ROSINVEST (Z) LIMITED

ENVIRONMENTAL IMPACT STATEMENT (EIS)

FOR THE PROPOSED TIN MINING IN CHIROBI VILLAGE OF MAPATIZYA CONSTITUENCY OF KALOMO DISTRICT SOUTHERN PROVINCE OF ZAMBIA

UNDER LARGE MINING LICENSE NO. 16395-HQ-LPL

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ENVIRONMENTAL IMPACT STATEMENT (EIS)

SEPTEMBER 2014

FIRMATION

Rosinvest Zambia Limited hereby affirms that the information presented in this report reflects our environmental management commitments. Therefore, necessary resources shall be made available by our management to fulfill our commitments as presented in this report. We also acknowledge that failure to implement our commitments and any approval conditions that may be issued by the Zambia Environmental Management Agency (ZEMA) will be contrary to environmental and social laws in Zambia.

Name: Mr. Edward Simukonda

Signature: 

Date: 12th June 2014

Mine Manager/Holder

EXECUTIVE SUMMARY

This Environmental Impact Statement (EIS) have been prepared by Tropical Environmental Management Experts (TEME Consultants) for Rosinvest Zambia Limited (Developer) a Private Joint Venture Company between Daled Mining Limited and Vidayu Holdings Corporation Zambia Limited.

Rosinvest Zambia Limited is a Private Joint Venture company between Daled Mining Limited and Vidayu Holdings Corporation Zambia Limited who has acquired a Tin Mining Area in Chirobi Village of Kalomo District Southern Province of Zambia. The company was registered by the government of Zambia as a Private Limited Company on the 26th day of February, 2014 with the Company Registration No. 120174 and it is currently holding a Large Tin Mining License under Daled Mining Limited in Mapatizya Constituency of Kalomo District.

The mine for which this Environmental Impact Statement (EIS) report is prepared for is located in Chiefdom Simwata Chela of Chirobi village, Mapatizya Constituency of Kalomo District on a Large Mining License No. **16395–HQ–LPL.** The mine approximately covers an area of about 40km^2. It is about 165Km from Mapatizya Junction off Great North Road (T2).

The project under consideration involves open pit mining of Tin, Transportation of Overburden Material to the Overburden Dump, Dewatering the Open Pit, Servicing of Equipment, Hand Picking of Tin if seen in the Pit and Transportation of the Tin Ore to the Crushing and Smelter Plant. Support facilities include a Mine Camp for 82 workers, Security Fence, Explosives Magazine, Generator, settling Pond for Dewatering Water, Hired Earth Moving Machines, Water Bowser, Fuel Bowser, Service Workshop, Borehole and an Administration Office support the above.

The lifespan of the Mine has been estimated at 40 years with a possibility of extension if exploration is carried out and more tin resources are discovered.

Some of the Key and relevant legislation to this proposed project are the Environmental Management Act No. 12 of 2011 and its regulations, the Mines and Minerals Development Act No. 7 of 2008 and its regulations. Legislation on the workers welfare is also relevant to this proposed project. All relevant legislation that is key and relevant to this proposed developmental project has been discussed under the legal and policy framework chapter of this EIS report.

Post mine acquisition activities (mainly for maintenance reasons) included installation of a security fence, accommodation containers, continuation of dewatering activities, stabilizing the open pit and general housekeeping activities.

PROJECT ENVIRONMENT

The proposed mine is approximately 4 hectares in extent. The terrain is high and flat. The main vegetation cover is natural vegetative canopy of medium density with occasional ridges and hills hidden beyond the canopy. Most of the vegetation in the project site has not been affected by anthropogenic activities because for a long period access to the area by local people has been restricted. Vegetation covers within the proposed project site are Brachystegia allenii (mutondo) woodland with Muombo woodland, moderate grass covers in the slopes, Pterocarpus angolensis (mulombwa). The extraction of the Tin from Cassiterite will revert the site to above level visual access in the area except for the vegetative canopy crowning the forest with its nature beauty.

SCOPING AND CONSULTATIONS

A scoping process was conducted to identify and determine potential impacts of significance that would form the basis of the study and to eliminate issues unlikely to be of importance. In order to take into account public views in this process, a public consultation meeting regarding the proposed project and EIA study was held on 13th March 2014 and attended by different stakeholders. The results of this meeting together with deliberations within the study team formed a basis for determining the project Terms of References (TORs). Consultation with government institutions, local authorities and relevant stakeholders and interested and affected parties had continued throughout the study process as found necessary.

The scope of the study follows the EIA terms of reference for review. It consisted of three main phases, firstly the preliminary actions and scoping exercise; secondly the baseline studies and data collection; impacts and their mitigation measures. The study addresses issues surrounding the following aspects of the environment;

- Land and soil;
- Air quality and noise environment;
- Surface water;
- Underground water and quality;
- Occupational health and safety;
- Public health and safety;
- Traffic, road safety and public access;
- Local Ecosystem, vegetation and habitat; Land use/ Aesthetics;
- Employment and multiplier effects

POTENTIAL SOCIO AND ENVIRONMENTAL IMPACTS

Positive impacts of the project include a significant contribution to Large Scale Mining development in Zambia and provision of job opportunities to the local Kalomo/Chirobi Residents. Other benefits include tax to government, revenue contribution to the local authority, local business opportunity development and profit to the company for further investment in large scale mining development.

Just like other mining related projects, negative impacts of the project for which mitigation measures have been proposed are summarized below in the order of significance.

- ✓ **Social challenges for employees due to the camping arrangement which makes them leave their families during all the working days of the week:** - Mitigation measures for this impact include ensuring that employees go home during weekends and they are entitled to annual leave. Counseling services shall also be provided to all employees and their families.

- ✓ **Conflicts with the community and nearby mines: -** This impact shall be managed by continuing with stakeholder engagement and putting in place a grievance management system which shall be publicized to the community once developed none of the residents will be removed from their settlements because the mining activities will be more than 5km away from any human settlements.

- ✓ **HIV/AIDS related challenges due to limited time at home by employees and by having more money in their pockets: -** This shall be managed through professional counseling services and support for employees living with HIV/AIDS.

- ✓ **Occupational health and safety problems due to exposure of employees to dust, hazardous waste and explosives: -** Various operating procedures have been proposed and these include provision of protective clothes, monitoring and annual medical check-ups for all the employees.

- ✓ **Air pollution due to release of dust from the open pit, from the overburden dump, from roads and from open spaces within the camp: -** This shall be managed by frequent dust suppression using a water bowser and monthly ambient dust monitoring which shall include monitoring dust in confined working places.

- ✓ **Water pollution due to dewatering activities, effluent from the machinery washing bay, effluent from the workshop and due to sewage disposal: -** Water from the pit shall be pumped into a settling pond for settling off solids before discharge, all the effluent from the washing bay and the workshop shall be directed into an oil/water separator before discharge and a modular sewage treatment plant has been proposed for treatment of sewage.

- ✓ **Noise and vibration due to blasting and movement of machinery: -** Noise monitoring shall be done frequently, noise protective clothes shall be provided to workers and warning signs to show places where protective clothes are required shall be installed.

- ✓ **Loss of flora and fauna due to site clearing activities: -** This shall be management by restricting site clearing to specific areas, routine security patrols of the mine licensed area, prohibiting charcoal burning, obtaining a site clearing permit from management before site clearing and conducting conservation awareness activities.

- ✓ **Landscape change and land degradation due to mining and overburden disposal: -** This shall be managed by re-vegetation of the overburden dump and minimizing site clearing. Rehabilitation of contaminated sites in the entire mine area shall also be conducted.

ENVIRONMENTAL MANAGEMENT AND MONITORING

To implement all the commitments herein, an environmental management and monitoring plan has been proposed. Major issues that shall be monitored frequently include air quality, water quality, flora and fauna, soil quality, climate, waste management and socio-economic issues.

MANAGING DIRECTOR STATEMENT

I, Mr. Edward Simukonda Project Manager for Rosinvest on behalf of the Director, declare that the information presented in this report is nothing else but only the truth about Rosinvest's intention regarding the proposed project.

Signature: _____

C O N T E N T S

ABBREVIATIONS AND ACRONOMYNS

dBA	Decibels on the "A" Scale
CBD	Convention on Biological Diversity
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMMP	Environmental Management and Monitoring Plan
EMA	Environmental Management Act
FNDP	Fifth National Development Plan
GDP	Gross Domestic Product
HIV/AIDs	Acquired Immune Deficiency Syndrome
Km	Kilometer
Kph	Kilometers per hour
MMDA	Mines and Minerals Development Act
MSD	Mine Safety Department
NAPSA	National Pension Scheme Authority
NCS	National Conservation Strategy
NEAP	National Environmental Action Plan
NHCC	National Heritage Conservation Commission
OB	Overburden
PAYE	Pay As You Earn
PMT	Project Management Team
SI	Statutory Instrument
STDs	Sexually Transmitted Diseases
TORs	Terms of Reference
USD	United States Dollar
VAT	Value Added Tax
(Z)	Zambia
ZABS	Zambia Bureau of Standards
ZEMA	Zambia Environmental Management Agency
ZRA	Zambia Revenue Authority

LIST OF TABLES

LIST OF ANNEXTURES

1.0 INTRODUCTION

1.1 BACKGROUND OVERVIEW

Mineral resources of the nation reflect in terms of potential economic growth of the country at large. Our natural mineral wealth has been exploited considerably during the past years. With increase in industrialization coupled with population growth, the demand for different minerals has increased and is likely to grow further in years to come. With liberalized mining sector, there are efforts by locals and foreigners to take a share in the mining industry. Most investors have since ventured into mining at both small and as well large scale.

The Tin Belt of the Southern Province of Zambia has a history of small working extending over Sixty years, with limited production from numerous small eluvia, alluvial and pegmatite deposits, co-operative tin mining was initiated in 1963, but ceased in 1965 following Rhodesia's unilateral declaration of independence. The Geological Survey Department carried out a study of all known occurrences in 1967 and 1968 in order to assess the potential of the area as a preliminary to re-activating co-operative mining. (See expanded Geological Maps in Annex 21).

