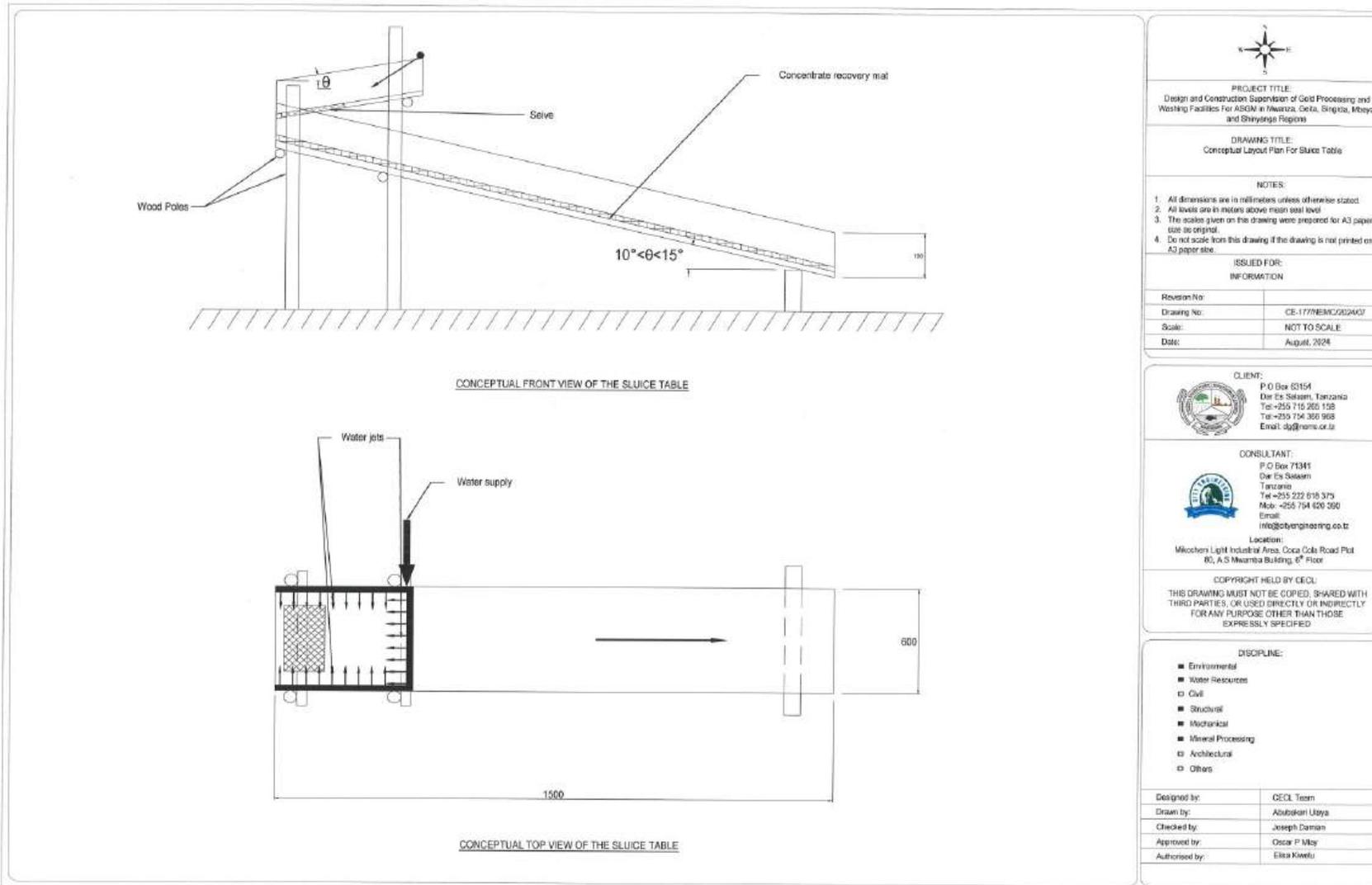
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  - Architectural
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**PROJECT TITLE:**  
Design and Construction Supervision of Gold Processing and Washing Facilities For ASGM in Mwanza, Geita, Singida, Mbeya, and Shinyanga Regions

**DRAWING TITLE:**  
Conceptual Layout Plan For Sluice Tables

- NOTES:**
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  - All levels are in meters above mean sea level.
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Date:	August, 2024