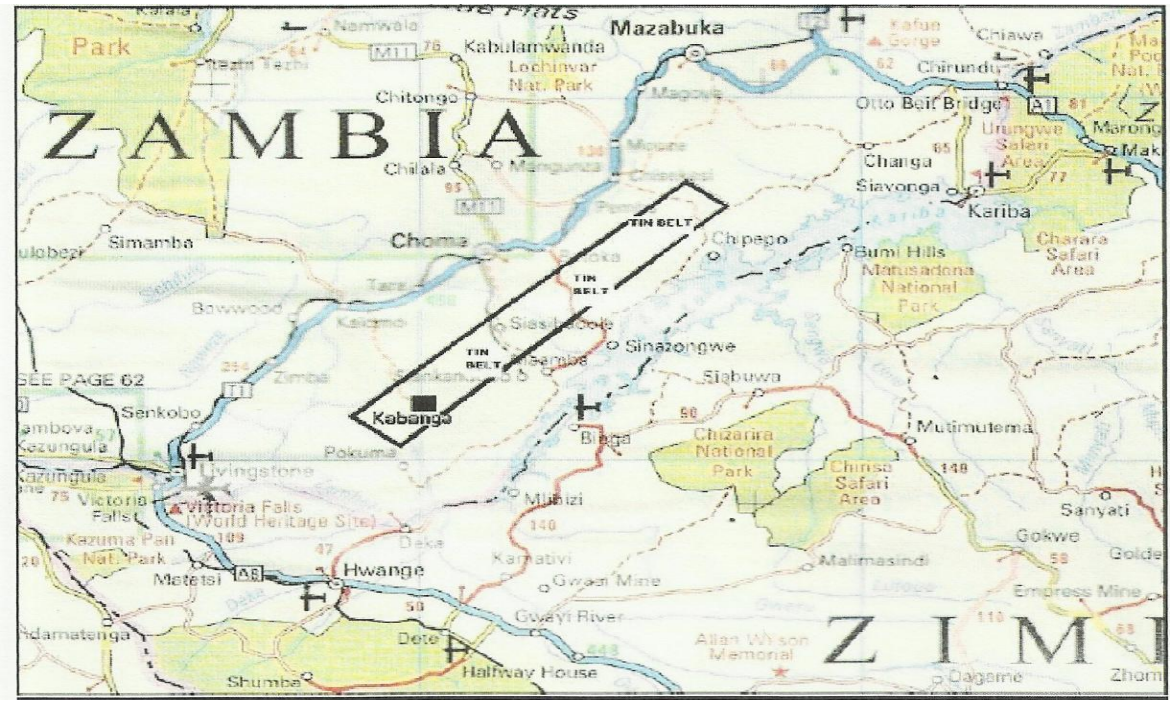

Fig 1: Tin Belt of Southern Province

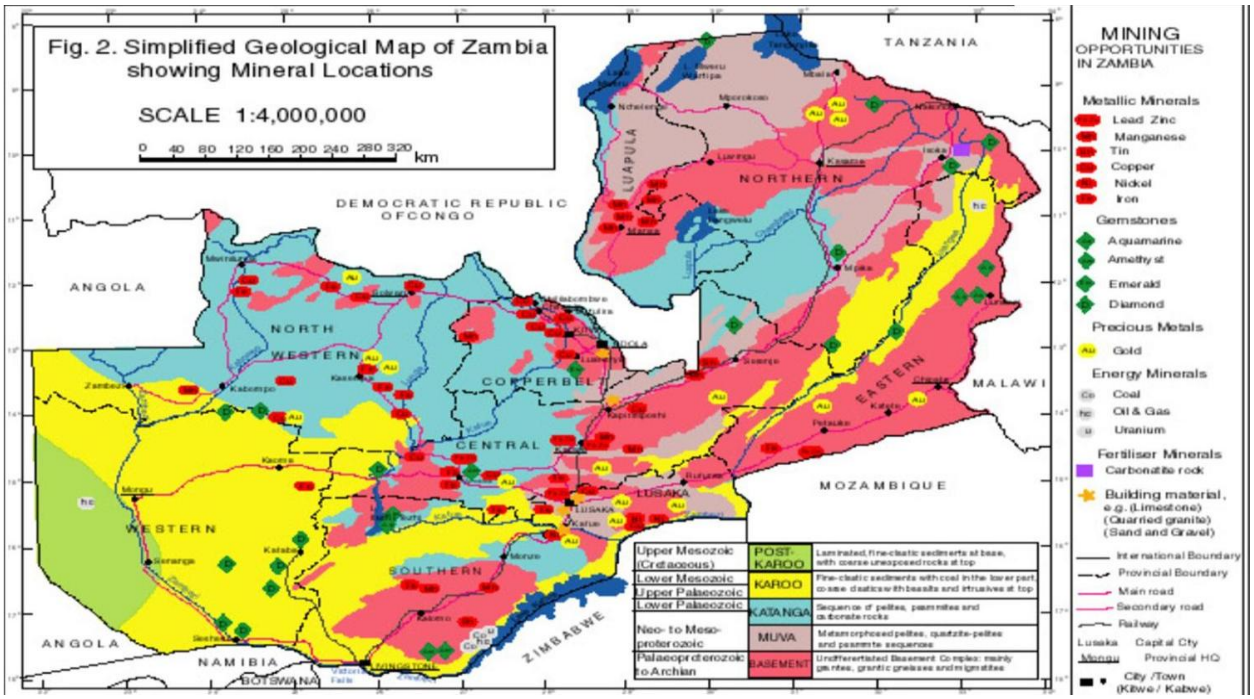

Fig 2: Geological Map of Zambia

Zambia is an attractive investment destination offering various lucrative investment opportunities in mining tourism, agriculture, manufacturing, energy. The investment climate is characterized by a stable macroeconomic environment, stable political system, investment guarantees and security.

Rosinvest Zambia Limited is one such Company which has been attracted by the aforesaid incentives. To break through the market, the company would like to invest in the Tin Mining project in Chiefdom Simwata Chela of Chirobi Village, Kalomo District of the Southern province of Zambia.

The company plans to spend **US$6,508,000 (Six million Five Hundred Eight Thousand dollars)** to implement and start its operations of the project. The life of mining is estimated about 40 years, tin average cost of producing tin ingot at the site is estimated at USD 4500 per ton. This includes costs for mining, concentrating, smelting, and government taxes.

The project site is located in Chiefdom Simwata Chela of Chirobi village, Mapatizya Constituency of Kalomo District on a Large Mining License No. **16395 – HQ – LPL**. The site is

about 165Km from Mapatizya Junction off Lusaka Livingstone Road (T2) and is approximately about 40km^2.

1.2 SCOPE OF WORK

The Project falls under the Environmental Management Act (EMA) No.12 of 2011 of the Environmental Impact Assessment (EIA) Regulations and it is therefore a requirement that an Environmental Impact Assessment (EIA) study is carried out for the project. The Environmental Impact Statement (EIS) presents the findings of the study to identify both positive and negative impacts together with recommendations to mitigate potential negative impacts and to enhance benefits.

The scope of work for this report includes identifying all the key project aspects (activities that interact with the environment) and proposing management measures as a means of mitigating environmental impacts. Major components of the report therefore include the project description, environmental impact analysis, mitigation measures and a Decommissioning and Closure Plan.
The scope of work for the Project baseline study included:-

- A desk study of all available information on the project area;
- Visits to government departments, Non-Governmental Organisations and other relevant authorities.
- An investigation/assessment of environmental baseline conditions including:-

  - ✓ Land and soil;
  - ✓ Air quality and noise environment;
  - ✓ Surface water;
  - ✓ Underground water and quality;
  - ✓ Occupational health and safety;
  - ✓ Public health and safety;
  - ✓ Traffic, road safety and public access;
  - ✓ Local Ecosystem, vegetation and habitat; Land use/ Aesthetics;

- ✓ Employment and multiplier effects

Other environmental concerns addressed by the proposed project include;

- To identify major activities of the project that shall interact with the environment, also called environmental aspects.
- To comply with the Zambian legal requirements.
- To provide a platform to the local people and other Interested and Affected Parties (IAPs) to suggest how best the mine should operate and how they shall benefit.
- To highlight key environmental management costs expected throughout the project life cycle.

1.3 OBJECTIVES

1.3.1 The Project

The main objectives of the proposed project are;

- Develop a project into a major open pit tin mining
- Mining Tin Ore for commercial use
- Running and operating a profitable Tin mine
- Creating wealth for both the shareholders and workers
- Improving the welfare of the local people
- Providing jobs to the local people living in the vicinity of the proposed project site
- Enhancing social and security services through corporate social responsibilities

1.3.2 The EIA

The objective of the EIA is to provide relevant details of the Project, the potential impacts and proposed management measures to minimise and control any potential adverse impacts. The information provided in the EIA should enable the environmental acceptability of the project to be assessed. The specific aims of this EIA are:

- To identify and evaluate the environmental impacts that will be caused by the construction and operation, and may be caused by the continued operation, of the mine.
- To identify and describe procedures and activities that will mitigate adverse impacts and enhance any beneficial effects.
- To make recommendations on how mitigation measures should be incorporated into the operation and decommissioning stages of the project as appropriate.
- To produce an environmental management plan that summarises the impacts and mitigation measures in a formalised way, and designates responsibility for each of them. This will help ensure that items identified in the EIA are taken forward and incorporated into the operation and decommissioning stages as appropriate. It will also incorporate recommendations for on-going monitoring.
- Providing necessary information to the local people, Mines Safety Department (MSD), Zambia Environmental Management Agency (ZEMA) and Kalomo Municipal Council for decision making.

1.4 THE COMPANY/CONTACT DETAILS

Rosinvest Zambia Limited is a Private Joint Venture Company between Daled Mining Limited and Vidayu Holdings Corporation Zambia Limited. It was registered by the Republic Government of Zambia as a Private Limited Company on the 26th day of February, 2014 with the Company Registration No. 120174. The company has two company shareholders Daled Mining Limited with 50% of shares and Vidayu Holdings Corporation Limited with 50%.

DEVELOPER'S CONTACT DETAILS:

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LUSAKA, ZAMBIA.

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Table 1: Particulars of Shareholders

Names	Address	No. of Shares	Shares%
Daled Zambia Limited	Box 320112 Woodlands Lusaka, Zambia.	2,500	50%
Vidayu Holdings Corporation (Z) Limited	P.Bag E 017, Cross Roads, Lusaka, Zambia	2,500	50%
Total		**5,000**	**100%**

Table 2: Details of Directors

Names	Address	Description
Mr. Rustem Nuriev	6786, Chiwalamabwe, Rd, Olympia	Director
Mr. Eldar Nuriev	6786, Chiwalamabwe, Rd, Olympia	Director
Mr. Yury Zhukov	Central Street 66, Jesmondine	Director
Mr. Edward Simukonda	5176, Chishango Road, Villa Elizabeth	Director
Mr. David Bowa	5176, Chishango Road, Villa Elizabeth	Director
Mr. Ali Ismail	5176, Chishango Road, Villa Elizabeth	Director

1.5 TRACK RECORD/PREVIOUS EXPERIENCE OF THE PROJECT DEVELOPER

Rosinvest Zambia Limited was incorporated into the Zambian Laws on 26th day of February, 2014 as a Private Joint Venture between Daled Mining Limited and Vidayu Holdings Corporation Zambia Limited. Apart from mining the shareholders of the company are involved in other business ventures such as Industry, Agriculture, Construction and Transport.

At a higher level, the Director of Mine for Daled Mining Limited (one of the directors for Rosinvest) has experience in mining industry. He has worked as an Inspector of Mines. His duties involved inspecting underground and surface working environment; enforce the provision of mining; dumps, explosives and environmental regulations. Inquiries into fatal accident, give evidence at inquests hear cases related to contravention of mining and explosives regulation and take appropriate action. Investigate dangerous or defective practices, instructs more management to discuss problems pertaining to matters of safety and health, participates in mine rescue meeting and evaluates mine rescue exercises.

1.6 COMMENCEMENT OF THE PROJECT

The project will commence upon the approval of the project by the Zambia Environmental Management Agency (ZEMA) and other Government Institution e.g. Ministry of Mines.

1.7 THE EIA STUDY

The Project falls under the Environmental Management Act (EMA) No.12 of 2011 of the Environmental Impact Assessment (EIA) Regulations and it is therefore a requirement that an Environmental Impact Assessment (EIA) study is carried out for the project. The Environmental Impact Statement (EIS) presents the findings of the study to identify both positive and negative impacts together with recommendations to mitigate potential negative impacts and to enhance benefits.

1.8 SCOPE OF THE EIA STUDY

The EIA study has been carried out following the guidelines and requirements of the Zambia Environmental Management Agency (ZEMA) and the project Terms of References. The final document of the EIA study comprises an Environmental Impact Statement (EIS) and an Environmental Management and Monitoring Plan (EMMP).

Geographically the study is limited chiefly to the mining area Chirobi Village of Mapatizya Constituency Kalomo District and neighbouring areas such as Choma District and Southern province at large although effects on issues such as traffic, sources of raw materials and socio-economic effects may have implications further afield.

From the outset it should be mentioned that one of the major environmental concerns that has been addressed by the study, and as expressed by neighbouring residents to the project, is the issue of Noise and Air Pollutions.

Other important environmental issues that have been addressed by the study include:

- Water pollution control: management of sewage, solid waste and other waste products as well as the storage and handling of petroleum products especially during mining construction and operation.
- Public health issues including waste management, HIV/AIDS and vector control
- Road access and traffic.
- Land use, aesthetics and urban development.
- Socio-economic issues including employment and multiplier effects.

The Environmental Management and Monitoring Plan (EMMP) outlines duties and responsibilities of the developer, Company and other relevant parties to serve as a management tool in the successful implementation of recommended mitigation measures and subsequent monitoring thereof during all project phases.

1.9 METHODOLOGY

The study consisted of three main phases as follows:

Phase 1: Preliminary actions and scoping exercise

Phase 2: Baseline studies and data collection

Phase 3 Impact Assessment (of Bio-physical and Social-economic environment during Construction and operational phases) and recommendations.

Formal review of the EIS document by ZEMA (including public review) follows as the final main stage in the EIA process.

1.9.1 PHASE 1: PRELIMINARY ACTIONS AND SCOPING

Information regarding the proposed project was reviewed and a pilot survey was conducted of the study area in order for the study team to obtain an initial appraisal of the environmental issues involved. Various alternatives for development of the project were discussed with the developer. The legal and institutional framework applicable to the project was also reviewed at this stage. From this the team made a preliminary identification of all environmental impacts that could potentially arise as a result of implementation of the project.

A scoping process was then conducted to determine potentially significant issues that would form the basis of the EIA study to be included in the Terms of References (TORs), and to exclude issues unlikely to be of any significance. In order to ensure that public views were taken into account in the preparation of the TORs, a public consultation (scoping) meeting was held at in Chirobi Village which was attended by relevant Government agencies, local authorities, and local residents as well as other interested and affected parties.

The agenda of this meeting included a presentation of the proposed project by Rosinvest Zambia Limited and project professional team with questions and answers followed by an outline by the Consultant of anticipated impacts and proposed mitigation measures with an open floor

discussion. A full attendance list and minutes of the meeting are included in the in the Terms of References.

TERMS OF REFERENCE

The Terms of Reference were drawn up from discussions within the EIA study team taking into consideration the issues contained in the Third Schedule of the EIA guidelines and results of the public consultations. The scope of the study as described by the Terms of Reference is summarized in Section 1.8 and a copy of the full Terms of Reference will be attached as annexure 3.

1.9.2 PHASE 2: BASELINE STUDY AND DATA COLLECTION

The baseline study included the following tasks:

- A desk study was undertaken wherein the Consultant concentrated on available data, documents and literature with information relevant to the study. References will be incorporated in the final document.
- Several field trips / surveys were conducted by the study team at the mine and surroundings to gather information on the existing environment including topography, geology and soils, fauna and flora, population and settlement, economic activities and existing physical infrastructure relevant to the environmental study.
- Continued consultation was undertaken as necessary with government agencies, other stakeholders and members of the community to collect data and identify qualitative issues associated with the proposed project.

From the above a baseline description of the bio-physical and socio-economic setting of the study area was formed.

1.9.3 PHASE 3: IMPACT ASSESSMENT AND RECOMMENDATION

An assessment of potential positive and negative impacts resulting from implementation of the proposed project was undertaken taking into consideration the technical description of the proposed project and baseline information of the existing environment. Assessment was undertaken through discussions within the study team and based on a combination of objective and subjective experience and professional judgment. Further consultations with relevant agencies / bodies / experts were undertaken as found necessary to assist in this process.

Potential impacts, both positive and negative, were identified and their significance assessed with the help of the following criteria (as applicable):

- Likelihood of impact occurring (L)
- Magnitude / intensity (M)
- Extent (spatial area to be affected) (E)
- Duration (D)
- Frequency (F)

From this, mitigation measures could be identified and recommended to be incorporated into the design, implementation and operation of the project so as to minimise, compensate for, or avoid the occurrence of potential negative impacts or to enhance positive effects. This includes advice on management clauses to be included in the contractual scope of works.

Mitigation measures and recommendations as well as parameters to be monitored, timing and responsibilities, are outlined in the EMMP that constituted the final stage of document preparation.

2.0 LEGAL AND POLICY FRAMEWORK

This section describes social and environmental laws and institutions that shall be significant to the Rosinvest Zambia Limited Tin project. This section shall also form the basis for development of the environmental and social management legal register for the mine. The section briefly describes the applicable law and explains the relationship to the project.

2.1 BRIEF HISTORICAL BACKGROUND OF THE LEGAL AND POLICY FRAMEWORK IN ZAMBIA

Due to the requirement for development which meets the needs of today's generations without compromising the needs of future generations, the Government of the Republic of Zambia (GRZ) adopted the National Conservation Strategy (NCS) in 1985. This was upgraded to the National Environmental Action Plan (NEAP) in 1992 with the same aim of fostering sustainable development. The NCS and NEAP are the foundation pillars of environmental laws in Zambia.

The NCS facilitated development of the Environmental Protection and Pollution Control Act (EPPCA) in 1990 which led to formulation of the Environmental Council of Zambia (ECZ) in 1992. The EPPCA was repealed in 2011 into the Environmental Management Act No. 12 of 2011, which is the current supreme environmental management law. Consequently, ECZ was changed to Zambia Environmental Management Agency (ZEMA) following repeal of the EPPCA.

Likewise, the supreme environmental regulatory institution in Zambia is ZEMA, previously called ECZ. This institution has the legal mandate to enforce provisions of the Environmental Management Act with its subsidiary regulations. Further to this, the institution has the mandate to create environmental management awareness and play an advisory function to both the private and public sectors.

2.2 THE ENVIRONMENTAL MANAGEMENT ACT NO. 12 of 2011

As highlighted above, this Act was immediately preceded by the Environmental Protection and Pollution Control Act No. 12 of 1990. Provisions of the Environmental Management Act require that all new projects begin with an Environmental Impact Assessment (EIA) and after project implementation; follow-up activities such as licensing, auditing and compliance inspections are done. These follow-up activities are conducted in accordance with provisions of applicable Regulations. The Environmental Management Act also provides regulatory instruments for activities such as, but not limited to waste management, water pollution, air pollution, chemicals management and hazardous waste management.

Relevance to the Project: - All developments, whether small scale mining or large scale mining have positive and negative environmental impacts. It is important to identify these impacts in order to know management measures for mitigating negative impacts and promoting positive impacts. The Environmental Management Act provides the general guiding principles for environmental protection and pollution control. It is the umbrella regulatory tool for environmental management issues in Zambia and all development activities with environmental aspects have to comply with provisions therein hence the relevance.

Applicable Regulations under the Environmental Management Act No. 12 of 2011 are described below.

2.2.1 Air Pollution Control (Licensing and Emissions Standards) Regulations of 112 of 2013 Part 2 (SI No. 3).

These Regulations provide air quality standards and guidelines for mitigating air pollutants. The regulations gave both point source standards and non-point source standards.

Relevance to the Project: - Aspects that shall contribute to air pollution shall mainly be in form of dust generation from the pit, from overburden dump and from access roads. Earth moving machines shall also contribute to air pollution from exhaust fumes although regulations are not

yet developed for mobile emission sources. The project activities described herein will not have significant point source emissions but ambient air shall have to be monitored especially dust particulates hence the relationship to the project.

2.2.2 Water Pollution Control (Effluent and Waste Water) Regulations, 112 of 2013 Part 2 (SI No. 3).

These Regulations provides for control of water pollution by providing effluent discharge standards. Ground water standards are basically established after collecting a set of monitoring results as baseline and this is specific to the area under consideration. The Regulations also provide requirements for licensing all effluent discharge points.

Relevance to the Project: - Storm water shall be generated and other effluents in form of overflow from settling ponds, sewage and from washing of machinery shall be generated. The effluent from project activities shall not be discharged without obtaining applicable licenses which are issued with conditions. Therefore, these Regulations are relevant to project.

2.2.3 Waste Management (Licensing of Transporters of Waste and Waste Disposal Sites) Regulations, 112 of 2013 Part 3 (SI No. 10).

Under these Regulations, activities relating to waste management such as waste generation, collection, storage and disposal are regulated. The Regulations are only applicable to non-hazardous waste.

Relevance to the Project: - Environmental aspects associated with waste generation are provision of food to employees, housekeeping activities and removal of overburden material from the open pit. To manage these wastes accordingly, adherence to the Waste Management Regulations is relevant hence the relationship to the project.

2.2.4 Hazardous Waste Management Regulations, 112 of 2013 Part 4 (SI No. 18).

These Regulations do not cover non-hazardous waste. The Regulations control and monitor the generation, storage, transportation, pretreatment, treatment disposal, export, import, transit, trade in and Trans boundary movement of hazardous of all waste.

Relevance to the Project: - Rosinvest will hire a generator, light vehicles and earth moving machines from the local suppliers which will be operating on the site. These machines require frequent servicing and this leads to generation of hazardous waste. Further to this, used fluorescent tubes will be generated. All these wastes have to be managed in a manner that would not cause harm to human health and the environment hence the relevance to the project.

2.2.5 Pesticides and Toxic Substances Regulations, 112 of 2013 Part 5 (SI No. 31)

This provide for ZEMA to regulate the use and importation, exportation and manufacturing of pesticides and chemicals in the country.

Relevance to the Project: -The proposed project will comply with these regulations. Appropriate permits will be sought from ZEMA prior to implementation of the proposed project. In addition, the storage areas will be bundled and upraised to contain any spillage and washing from the toxic substances emanating from the proposed facilities. An impervious lining will be laid on the floor to contain leaks. Further, a leak detection system will be put in place.

2.2.6 Noise Pollution

Noise will be generated by the moving vehicles and Mining equipment during operation. However the noise will be localized by properly servicing vehicles and that the silencers are in good condition. Any operations, which result in undue noise disturbance, will be restricted. Signage will be put up to remind workers not to make noise during operation stages whilst on site

2.3 THE MINES AND MINERALS DEVELOPMENT ACT NO. 7 of 2008

Besides the Environmental Management Act No. 12 of 2011, environmental issues associated with mining activities in Zambia are also regulated by the Mines and Minerals Development Act (MMDA) No. 7 of 2008. The enforcing institution of the MMDA is the Mines Safety Department (MSD). Provisions of this Act entails that for all mining related projects, the Factories Act CAP 441, which provides a framework for developing and enforcing regulations to ensure the safety, health and welfare of persons employed in factories does not apply to the mining industry. This is to avoid duplicity in law since most of the provisions are already covered by the MMDA.

Requirements of the MMDA include conducting scheduled inspections, audits, appointment of competent persons to oversee mining related activities and submission of periodic statutory returns to MSD.

Relevance to the Project: - The Act provides key safety requirements in the mining industry, environmental management requirements as well as mine development and mineral processing requirements. The project under consideration is a typical open pit mining project with associated support facilities hence provisions of this Act are applicable.

Subsidiary Regulations under the MMDA, which are relevant to Rosinvest Zambia Limited, are described below:

2.3.1 The Mines and Minerals (Environmental) Regulations of 1997 (SI No 29):-

These Regulations provide a framework for conducting and reviewing EIA reports for all mining related projects. Further to this, it provides follow-up activities such as auditing and compliance inspections. The Regulations stipulates specific issues that must be covered in an EIA report for a mining project and how such issues must be presented. The review and decision making process is also outlined in these Regulations. The final decision making for new projects is

legally done under the auspices of ZEMA but MSD plays a key function and ZEMA may actually reject a project based on comments from MSD.

Relevance to the Project: - This report shall be submitted to MSD through ZEMA and it shall be reviewed by MSD in accordance with provisions of the Mines and Minerals (Environmental) Regulations. MSD will also have a duty to conduct inspections in accordance with their legal mandate. Compliance with these Regulations is therefore very important hence the relevance.

2.3.2 Mines and Minerals Environmental Protection Fund (EPF) Regulations (SI No. 102 of 1998)

These Regulations provides the mechanism for setting up and operating the EPF as an environmental protection security fund. The fund is managed under the auspices of the Ministry of Mines and Minerals Development (MMMD) as a security fund for post-mining environmental liabilities. The Regulations provide for periodic audits to be conducted and includes an assessment of environmental management costs. Depending on the quality of environmental management, specifically progressive rehabilitation activities in place, a percentage of the security fund required to be contributed is proposed and once approved, the mining company in question pays the stipulated contribution annually.

Relevance to the Project: - It is a legal requirement that all mines contribute to the EPF as a security fund. The Regulations also demand for periodic audits by mining firms in accordance with the EPF information requirements. Rosinvest Zambia limited, being a mining project is fully subjected to these provisions and shall have to continue complying with these Regulations hence the relevance.

2.3.4 The Explosives Act No. 10 of 1974

The Act defines explosives and the raw material used for manufacturing of explosives. It further provides guidelines for manufacturing, storage, transportation, distribution and use of all

explosives and related products/accessories in Zambia. Safety issues are the most outstanding in this Act.

Relevance to the Project: - The mining methods adopted require procurement, transportation, storage and use of explosives. This will be done under care and maintenance and it shall continue in accordance with provisions of this Explosives Act and the regulatory institution (MSD) is will be fully notified.

2.4 THE OCCUPATIONAL HEALTH AND SAFETY ACT NO. 36 OF 2010

Unlike the Factories Act which does not cover the mining industry, the Occupational Health and Safety Act cover all types of industries in Zambia. It provides general guiding principles for occupational Health and Safety. For Example, Section 11 of the Act requires that all employers establish Health and Safety committees.

Relevance to the Project: - Provisions in this Act are more inclusive than the Mining Regulations and it is a legal requirement for all industries to comply with these provisions hence the relevance to Rosinvest Zambia Limited.

2.5 THE PNEUMOCONIOSIS ACT NO. 13 OF 1994

The Pneumoconiosis Act provides the Health and Safety regulatory requirements for mining and related activities carried out in restricted spaces where silica mineral fractions below 5 microns are likely to be encountered in ambient air. Under this Act, all workers in the mining industry, especially those that might be exposed to silica must undergo silicosis medical check-ups annually.

Relevance to the Project: - Workers shall be exposed to silica especially at the pit and the Overburden Dump. Dust can also be a potential source of silica. Therefore, all workers shall be subjected annually to silicosis test in accordance with provisions of this Act. Therefore, the Pneumoconiosis Act is relevant to the operations at mine.

2.6 THE NATIONAL HERITAGE CONSERVATION COMMISSION ACT

The National Heritage Conservation Commission Act CAP 173 of 1989 stipulates preservation and protection of ancient cultural and natural heritage resources and objects of aesthetic, historical and archeological value. In this Act, "Ancient Heritage is defined as being among other things, any structure, settlement previously inhabited, land mark, burial place or any other item designated by the commission which is known or believed to have been erected, constructed or used before 1st January 1924. The Act also provides for the formation of the National Heritage and Conservation Commission which is the responsible institution.

Relevance to the Project: - In order to protect national heritage resources in the project area, it is important to conduct any activity in accordance with provisions of the National Heritage Conservation Commission Act. The project is located in the area gazetted for and all activities are regulated. However, any resource of national heritage importance has to be protected hence the relevance.

2.7 THE ROAD TRAFFIC ACT

The Road Traffic Act No. 11 of 2002 was enacted to cover issues of road safety in Zambia. The Act provides for establishment of the Road Transport and Safety Agency (RTSA) and defines functions of RATSA. It also provides for a system of road safety and traffic management.

Relevance to the Project: - Access to the site is through feeder roads that are used by other road users. There are also settlements along these feeder roads, which is common for all rural roads in Zambia. It is therefore necessary to adhere to road traffic requirements in order to safeguard the health and safety of other road users.

2.8 THE FOREST ACT CAP199 OF 1973

The Act provides for establishment, gazetting and de-gazetting of forests. It also provides for monitoring, forest inventories, management and regulation of forest areas and forest products,

nationwide, and particularly in National and Local Forests. The Act is enforced by the Forest Department Specific to the general protection of forest resources, the Act provides for protection of Six (6) tree species in Zambia whether in a protected area or outside. These tree species are:

- Afzelia quanzensis (*Pod Mahogany*)
- Baikiaea plurijuga (*Teak*)
- Entandrophragma caudatum (*Mountain Mahogany*)
- saligna (*Beech wood*)
- Khaya nyasica (*Red Mahogany*)
- Pterocarpus angolensis (*African Teak*)

Relevance to the Project: - The site is surrounded by an intact forest, apart from the already cleared potion for mining. It is necessary to protect the area surrounding the site especially within the mining license area. In addition, adherence to provisions of the Forest Act is relevant to protection of the species listed above and any other forest resources around the project area.