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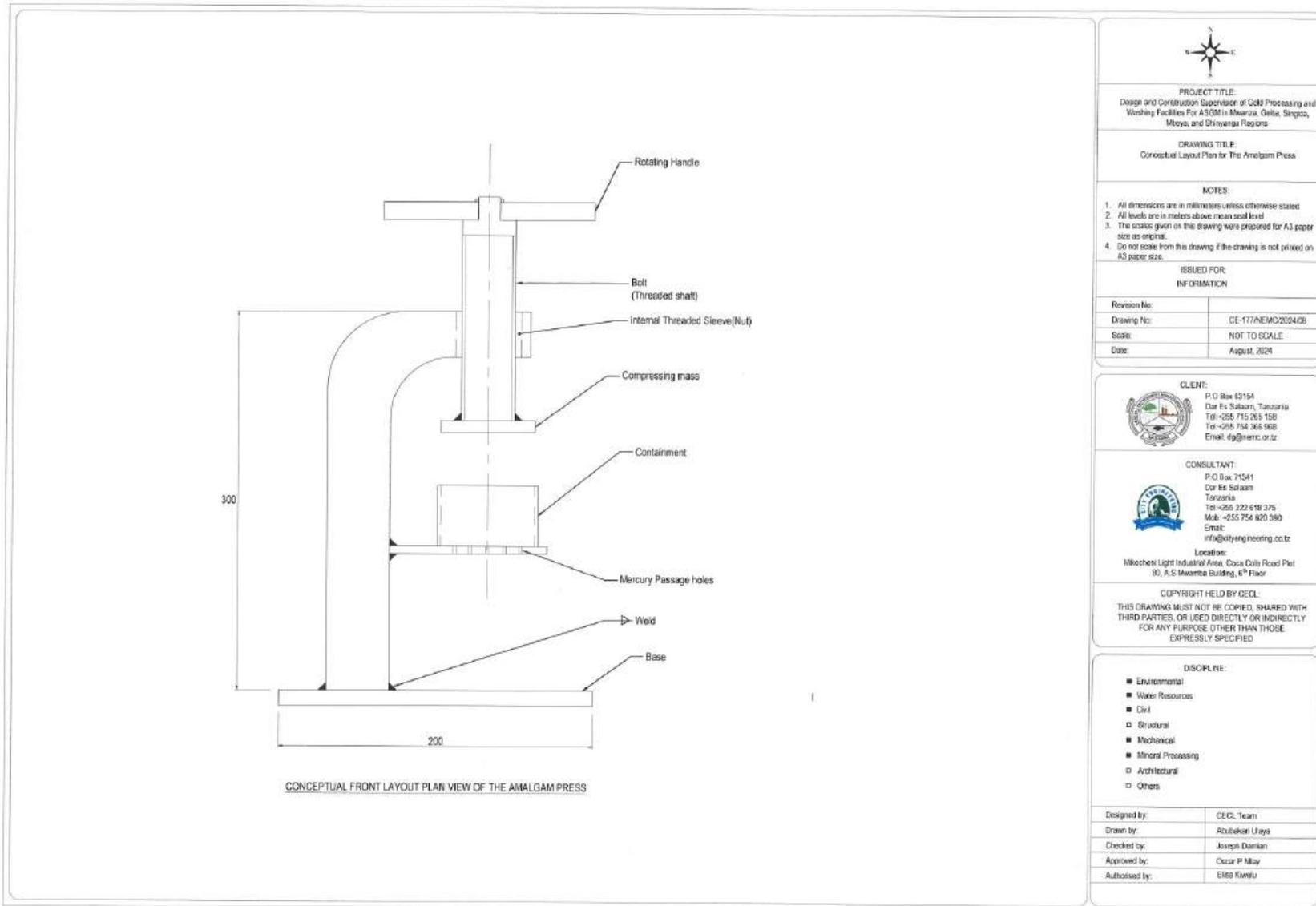
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  - Others

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Authorised by:	Elika Kweleu



**PROJECT TITLE:**  
Design and Construction Supervision of Gold Processing and Washing Facilities For ASGM in Mwanza, Gitega, Singida, Mbeya, and Shinyanga Regions

**DRAWING TITLE:**  
Conceptual Layout Plan for The Amalgam Press

- NOTES:**
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  2. All levels are in meters above mean sea level
  3. The scales given on this drawing were prepared for A3 paper size as original.
  4. Do not issue from this drawing if the drawing is not printed on A3 paper size.

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Scale:	NOT TO SCALE
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  - Structural
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  - Mineral Processing
  - Architectural
  - Others

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Approved by:	Oscar P May
Authorised by:	EMR Kawu

**APPENDIX IV: GRIEVANCE FORMS**

**FORM A: STAKEHOLDER GRIEVANCE RECORD –**

To be completed by GRC personnel (if grievance being submitted in person) or persons submitting complaint		
<b>Grievance Record</b>		
<b>Reference No:</b> (for official use)		
<b>Anonymous:</b>	<b>Yes</b>	<b>No</b>
<b>Full Name:</b>		
<b>Contact Information:</b>  Please mark how you wish to be contacted (letter, telephone, e-mail).		<b>Address/village/traditional authority and ward:</b>  _____  _____  _____  <b>9 Telephone:</b>  <b>10 E-mail:</b>
<b>Preferred Language for communication</b>	<b>for</b>	
<b>Description of Incident or Grievance:</b> What happened? Where did it happen? Who did it happen to? What is the result of the problem?		
<b>Date of Incident/Grievance</b>		
	One-time incident/grievance (date _____)	
	Happened more than once (how many times? ___)	
	On-going (currently experiencing problem)	
<b>What would you like to see happen to resolve the problem?</b>		
<b>Additional Comments:</b>		

**GRIEVANCE RECORD – TO BE USED AS PART OF THE DATABASE**

Grievance Record			
Grievance Number:	Date Submitted:	Target Date for Resolution:	
Name:			
Address and Contact Details			
Grievance Received By:			
Name of Grievance Coordinator:			
Description of Grievance:			
Assessment of Grievance Level:		Notification to the committee or other senior Management?	Y/N
Actions to Resolve Grievance			
Delegation to:			
Action	Who	When	Completed Y/N/Date
Response/Resolution:			
Strategy to Communicate Response:			
Sign-Off:			
Date:			

Conclusion			
Is complainant satisfied?	Y/N	Comments from Grievance Coordinator	
Grievance Closed?	Y/N	Grievance Resubmitted?	Y/N
Signature of GRC Chairperson:		Date:	
Date:		New Grievance Number:	

**GRIEVANCE RECEIPT FORM – TO BE USED TO ACKNOWLEDGE GRIEVANCES SUBMITTED**

Grievance Receipt Form		
Grievance Number:	Date Submitted:	Target date for initial meeting to address grievance:
Name:		
Address and Contact Details		
Grievance Received By:		
Name of Grievance Coordinator:		
Contact details of Grievance Coordinator	Telephone:  Email:  Address:	