2.9 THE ZAMBIA WILDLIFE ACT, NO. 12 OF 1998

The Zambia Wildlife Act No. 12 of 1998 provides for establishment of the Zambia Wildlife Authority (ZAWA) and provides for the sustainable management of wildlife resources in Zambia. The Act also provides for regulation of all wildlife activities such as hunting, poaching and keeping of wild animals. The local management of wildlife resources and habitats is partly delegated to Community Resource Boards (CRBs) in designated Game Management Areas (GMAs). The CRBs in turn are given commission for the income generated from GMAs and this technique has so far proved to be a success.

Relevance to the Project: - The existing ecosystem within the project area has potential for existence of wild animals although most of the big animals have migrated from the area. In order to protect wild life resources, it is important for Rosinvest to comply with provisions of the Zambia Wildlife Act hence the relevance to the project.

2.10 THE FISHERIES ACT OF 1974

The Act regulates all fishing activities in Zambia undertaken in any kind of aquatic ecosystem. This includes lakes, rivers and streams. It also regulates activities that may interfere with fisheries such as discharge of pollutants into aquatic ecosystems. The implementing institution for this Act is the Ministry of Fisheries and Livestock.

Relevance to the Project: - The nearest stream to the project site in Siankopo area is in the east side of the license area which drains into the Tabana River about 500 m in north east of the site. Another stream in the Siankopo area about 3km from the site in south east is Singewso River. Baseline assessments revealed that the stream does not have fish stocks of significance. However, it is necessary to understand provisions of the Fisheries Act to avoid legal non-compliances especially that there are water bodies near and around the project area.

2.11 THE PETROLEUM ACT CAP 439 AND THE ENERGY REGULATION ACT CAP 436

The Petroleum Act provides for control of conveyance and storage of petroleum products such as diesel and petrol. The Act further provides for control measures regarding production, transportation, handling, distribution, re-sale and use of energy in Zambia.

The Energy Regulation Act of 1995 makes provision with respect to the production and distribution of energy in Zambia and establishment of the Energy Regulation Board (ERB) for purposes of control and licensing of energy undertakings. In accordance with this Act, ERB shall, in conjunction with other Government agencies, formulate measures to minimize the environmental impacts of transportation, storage and use of fuels and enforce such measures by attachment of appropriate conditions to licenses held by such undertakings.

Relevance to the Project: - Mining machines and the generator shall require fuel in large quantities. This fuel shall be obtained from various fuel suppliers. Even if an above ground fuel

storage facility shall be constructed, transportation and refueling has to comply with provisions of the Energy Regulation Act hence the relationship.

2.12 TOWN AND COUNTRY PLANNING ACT CAP 475 OF 1962

The Town and Country Planning Act came into force in 1962. It provides for the establishment of planning authorities (Councils) and the preparation, approval and revocation of development plans. It further provides for the control of development in a district and the subdivision of land. The zoning and rezoning of areas must comply with the provisions of this Act. Environmental Impact Statement for Rosinvest is in Kalomo District Southern Province of Zambia.

Relevance to the Project: - Rosinvest Zambia Limited falls within the jurisdiction of Kalomo District Council and all planning and land use development activities are regulated by this Council. The Council is constantly engaged in development activities and Rosinvest shall continue with this relationship as a way of ensuring that activities are compliant with the Act.

2.13 THE LOCAL GOVERNMENT ACT OF 1991

The Local Government Act CAP 474 of 1991 provides for a system of local government administration in Zambia at city, municipality and district Council levels. Each local governance level has delegated statutory functions with respect to development planning. The Act also allows Councils to implement environmental protection and natural resources management functions which include prevention of pollution of water supplies and has some control in undertaking of mining operations.

Relevance to the Project: - As already stated the project is located in Kalomo District which is the implementing institution of the Act. In accordance with this Act, all construction engineering drawings and site plans must be approved by the Local Authority before construction.

2.14 PUBLIC HEALTH ACT CAP 295 OF 1978

This Act provides for prevention and suppression of public health hazards. It regulates all matters and activities that are connected to outbreak of diseases. Local Authorities, in this case Kalomo District Council is the custodian of the Public Health Act. Provisions of the Act are implemented by Councils through licensing and inspections.

Relevance to the Project: -Wherever human activities take place, issues of public health are critical. Environmental aspects of the project that shall require adherence to the Act include provision of waste management facilities, sanitation facilities, food, shelter, pest control services, drinking water storage and food storage facilities. To ensure that issues of public health are understood, implemented and sustained, the Public Health Act is relevant to the proposed project.

2.15 LANDS ACT CAP 29 OF 1995

The Lands Act controls all matters pertaining to the management/use of land and land tenure systems. The process of acquiring the mining license exhausts part of the applicable land acquisition laws.

Relevance to the Project: -The project is being implemented on land that falls with Chiefdom Simwata Chela within Kalomo District. For land acquisition and surface rights, provisions of the Lands Act do hereby apply hence the relevance.

2.16 EMPLOYMENT ACT CAP 268

This Act provides conditions under which employees should work in Zambia. The Act covers both temporary and permanent employees. Generally, this Act talks about employee protection and social security requirements. Major provisions include:

- Minimum contractual age;

- Establishment of employment contracts;
- Settlement of disputes arising from such contracts of employment;
- The appointment of Labor Officers and other staff for the administration of the Act; and
- Certain conditions of employment such as ordinary leave, sick leave, maternity, redundancy and welfare of employees.

Relevance to the Project: - One of the significant positive impacts of the project is creation of job opportunities to the local people. Whenever labor issues are involved, provisions of the Employment Act are critical hence the relevance of the Act to the project.

2.17 THE WATER SUPPLY AND SANITATION ACT NO. 28 OF 1997

The Water Supply and Sanitation Act provides the regulations and standards applied in the provision of public water and sanitation services. It also provides for permitting of water supply and sanitation service provision.

Relevance to the Project: - Domestic water will be provided to workers at the project site and this water will meet the minimum quality standards. This report therefore acknowledges this fact for compliance hence the relevance to the project.

2.18 THE WATER ACT, CAP 312 OF 1948

The Water Act provides the control process for the abstraction of water from surface sources. The Act is currently being revised as an Integrated Water Resources Management Act that will widen its influence to include groundwater. The Act further provides for the right to access public water and restricts public access prohibiting activities around public water sources such as rivers.

Relevance to the Project: - Water abstraction activities require permits from the Water Board through provisions of the Water Act. Currently, no permits are obtained and through implementation of this report, all applicable water abstraction and use permits shall be obtained.

2.19 MINIMUM WAGES AND CONDITIONS OF EMPLOYMENT ACT (CAP 276)

This Act stipulates the minimum conditions of service for permanent as well as casual workers. It further provides the minimum monthly wages for different categories of workers and defines workers who are exempted from the wage categories.

Relevance to the Project: - When jobs are provided, labor related issues should also be followed to strike a balance between employees and the employer. The Act actually protects both parties and its provisions are very much applicable to the project.

2.20 WORKERS COMPENSATION ACT No. 10 OF 1999

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

Relevance to the Project: -The mining industry is not exempted from provisions of this Act. Considering the fact that job opportunities will be provided by Rosinvest Zambia limited, a detailed understanding and adherence with requirements of the Workers Compensation Act.

2.21 INTERNATIONAL CONVENTIONS AND PROTOCOLS

Among the most relevant environmental conventions are; Convention dealing with the Protection of the World Cultural and Heritage (1972) and ratified by Zambia in 1982, Statutes of the International Union for the Conservation of Nature and Natural Resources (IUCN). Others include Convention on Biological Diversity (1992) ratified in 1993 and the RAMSAR Convention. Below are some of the applicable international conventions;

2.21.1 Convention on Biological Diversity (CBD)

The major aim of the CBD is to effect international cooperation in the conservation of biological diversity and to promote sustainable use of natural resources worldwide. It also aims at bringing about sharing of the benefits arising from utilization of natural resources. A number of plans in this convention fall under the Departments of Agriculture, Forestry, Fisheries and ZAWA.

Relevance to the Project: - All wildlife conservation activities in this report are aimed at implementing best practices for environmental management. Therefore, adhering to local laws and complying with the CBD provisions is relevant. For this, provisions of the CBD are relevant to the project.

2.21.2 Ramser Convention

The general objective of the Ramser Convention is to curtail the loss of wetlands and to promote wise use of all wetlands. The convention addresses one of the most important issues in Southern Africa, namely the conservation of water supplies and use of the natural and the human environments in responsible manner for intergenerational benefit.

Relevance to the Project: - Wetlands provide a wide range of resources and services ranging from pollution control as a service and water provision as a product. The nearest wetland to the Mine is Lake Kariba. It is therefore imperative to protect these water resources as a conservation measure and a way of complying with the above cited Convention hence the relevance to the project.

2.21.3 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

The objective of this agreement is to ensure that international trade of wild flora and fauna does not endanger their existence. The convention is customized through the Zambia Wild Life Act No. 12 of 1998 and the implementing body is Zambia Wildlife Authority.

Relevance to the Project: - The project area has potential for existence of wildlife and if protection measures are not strictly enforced, there is likelihood that employees may start exploiting these resources. Therefore, provisions of this Convention together with the customizing regulations are critical to the project.

2.21.4 The United Nations Framework Convention on Climate Change (UNFCCC)

It was signed by Zambia in 1992. The main objective is to achieve stabilization of greenhouse gas concentrations in the atmosphere. Zambia recognizes that the largest source of one of the main greenhouse gases, carbon dioxide, is from burning wood fuel and the use of coal and oil.

Relevance to the Project: - Just like the Kyoto Protocol, reduction of greenhouse gases is key to this Convention. Use of petroleum products such as fuel is one of the ways in which carbon emissions are encountered and there is need to consider these issues during project planning. This explains the relevance and relationship to the project.

3.0 BASALINE DESCRIPTION OF THE ENVIRONMENT

3.1 BIO-PHYSICAL ENVIRONMENT AND GEO-ENVIRO

3.1.1 DESCRIPTION AND LOCATION OF THE SITE.

The project site is located in Chiefdom Simwata Chela of Chirobi village, Mapatizya Constituency of Kalomo District on a Large Mining License No. 16395 – HQ – LGL. The site is accessed through Mapatizya Gravel Road about 165Km from Mapatizya Junction off Great North Road (Livingstone Road T2) and is approximately about 40km^2.

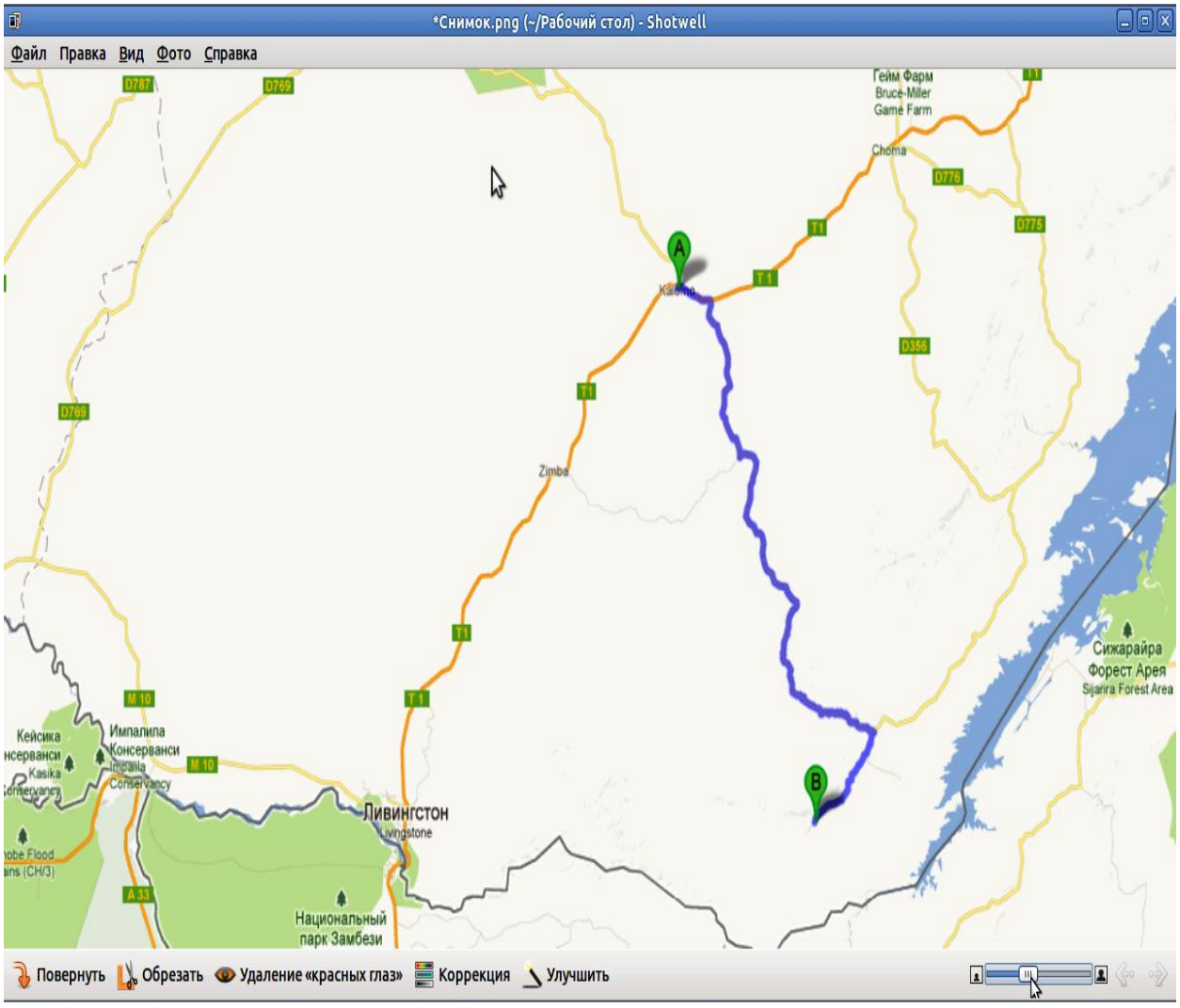

Fig 3: Location Map

Side	Distance (Units: m)	Angles of Direction (deg, min, sec)	CO-ORDINATES SYSTEM: Geographical Coordinates Systems		
			Point	Eastings/Latitudes (deg, min, sec)	Northings/Longitudes (deg, min, sec)
1-2	20 409	090 00 00	1	26 47 30	17 31 48
2-3	1 109	000 00 00	2	26 59 00	17 31 48
3-4	183	270 00 00	3	26 59 00	17 31 12
4-5	2 379	000 00 00	4	26 58 54	17 31 12
5-6	2 024	090 00 00	5	26 58 54	17 29 54
6-7	7 355	180 00 00	6	27 00 00	17 29 54
7-8	1 768	270 00 00	7	27 00 00	17 34 00
8-9	936	180 00 00	8	26 59 00	17 34 00
9-10	5 352	270 00 00	9	26 59 00	17 34 30
10-11	4 642	180 00 00	10	26 56 00	17 34 30
11-12	15 038	270 00 00	11	26 56 00	17 37 00
12-1	9 348	000 00 00	12	26 47 30	17 37 00
A-B	2 570	090 00 00	A	26 49 30	17 33 36
B-C	1 286	000 00 00	B	26 50 54	17 33 36
C-D	1 102	090 00 00	C	26 50 54	17 34 18
D-E	551	000 00 00	D	26 50 18	17 34 18
E-F	1 470	090 00 00	E	26 50 18	17 34 36
F-A	1 836	000 00 00	F	26 49 30	17 34 36
V-X	2 020	000 00 00	V	26 51 06	17 35 30
X-Y	2 387	090 00 00	X	26 52 24	17 35 30
Y-Z	2 019	180 00 00	Y	26 52 24	17 36 36
Z-V	2 386	270 00 00	Z	26 51 06	17 36 36

Fig 4: Coordinates of the Mine

3.1.2 ECOLOGY

The ecological environment in the project area comprises of (i) terrestrial habitat of primary, secondary forest, river-line vegetation, (ii) the aquatic habitat of local seasonal streams of which the main rivers Lake Kariba. It is from this environment where a number of species (flora and fauna) may be found.

3.1.3 CLIMATE

Chirobi village experiences a modified type of equatorial climate, the mean monthly rainfall ranges within 0m in the dry summer months to 380mm in the winter part of the year, while the mean annual rainfall is within 800mm to 1000mm. The mean monthly maximum temperature ranges within 22°C to 34°C while the mean monthly minimum temperature is in the range of 6°C to 14°C.

Wind direction in Chirobi is generally from the North West to the south east with occasional changes in the wet part of the year. Wind speed average 30m/sec in the summer months to 22m/sec in the winter.

The mean monthly evaporation averages around 170mm. Kalomo District has experienced incidences of extreme weather conditions such as the 1996-1997 drought that affected most parts of the country causing a number of streams to dry up. The streams are gradually recovering from the drought in the past two rainy seasons in which the country has received adequate rainfall.

3.1.4 HYDROLOGY

Chilobe stream crosses the edge of the site in the eastern direction while Chana stream is about 4km south of the site as shown in figure 6 and the attached annexure 7. This pattern of the two streams in the area assumes adequate opportunity for infiltration and downward percolation in the upland soils, allowing only minor runoff. However, during the study, it was noted that within the area there were some pockets that had unsteady flow systems (Dambos and depressions),

where hydraulic gradients and moisture contents were varying with time. This kind of scenario was noted on the land set imagery. Upon triangulation it was noticed that the variation was associated with soil differences and this usually resulted in variation of vegetation types. It was also observed that in the Dambos and depressions, vegetation and/or tree cover was not dense; this could be due to poor drainage -where trees are not able to cope with water logged conditions.

3.1.4.1 SURFACE WATER FEATURES

The area is rapidly draining and has a number of perennial streams serving it. The nearest streams to the mining license area include Chilobe stream which partially passes the license area and Chana stream which passes about 4km south of the site. Figure 6 below shows the nearest streams to the license area.

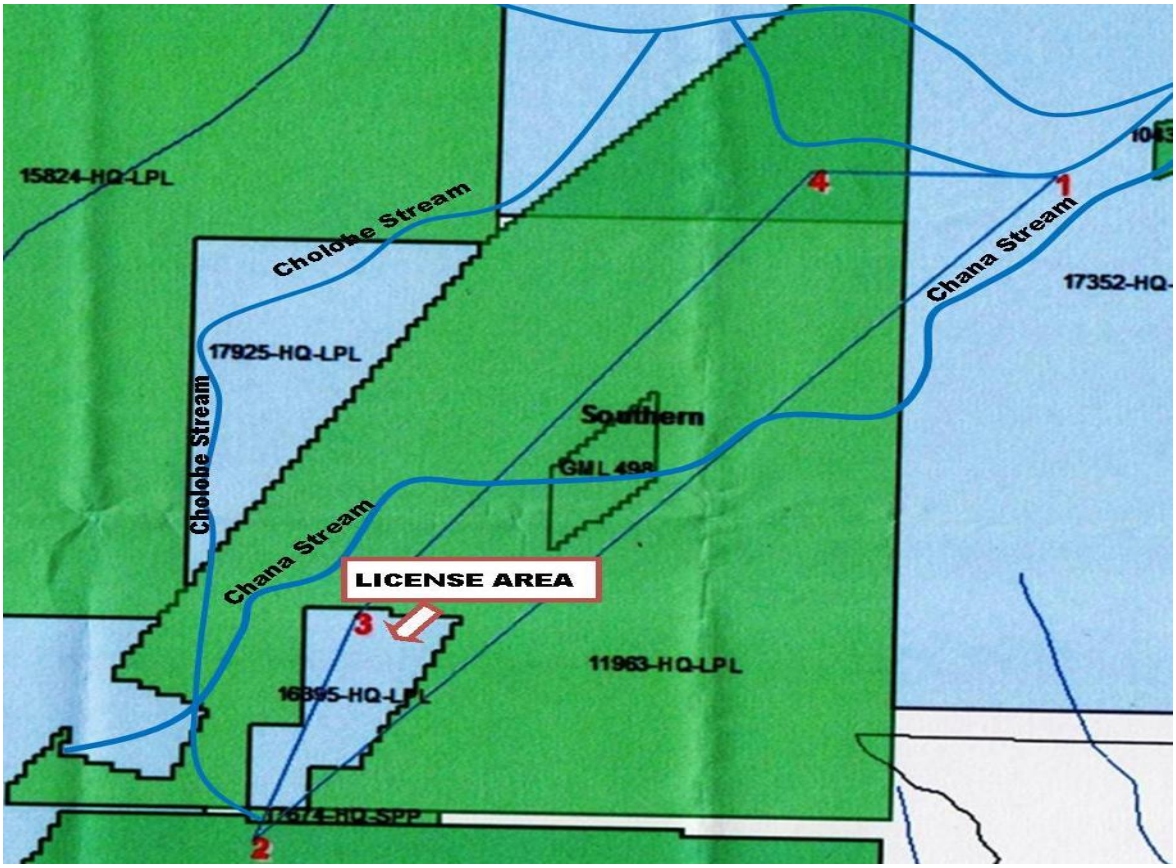

Fig 5: Nearest Streams to the License Area

Not much significant work has been done so far, to ascertain the depth, presence and quality of ground water but the area holds promise that the water table is nearly 50-65m below the surface.

Fig 7: Surface Water in Chirobi Area during Rainy Season

3.1.4.2 UNDERGROUND WATER RESOURCES

While rainfall is the primary contributor usually the rainfall provides sufficient recharge facility for the aquifer although seasonal groundwater level fluctuations occur according to rainfall received. Levels go down between May and November and rise between December and April during the rainy season.

The area is well drained with surface water streams which is unsuitable for human consumption. The ground water table is estimated at around 50-65m below the surface, the quality is expected to be good and suitable for domestic use.

3.1.5 GEOLOGY AND GEOMORPHOLOGY

According to general survey map and study by the Geological Survey Department of Zambia (1992), the regional geological description of the area where the project falls is dominated by a granitic dome centred to the south of Kalomo town. The rock formation mainly consists of calcite and dolomitic marbles. Others are a geological formation called pelitic formation, mainly consisting of biotite schists, phylittes, calcareous and graphite slates. Ground elevations within the project vary between 520 and 1,000 meters (M) above sea level (AMSL).

The proposed area lies within a basement complex zone mainly underlain by the gneisses and schists. These rocks are intruded by the quartz-muscovite-feldspar-tourmaline pegmatites and dolerite dykes. In some places these are cassiterite-bearing while in some they are not. In many cases these pegmatites form hills for instance at Kapongo Hill. Tin occurs in form of cassiterite (SnO_2) as eluvial and alluvial, predominantly eluvial. In hand specimen it looks massive or as tetragonal crystal with a sub metallic black colour and is heavy.

The geological survey of the proposed area was conducted and the chemical analysis reveals the results as shown below:

Table 3 Chemical analysis results (done by MABVUTO MWALE)

Sample Id	Location		Element (%)											
	X coord	Y coord	Mn	Fe	Cu	Zn	Ta	Pb	Zr	Nb	Sn	Co	Ti	LE
HM5-R/side	**479122**	**8057023**	**-**	**-**	**-**	**-**	**0.312**	**-**	**-**	**0.235**	**21.08**	**-**	**-**	**-**
Chise-R/Ta-HM4	**483250**	**8056833**	**-**	**-**	**-**	**-**	**0.105**	**-**	**-**	**0.073**	**6.607**	**-**	**-**	**-**

HM6-V/high	**478831**	**8056750**	**-**	**-**	**-**	**-**	**0.892**	**-**	**-**	**0.708**	**74.580**	**-**	**-**	**-**
Dobolobo I T1	**483348**	**8059428**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.1**	**-**	**-**	**-**
HM1	**482619**	**8060083**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
HM3	**486161**	**8055670**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Maboono pit 3	**483284**	**8060323**	**-**	**-**	**-**	**-**	**0.495**	**-**	**-**	**0.359**	**85.69**	**-**	**-**	**-**
S7-Dobo2	**483430**	**8059251**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.618**	**0.001**	**-**	**-**	**-**
Grave	**483161**	**8056297**	**0.33**	**14.11**	**-**	**0.24**	**0.04**	**0.03**		**0.02**	**1.64**		**0.52**	**83.05**
Maboono pit 1	**483298**	**8060178**	**0.52**	**3.08**	**0.16**	**0.19**	**0.79**	**0.10**	**0.10**	**0.63**	**94.44**	**-**	**-**	**-**

According to the results obtained from the chemical analyses of the ore (table3), the grades for tin (Sn), Tantalum (Ta) and Niobium (Nb) range from 0.001%Sn [S7] to 94.44%Sn [Maboono]; from 0.04%Ta [Grave] to 0.892%Ta [HM6] and from 0.02%Nb [Grave] to 0.708%Nb [HM6].

From the results so obtained the average values in the entire study area are:

Ta: 0.439%
Nb: 0.378%
Sn: 35.51%4

Fig 6: Geology of the Area

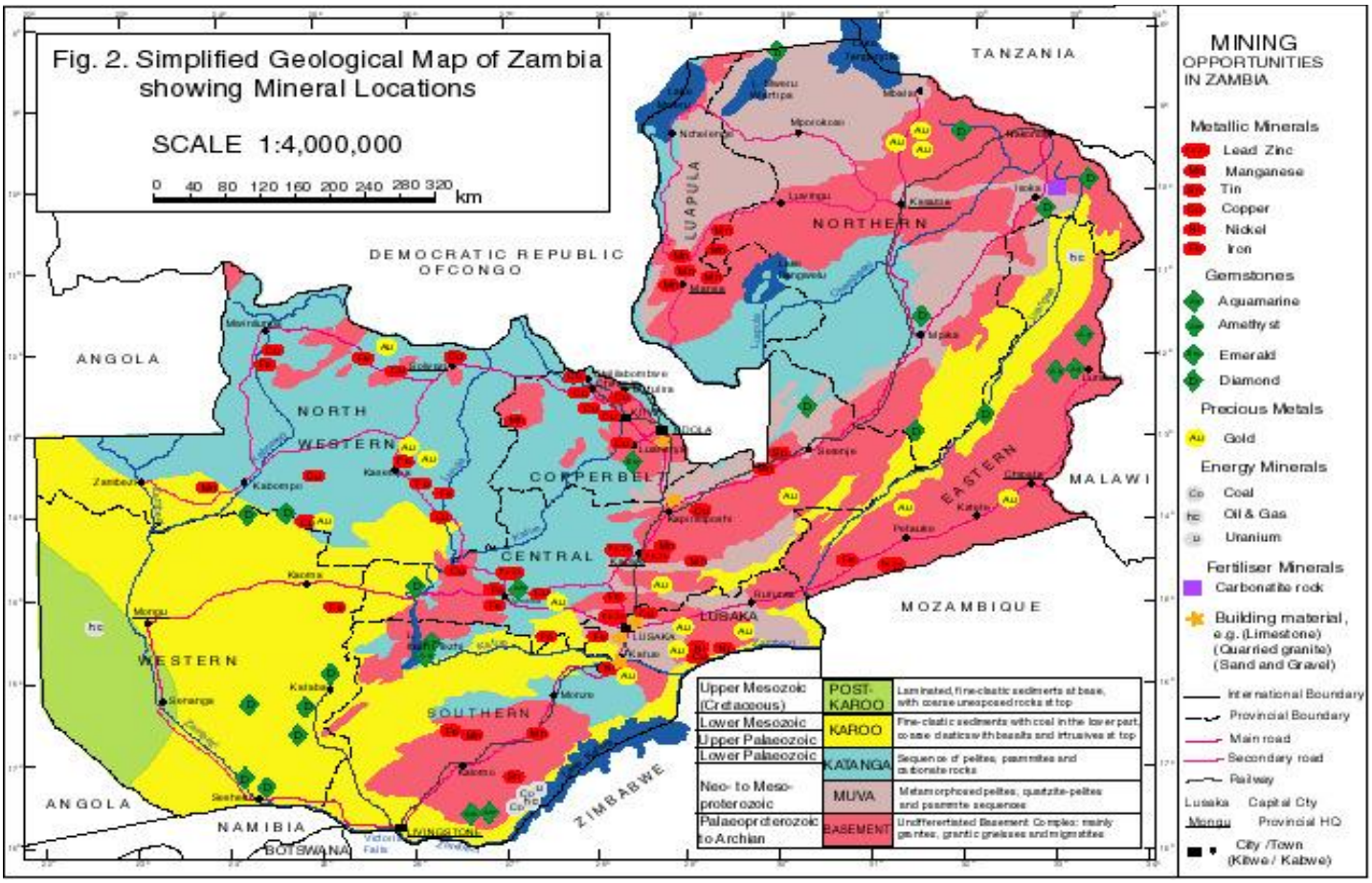

Figure 7: Map showing the general geological layout of Zambia.

3.1.6 TOPOGRAPHY

Four elevation points recorded with a Global Positioning System (GPS) receiver around the project area gave an average elevation of 1403 meters above mean sea level. A walk around the project area for a distance of 1000-1300m indicate water bodies and interviews with the field guide explained that there were seasonal streams within a radius asked of about 5 km.(See Topographical Map in Annex 20).

Figure 8: Topography at the proposed Site

3.1.7 LANDSCAPE

The landscape is naturally gentle with depressions only where there are water bodies and most elevations where there are anti-hills. From the field assessment, anthills in the area cover about 10% of land and these are on average about 7 meters high and are covered by a variety of vegetation species.

Considering the average elevation recorded for the area, it is clear that the mine is on a higher flat land hence the reasons why there are water bodies nearby.

3.1.8 SOILS

The soil classification conducted by Mount Makulu Agriculture Research Station in 1983 for Kalomo district indicates the following generic soil types in the catchment area.

- *Gleyic Cambrisol:* - This soil type mainly occurs in dambo areas. This has a relatively fertile top soil but it usually gets waterlogged in the rainy season.
- *Xanthic Ferrasol and Orthic Ferrasol*: - These are extremely weathered, deep and well drained soils. The soil is yellowish in color and the texture is clay.
- *Ferric Acrisol:* - These soils are extremely weathered, well drained and with a fine clay soil texture.

Constraints for the common soils listed above are shallow rooting depth, nutrient deficiency, highly leached, low pH and usually have a nutrient imbalance.

The site is characterized by reddish-brown soil varying from sand in the top soil to sandy loam or clay loam at depth of close to 2m.The area is freely drained. In ridges and hills deep Laterite stones mantle over weathering grit is evident. The wide valley flows have black to dark brown, loose schist rocks. Being remote area, soil has predominantly been undisturbed. However, the specific soil type for the project area is sandy loamy soil.

3.1.9 FLORA

The main vegetation cover is natural vegetative Miombo Woodland. This is the characteristic vegetation of the Chirobi area. This vegetation type covers some 80% of the country. The term 'Miombo' is derived from the plural of 'Muombo' the Bemba name for Brachystegia longifolia one of the common dormant species in these woodlands. This plateau Miombo Woodland has an open and semi evergreen canopy of about 15– 20m.The other species are Chipya and Riparian. Below is the table of the different species:

Table 4 Species of Area;

Vegetation Type	Common Species	Condition
Miombo woodland – Subtype Brachystegia- Burkea woodland	*Brachystegi longifolia, B. boehmii, B. spiciformis, Burkea Africana, Combretum molle, Diplorynchus condylocarpon, isoberlinia angolensis, Parinari curatellifolia and Pericopsis angolensis*	Woodland rich in green trees of different sizes

Miombo woodland – Subtype Brachystegia - Pteleopsis woodland	*Anisolphlea pomifera, Brachystegia boehmii, B. spiciformis, Burkea Africana, Parinari curatellifolia, Phyllocosmus andDiplorynchus condylocarpon*	Woodland rich in green trees of different sizes
Miombo woodland – Subtype Marquesia – parinari woodland	*Brachystegia spiciformis, Marquesia macroura Uapaca kirkiana, U. bangweolensis*	Woodland rich in green trees of different sizes
Riparian Forest – restricted along the stream	*Bridelia micratha, Ficus…,Parinari excels, Uapaca nitida*	Intact with fires affecting trees on the fringes
Chipya woodland	*Diplorynchus condylocarpon Julbernadia globiflora, Isoberlinia angolensis, Monotes africanus Pericopsis angolensis, Phyllocosmos*	Intact with little fire effect

Figure 9: Vegetation at the proposed Site

3.1.10 FAUNA

The welfare factors which attract wildlife such as water, vegetation cover and sandy areas are available within the mining area.

Animal life:

There was a variety of wildlife observed ranging from *Otolemur crassicaudatus (Bushbaby), Crocuta (Spotted hyena), Potamochoerus porcus (Bushpig), Cricetomys gambianus (Giant rat), Paraxerus cepapi (Bush squirrel), Lepus victoriae (Hare), and Sylvicapra grimmia (Common duiker).*

Reptiles included; *Agama aculeate armata, Hemidactylus mabouia, Gerrhosaurus nigrolineatus, Python sebaenatalensis, Natriciteres olivacea, Psammophis phillipsii and Philothamnus hopplogaster and Bitis arietans while amphibians included Phrynobatrachus natalensis and Xenopus laevis pertersii.*

Bird life includes:

- Globally threatened species in the IBA are:
- Lesser Kestrel;
- Wattled Crane;
- Denham's Bustard; and
- Black-winged Pranticole.

Species of regional conservation concern are:

- Bateleur;
- White-Spotted flufftail;
- Southern Ground Hornbill;
- White-Bellied Bustard;

- White-bellied Kingfisher;
- Brown-eared Woodpecker;
- Shrike-Flycatcher;
- Margret's Batis;
- Chestnut Wattle-eye; and
- Potted Thrush-Babbler

Other animal species to have once been there are in the table below:

Table 5 Animal Species

Species Local Name	Common Name	Scientific Name
Insefu	Eland	*Taurotragus oryx*
Inkosa	Hartebeest	*Sigmoceros lichtensteinii*
Intandala	Kudu	*Tragelaphus strepsiceros*
Chisuumpa	Leopard	*Panthera pardus*
Impelembe	Sable antelope	*Hippotragus niger*
Impelembe	Roan antelope	*Hippotragus enquinus*

These species are said to be locally extinct. Most common reason for extinction of these animal species is hunting using, hand-made guns, dug-pits armed with spears and wire snares.

3.2. SOCIO- ECONOMIC AND CULTURAL ENVIRONMENT

3.2.1 DISTRICT BACKGROUND

Kalomo District Council is one of eight Districts of the Southern Province. Other Districts of the Southern Province are Mazabuka, Monze, Choma, Livingstone, Siavonga, Sinazongwe and Mulobezi. The district geographical location is 27 10' 25 50" Longitudes East and 16 55' - 17 30" Latitudes South. The Districts Headquarter is at Kalomo Town 340 Kilometers from Lusaka city along Lusaka- Livingstone highway. The District is bordered by Choma District to the

North, Livingstone District to the South and Mulobezi Districts to the West and to the East is bordered by Zimbabwe border. It has a about of 20,000 sq kms of which 12000 sq kms of the area is suitable for cultivation; and 51 sq kms is forest reserve area. Tonga Choma, Kalomo Hill, Tara and Zimba Hill forest reserve has 15.99 sq kms.

District Council has four (7) divisions namely: Kalomo, Kanchele, Kabanga, Zimba, Siachitema, Siavwima, Tara and Chikanta. These divisions are then divided into (15) wards, which in turn are divided into 120 Villages.

3.2.2 GOVERNMENT, ADMINISTRATION AND POPULATION CHARACTERISTICS

Southern Province had a population of 1,606,793 of which 49 percent were males and 51 percent were females. The population increased from 1,212,124 in 2000.The average annual population growth rate for the province over the intercensal period 2000-2010 was 2.9 percent. There was a decline in the growth rate from 2.3 percent in the 1990 -2000 period to 2.9 percent between 2000 and 2010.

The 2010 CSO preliminary statistics indicate that Kalomo District has a total of approximately 254,211people of which 130,886 representing a percentage of 51% are females and 130,886 representing a percentage of 49% males. In the year 2000, the district had a total of 169,503 people as shown in the table below. The 2000-2010 inter-censal average annual population growth rate stood at 4.1%.

The following table highlights the trend in the population growth rate of Kalomo from the year 2000 to 2010 according the CSO preliminary report of 2010.

Table 6: Population of Kalomo District (CSO Preliminary Report of 2010)

DISTRICT	2000 POPULATION			2010 POPULATION			AVERAGE ANNUAL POPULATION GROWTH RATE, 2000 - 2010		
	Males	Females	Total	Males	Females	Total	Males	Females	Total
KALOMO	83,175	86,328	169,503	123,325	130,886	254,211	4.0	4.2	4.1

The proposed project area is located in Mapatizya constituency which has a total of 66,725 people 32,186 males, 34,539 females and 13,284 households.

3.2.3 HEALTH/INFRASTRUCTURES

Malaria is the most common sickness in the area followed by diarrhea and respiratory diseases. Health services are accessed at Kabanga Mission Health Center about 30 km from the mine site. The Clinic is currently providing almost all the necessary services such as RCHC services level as farmers sell the crops to customers direct from the farm. Other health center is Simwatachela Mission Rural Health Center in Kabanga area.

In the Mapatizya area, commercial sex work an outcome of poverty is contributing to a rising number of HIV/AIDS cases. Migrant traders constitute the main clients for women in this profession. The RHC has reported + 40 HIV cases and has 10 people under anti. Malaria accounts for approximately 10 percent of district fatalities and can be attributed to conditions associated with the low-lying, peri-urban, and unplanned settlements. Generally, malaria, tuberculosis, HIV/AIDS, malnutrition, and silicosis account for many deaths among the population.

3.2.4 EDUCATION/INFRASTRUCTURES

The study revealed that the majority in the area have at least stepped into school. Out of these, said they had attained at least primary school level of education.

This is closely followed by those who have been to secondary school and attained tertiary education. A least of those in the area said they have never been to school.

The nearest schools to the area are Misika Basic School and Chalimungela about 10km from the mining area. Other schools include Chana Community School, Siajina and Kabanga schools.

3.2.5 TRANSPORT, TRADE AND COMMUNICATION

The site is accessed through a gravel road from Mapatizya junction off great north road.
On mine vehicle traffic will be limited and restricted to the developed road network. Two road ways will be constructed one (1) for public and second (2) for mining equipment.

Footpaths will be kept to a minimum, to prevent the opening up of the mine to too much uncontrolled activity. This will be done by designating areas that shall be used as foot paths with specific signs.

Most of the farmers in the proposed project sell their farm produce and buy their daily necessities at Kabanga market which happens to be the nearest market about 30km from the mine. Others prefer either Kalomo or Choma.

Figure 10: Nearest Market (Kabanga Market)

There are no telephone communication lines, though Mobile Cell Networks such as Airtel, MTN and Zamtel are available.

3.2.6 LAND USE IN THE PROJECT AREA.

The livelihood strategies of the people in project area largely depend on mining, agricultural fisheries forest products and animal rearing. These activities occupy most of the land use in the area where Maize is the main crop grown. Other crops grown in medium to small quantities include groundnuts, beans, sorghum, finger millet, sweet and potatoes. Livestock is a source of livelihood and it is practiced on a large scale. Animals mostly reared include Cows, Goats, Pigs, Chickens and Ducks.

Beside Mining, Agriculture, Animal rearing and Fisheries various activities are undertaken such as handcraft activities, carpentry, wood carving, mat carpet and basket making which are wide spread and normally are taken as an off farm activities to supplement farm income.

Rosinvest (Z) Limited intends to use the land for Tin Mining and ensure that the demand for Tin can be met with the favourable economic climate in the country and therefore contribute significantly to the sustainability of the mining industry with resultant multiplier effects.

3.2.7 LAND OWNERSHIP AND LAND TENURE

The study area falls under Traditional land tenure and it is in Chiefdom Simwata Chela of Chirobi Village, Mapatizya Constituency of Southern Province of Zambia.

The proposed area is under Traditional Land Tenure. Under this, Chief Simwata Chela through village headmen provides pieces of land to families and clansmen without title. The Chief and his/her clansmen communally own land. In a case where conversion of traditional land into lease is needed, the applicant seeks the consent of the Chief through the Headmen and his subjects within the area. If the Chief has no objection, Local Authorities process the application and recommends to the Commissioner of Lands for final approval and offer of the lease.

The mining area under consideration has been gazetted as a Mining Area by the Ministry Mines and it has been invested in interest of Rosinvest under Large Mining License No. 16395-HQ-LPL.

3.2.8 WATER AND SANITATION

With regards to sustained access to clean water and sanitation, people in the study area get their drinking water from hand-dug wells. With the investigation taken in proposed area shows that the average depth of the hand-dug wells varies as to those in the highland and those in the lowland. Those on highlands showed an average 8-10m and those on lowlands an average 5-8m. On the other hand others get their drinking water from the Chilobe and Chana stream. In terms of

treatment of drinking water, a few reported that they treated their drinking water with chlorine while the rest did not.

In terms of sewage management and domestic waste disposal, most use pit latrines and the rest resort to using the bush. For waste disposal, most respondents stated that they use rubbish pits.

For the proposed project, drinking water and operational use will be obtained from bore holes on the site. The company envisages sinking 3 bore-holes. Septic tanks shall be constructed for sewerage disposal and waste bin for domestic waste disposal.

3.2.9 EMPLOYMENT CREATION

The investment would create a number of jobs opportunities in the construction area and more in the operation phase. About 82 local people are anticipated to be employed for the construction and operation process for its duration.

The project will employ as follows:

- In mining about 60 persons
- In concentrator about 12 persons
- In smelting about 10 persons

As permanent employment and in temporary bases will be more.

3.2.10 ARCHAEOLOGICAL SITE

The area planned for the project including the access road did not show any unique resource that could be of historical or archaeological significance. During the field study the access road was trailed by foot in order to observe any feature of interest in this regard. A transect was also made across the area and interviews with locals also confirmed that the area has no resources of this nature.

3.2.11 SOCIAL-CULTURAL

Rural communities in Zambia are organized on the basis of chiefdoms which are under the jurisdiction of Chiefs, who have advisors called Indunas. The chiefdoms are divided up in villages, led by a village headman. Traditionally, the men of the village would gather to discuss issues of importance until a decision is reached by consensus. In addition, most communities have a chair lady; an elected female leader who will see to women's affairs. Apart from this person, women are poorly represented in traditional governance and are unlikely to influence or be informed about decisions made by the village council.

The visited licensed mining area falls within the jurisdiction of traditional authorities. In the case of Mapatizya, Chief Simwatachela presides over the area. His authority extends to the mining settlement area and the headman may settle disputes between people in this area when asked to do so.

4.0 PROJECT DESCRIPTION

4.1 BACKGROUND, OBJECTIVES AND NATURE OF THE PROJECT

4.1.1 BACKGROUND OVERVIEW

Zambia has a wide range of mineral deposits namely; Copper, Zinc, Manganese, Coal, Amethyst, Tin, Aquamarine, Silver, Garnet, Tourmaline, Gold etc. The mining industry has been dominated by Copper and Cobalt. Mines account for 8% employment in the country. Zambia is ranked as the 5th world's largest producer of Cobalt and 12th largest Copper producer. It was also one of the top producers of Gem-quality Emeralds in 2000. Besides Copper and Cobalt, Zambia produces Gold, Selenium and Silver as byproducts of Copper Refinery, a variety of industrial minerals and Coal.

The Tin Belt of the Southern Province of Zambia has a history of small working extending over Sixty years, with limited production from numerous small eluvia, alluvial and pegmatite deposits, co-operative tin mining was initiated in 1963, but ceased in 1965 following Rhodesia's unilateral declaration of independence. The Geological Survey Department carried out a study of all known occurrences in 1967 and 1968 in order to assess the potential of the area as a preliminary to re-activating co-operative mining.

4.1.2 OBJECTIVE OF THE PROJECT

The main objectives of the proposed project are;

- Develop a project into a major open pit tin mining
- Mining Tin Ore for commercial use
- Running and operating a profitable Tin mine
- Creating wealth for both the shareholders and workers
- Improving the welfare of the local people
- Providing jobs to the local people living in the vicinity of the proposed project site
- Enhancing social and security services through corporate social responsibilities

Other Objectives include the following:

- To identify major activities of the project that shall interact with the environment, also called environmental aspects.
- To comply with the Zambian legal requirements
- To provide a platform to the local people and other Interested and Affected Parties (IAPs) to suggest how best the mine should operate and how they shall benefit.
- To describe the existing environment in terms of ecological resources, physical environment and socio-economic activities.
- To identify major environmental impacts in order to suggest measures to sustain/promote positive impacts as well as measures for mitigating negative impacts.
- To highlight key environmental management costs expected throughout the project life cycle. recast

4.1.3 COMPONENTS OF THE PROJECT

The proposed project will consist of the following buildings:

- Concentrating plant
- Ore stockpiles/storage ore
- Security camps
- Workshop &stores
- Offices and accommodation
- Smelter plant

4.1.4 NATURE OF THE PROJECT

Rosinvest (Z) Limited Tin project is not complex and the only major activities are Open Pit Mining, Dewatering and Removal of Overburden Material/Waste Rock. The sub-sections below briefly describe the major activities of the project. The current and planned activities are both described.

The company will be using Open Pit Mining Method using heavy equipment like Excavators, Bulldozers, Loaders, Drilling Machines and Dump Trucks.

The schedule of activities will be similar to any other mining ventures, starting with mining which will include ripping of overburden, blasting of the virgin rock and the ore body (vein) and dumping of the overburden/ waste rock. The extraction of the tin will involve smelting in low temperature which rises to a maximum height of 300 degrees. There after ore crushing and washing shall follow. During washing the sorting is done and finally storage of the ore and disposal of slimes from the washing plant. The storage building will have the capacity of stocking up to 10,000 metric tons of tin ore.

The process of acquiring tin from its ore will be by the pyro metallurgical smelting methods. Pyro metallurgical techniques use heat to separate tin from Cassiterite ore, and finally fire and electrolytic refining. In put materials will be Cassiterite and coal only, oxygen will be pushed through to the furnace by blower. 60% from the input Cassiterite will come as 98%Tin (Sn), the impurities will be in the slag.

The company is scheduled to export at least 1000 tons tin ingot 98% Tin to European Countries, China and the United States of America.

Other scheduled activities are Domestic Waste and Sewage Management, Pit Dewatering, Domestic Water Supply, Waste Water Management, Fuel Storage, Construction of Fuel Storage Facilities, Access Roads, Campsite, Security Facility, Mechanical and Metal Fabrication Workshop, Salvage yard, Magazine, Wash bay, Oil and Water separator etc.

Decommissioning and closure of all these (above mentioned) activities is also part of the schedule.

These scheduled activities have been discussed in detail in the sections that follow. A life time of 40 years will be the total time in which all these activities will be implemented, starting with

infrastructure that requires construction, followed by routine activities which are cyclic and ending with decommissioning and closure activities.

1.1.4.1 OPEN PIT MINING PROCESS AND MINING MACHINERY

Mining activities will be done using open pit mining methods. Major activities will include removal of overburden material, de-watering activities, defining the pit benches to comply with standard open pit mining methods and generation of waste rock and overburden material.
The mining equipment that will be used include Excavators, Dump trucks, Compressors, Jack Hummers, a Water Bowser, a Rock D14 Drilling Machine, Generator and Water Bowser. All these machines will be hired from local suppliers.

4.1.4.2 MINING DESIGN

The mining plan will start with open pit method for mining, the strike will be to identify the diameter of the pit and the mining will be on the strike direction, the depth will depend on the ore vein. The side wall of the pit will be benched 2 meters high. This will be maintained throughout the mining activities and lifetime of the mine. Entrance to the pit will be through the ramp; one will be entrance and second will be exit. All mining regulation will be applied in the mining area. Blasting will be carried out in the hard rock's only like quartz and quartzite. No building will be near to the pit.

To remove all the waste material from the pit, the overburden material will be stripped from the pit by excavation, controlled blasting will be used for the next level after the OB which is a rock but highly weathered and the bottom competent layer is blasted using bulk explosives. These explosives will be stored on site and will be used in accordance with procedures and the license issued by MSD.

Haulage of the material will be done by using 35 tonnes dump trucks and a single ramp connecting the surface and the pit bottom that will be used.

4.1.4.3 OVERBURDEN DUMP (OB)

Waste rock will be managed in areas located at prescribed distances from the proposed open pit. The placement of waste rock will be initiated with perimeter buttresses designed to minimize the visual effects of the project for travellers or passers-by and for viewers in the surrounding area. The outside face of the buttresses will be re-vegetated and reclaimed as they are completed. Waste rock in the remaining portions of each phase will then be deposited east of (behind) these buttresses. Waste rock will also be placed in the dry-stack slurry/tailings storage areas to provide structural and erosional stability of the tailings pile.

4.1.4.3.1 Foundation

Preparation and Stability Portions of the waste rock areas may be required to be cleared and grubbed of organic materials. Suitable foundation materials will be stockpiled for later use in reclamation. The remaining alluvial and overburden soils and rocks following clearing and grubbing (and any foundation stripping) will be considered suitable foundation materials. The waste rock will be placed with a final safe inter-bench slope. In addition, detailed stability analyses will be carried out during final design to ensure that the waste rock piles will be stable during and after placement.

4.1.4.3.2 Waste Rock Facility

Storm water management at the waste rock facilities will be such that for the construction of the initial perimeter buttresses, concurrent reclamation will progress up the outer slopes as the buttresses are constructed. They will limit erosion potential while minor diversion channels will be used to direct runoff to down gradient sediment ponds. Where feasible, the top of the waste rock facilities will be sloped to facilitate storm water draining towards the open pit.

4.1.4.3.3 Collection and Treatment of Waste Rock Drainage

The waste rock management facilities will be constructed in lifts that will generally not exceed 20m in height. The top surfaces will be constructed with upward gradients of about 0.5% to the

south-east so that storm water runoff is directed back toward the open pit. The storm water will be collected along the northern toes of the waste rock facilities and allowed to drain through the coarse rock along the bottom.

Similarly, surface runoff from the northern faces will be allowed to collect along the toes and drain through the base of the waste rock storage facilities. This water, along with surface water runoff from the active face of the waste rock storage area will ultimately be collected in a sediment pond. This pond will provide sediment control and water catchment for all of the disturbed areas within the licence area. Runoff and seepage from the waste rock facility will be sampled and tested for water quality to verify modeling results. The sediment pond will serve as a final control point for water quality prior to discharge.

Suspended sediments will settle out in the collection pond downstream of the waste rock facility, and the clarified water will be released.

4.1.4.4 ORE CRUSHING, WASHING PLANT, CONCERTRATOR AND SMELTER

Rosinvest Zambia Limited shall have a crushing plant, washing plant, concentrator and smelter at the site. Crushing, screening, and washing and sorting and smelting shall be conducted at the site.

4.1.4.4.1 CONCENTRATOR DESIGN

The raw material coming from the pit will go straight for screening, followed by primary crusher then to the secondary crusher screening for classifying the products according to the size. The product below 2 mm will go direct to jigs, above that will go to crushers. Grinding will be used when the tin is combined with another mineral like tantalite to separate the two minerals and in the jig the water will separate them. The amount of water required in this operation will be calculated and will not be more than 20,000 litres jig/day. (ANNEX 9).

4.1.4.3.2 SMELTER DESIGN

The smelting process steps will start with roasting, smelting, converting, and finally fire and electrolytic. Operation will be carried out by one furnace and one 20x40m storage facility for stocking approximately 10,000 metric tons containing 70% tin oxide ore in an area about 4,000 m^2. (ANNEX 10).

4.1.4.5 DOMESTIC WASTE AND SEWAGE MANAGEMENT

The mine will have a total workforce of 82 and these employees will be staying within the camp. Meals and other house-keeping services will be provided to employees by the company.
Considering the total workforce at the camp, domestic waste generation is therefore significant. On the other hand, sewage management is also a significant activity.

The disposal method for domestic waste will be by the use of waste bins that will be provided and the waste will be disposed of in a land fill located within the license area. The land fill is not yet established and licensed. The proposed intervention is to have the landfill area licensed with ZEMA strictly for domestic waste disposal. In order to meet the licensing requirements, one (1) ha of land will be reserved for the land fill cells. The cells shall be dug in potions and each filled up cell within a section shall be covered with top soil progressively until it gets full. Top soil in this regard shall facilitate re-vegetation. Support facilities for the landfill area shall include a perimeter wire-fence with a lockable gate, warning signs written in English and Tonga and Nyanja to restrict access and a user instruction notice to remind users to always burry the waste with top soil.

Regarding sewage management, septic tanks shall be used which will be emptied at regular intervals. A ZEMA approved Sewerage Company shall be engaged to handle the job.

4.1.4.6 DE-WATERING, DOMESTIC WATER AND WASTE WATER FACILITIES

Dewatering will be done through in-pit pumping only. About 5000 liters of water is estimated to be pumped out per day during the rainy season and about 2000 liters per day during the dry

season. This water will be pumped into a settling pond which will be constructed at the site. The pumped water shall be used to water the mine to suppress dust. This practice shall continue throughout the lifetime of the mine. Therefore, no changes are foreseeable unless otherwise.

Domestic water for the camp will be divided in general use and drinking. A borehole will be sunk by the company for domestic use. Water for general use will be obtained from settling pond and some from the borehole.

The plan for domestic water is to install a water purifier at the camp for treatment of the aquifer water for drinking and to sink a borehole within the mine area where domestic water shall be extracted.

Ultimately, water loss at the mine site will be due to domestic use, dust suppression, seepage, evaporation and surface flow.

4.1.4.7 FUEL STORAGE FACILITIES

A 20 000 liters diesel storage tank will be installed. The fuel tank will be locally fabricated and constructed using carbon steel plates (300WA). The ends and the barrels of the tanks will be fabricated using 6mm thick plates. The tanks shall be pressure tested at 0.7 bars after thoroughly cleaning it of all loose matter. The tanks will be made in accordance with Zambia Bureau of Standards as well as meeting the international standards.

The fuel storage tank will be placed 1.5meters from the bund wall. The storage tank will be 6 meters in length and 2.5meters in diameter. The diameters of the inlet and outlet pipes will be 35mm and 20mm respectively. The tanks will have a dip pipe inlet and a vent pipe outlet and will be fitted with a ladder with handrails.

4.1.4.8 MINE SITE ACCESS ROAD

Rosinvest Zambia Limited will develop two access roads connecting to the site. One will be for the public and the other one for the mine equipment.

The access roads shall periodically be maintained by re-surfacing them with gravel and filling all the depressed points. Maintenance facilities that shall be installed shall include spoon drains and

culverts at appropriate places. In addition, the access road for mining equipment shall be widened to about 4.5 meters width to facilitate safe and smooth movement of the 35 tonnes trucks and the dust suppression water bowser.

In order to ensure good safety to other road users, all necessary traffic signs shall be installed along the access roads.

4.1.4.9 ACCOMMODATION AND SECURITY FACILITIES

The mine camp will have a perimeter wire fence covering a footprint of 2.0 hectares. All accommodation facilities will be located within the wire-fence. The accommodation infrastructure at the camp will be a combination of accommodation containers and hostels made of concrete blocks.

There will 7 hostels, the Director's House, the Mine Manager's House and the Security Manager's House. Other facilities will include a strong room, kitchen, guard house, generator shelter, ablution blocks and containerized offices. The camp is currently serviced by two septic tanks.

4.1.4.10 MECHANICAL AND METAL FABRICATION WORKSHOP

The hired mining machines and light vehicles will be serviced at the site. In order to comply with legal requirements for management of hazardous waste, a standard workshop shall be constructed. The workshop shall have all the required facilities for generation and storage of hazardous waste including storage of hazardous waste from the camp. Warning signs shall also be installed to educate workers about the hazardous nature of waste that shall be generated from the camp.

Key sections for the workshop shall include a bunded storage section with concrete lining and partitioned to restrict access. This shall be used for storage of all the hazardous waste that shall be generated from the mine site. The workshop shall have a concrete lined service bay for heavy machines and another section for light vehicles. A perimeter drain shall be constructed to connect both service areas to an oil/water separator. Used oil and used batteries shall be collected from site for re-use and recycling respectively by licensed companies. Healthcare waste shall be

transported to the nearby Healthy Clinic for appropriate disposal. The remaining hazardous waste specifically used oil filters and used fluorescent tubes shall be dumped at the nearest ZEMA licensed dumpsite and in an event that such a facility shall not be found, the waste shall be kept within the hazardous waste storage facility at the camp awaiting disposal at the right facility.

A small metal fabrication workshop shall also be included as part of the main workshop. The only waste from this section shall be metal off-cuts and swarf. The swarf shall be treated as hazardous waste whereas metal off-cuts shall be kept for alternative uses.

4.1.4.11 SALVAGE YARD

Scrap material will be generated and this is expected to continue. Lack of a good management system for scrap material can lead to poor housekeeping. This may consequently become a hazard to human health and the environment. Within the camp perimeter fence, a small section of 60 meters by 80 meters shall be dedicated for storage of scrap material. This shall be partitioned with a wire fence and all the scrap material shall systematically be kept under lock and key. The Security Manager shall be responsible for the salvage yard and once in a while, the scrap material shall be disposed off.

4.1.4.12 EXPLOSIVES STORAGE FACILITIES

The proposed plan is to construct the Explosives Magazine. The position of the Magazine will be about 500m further north east the camp and the mining pit. Since explosives storage and use is regulated by MSD, all the necessary permits will be obtained and the Magazine will be constructed in accordance with prescribed standards.

ROSINVEST LOCATIOM MAP/SITE PLAN

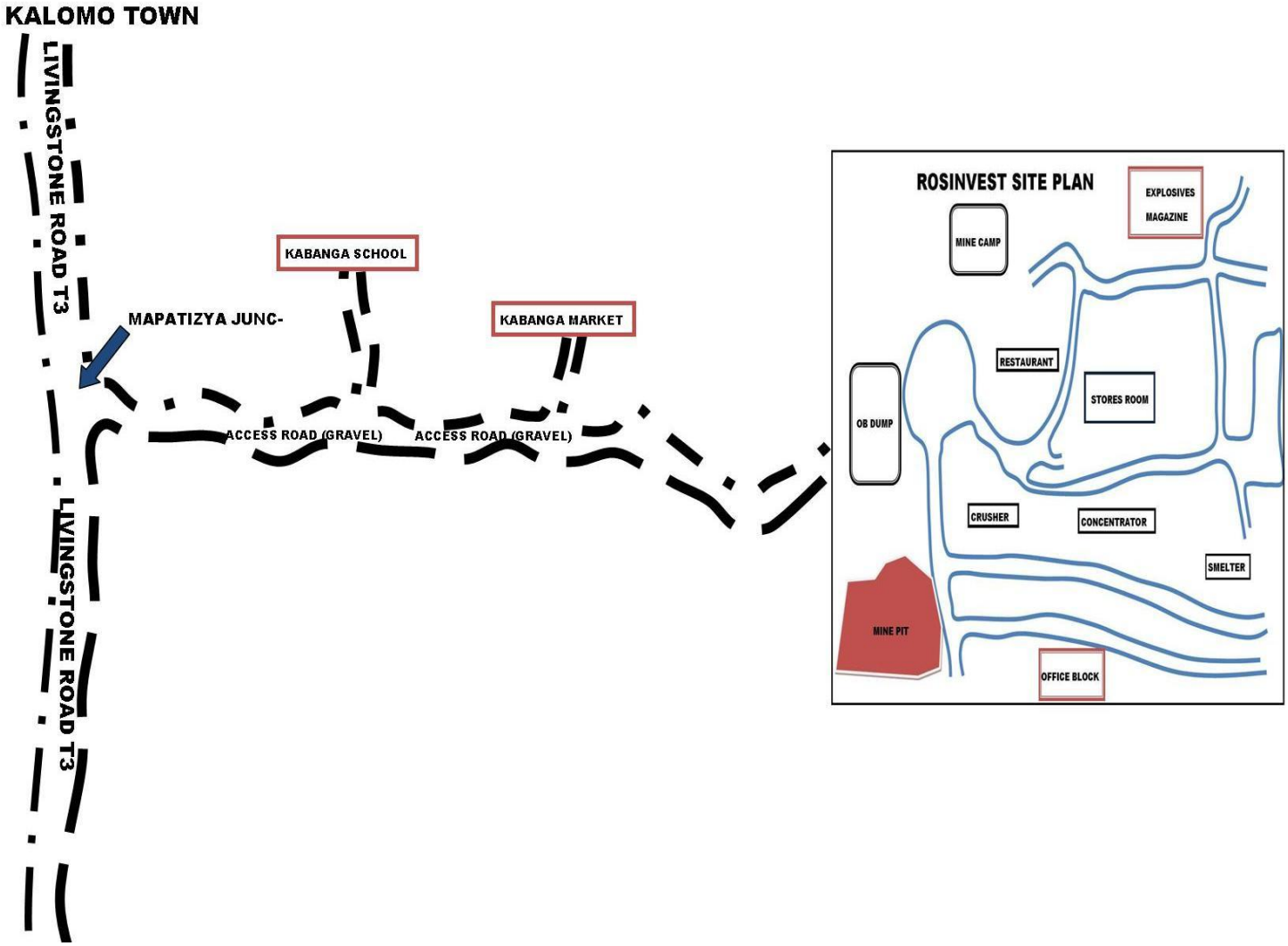

Fig 11: Mine Lay out showing an Explosives Magazine

4.1.4.12.1 Risk Assessment

Rosinvest will appoint one or more Safety Officer(s) who will assist in supporting a tactical plan to address risks so they can be eliminated or be reduced to an acceptable level.

A safety decision-making model will be used to brief Safety Officers regarding the nature of the incident, the allocated task and prevailing hazards and risks. The Incident Commander will confirm that the Safety Officer understands:

- ✓ their role and area of responsibility
- ✓ allocated tasks
- ✓ Lines of communication.

The Safety Officer will:

- ✓ be competent to perform the role
- ✓ ensure personnel are wearing appropriate personal protective equipment
- ✓ monitor the physical condition of personnel and/or general or specific safety conditions at the incident, in accordance with their brief
- ✓ take any urgent corrective action required to ensure safety of personnel
- ✓ update the Incident Commander or senior safety officer regarding any change in circumstances
- ✓ Not be engaged in any other aspect of operations, unless this is required to deal with a risk critical situation.

The activities of a Safety Officer will be carried out by any of the Explosives and Rescue Service roles, but the complexity of the task, size of the incident and scope of responsibility will be considered by the Incident Commander when determining the supervisory level required.

4.1.4.12.2 Response Plans

There should be in place response plans for all locations where explosives maybe found including 'temporary arrangements' for instance during loading/unloading of explosives on site. The plans will be a mixture of those required by legislation and the Explosives and Rescue Service's tactical plan.

4.1.4.12.3 Storage

The explosives will be typically held in a steel store, the site will also have a detonator annexe. Most of the explosives will be mixed on-site from non-explosive ingredients. The contents of the storage facility will be correctly identified through the use of hazard placards.
The Magazine will have a buffer zone of 700 m radius. It will be constructed to meet all applicable fire code and mining industry safety standards, and will be accessible only to authorized personnel.

4.1.4.13 DUST SUPPRESSION FACILITIES

A water bowser with a carrying capacity of 10,000 liters will be used to suppress dust at the mine. This facility will be used for dust suppression along the haulage roads from the pit to the OB dump and the service is extended to the public route connecting Rosinvest Zambia Limited mine. The bowser shall be available for throughout the mine life.

In addition to the water bowser, water sprays using horse pipes shall be introduced and this activity shall be conducted as part of good house-keeping.

The water that shall be used for dust suppression shall be pumped from the open pit as part of dewatering or it shall be pumped from the settling pond.

4.1.4.14 HEAVY MACHINES AND LIGHT VEHICLE WASHING BAY

A washing bay for heavy machines and light vehicles shall be constructed next to the workshop. To accommodate big dump trucks, the wash-bay shall be 50m by 50m in size. It shall be concrete lined with a concrete lined perimeter drain which shall direct all the effluent into a silt trap. The silt trap shall also be concrete lined.

After trapping solids in the silt trap, the overflow shall be directed through another concrete lined drain into the workshop's oil/water separator. Alternatively, the wash-bay will have its own oil/water separator to avoid overload of the workshop oil/water separator. Effluent from the

oil/water separator shall be directed into a soak-away and this effluent shall be monitored for total hydrocarbons as proposed in the Monitoring Plan.

4.2 DESCRIPTION OF THE PROJECT LIFECYCLE ACTIVITIES

Three phases shall be applied to develop Rosinvest Mining for the life span of 40 years. These will include;

4.2.1 Construction Phase

This phase shall include the following:

- Infrastructure development which shall involve vegetation clearing to establish Base Camps from where the work teams will be operating and the opening up of the forest area through developing access roads
- Construction of an explosives magazine to an appropriate site taking into account the safe distance. This involves site clearing, leveling and construction activities and it is being done in consultation with MSD who are the supreme regulator for such mining facilities.
- Construction of a standard workshop.
- Construction of Crushing and Washing plants
- Installation of the Smelter and concentrator
- Construction of a fuel bowser packing bay.
- Installation of a modular sewage treatment facility.
- Sinking of a domestic water borehole.
- Construction of an OB
- Construction of perimeter drains/silt traps for the overburden dump.
- Construction of a Crusher/Screening and Smelter Plant
- Installation of drinking water treatment equipment (filter).
- Installation of a Generator

4.2.2 Operation Phase

4.2.2.1 Mining Phase

Open pit operations will mainly comprise of drilling, controlled blasting, excavation, loading and hauling. The overburden and waste rock material generated will be dumped at the waste rock dump sites. Some waste rock generated from the operations of the mine will be used for the construction of the access roads in the area.

4.2.2.2 Production Sequence

Open Pit/Cast or surface mining will be the mining method to be used at Rosinvest mine due to the position of potential ore bodies which are near the land surface. The ultimate extent of the pit will be based on long-range price forecasts for ore as well as engineering estimates of operating costs, processing plant recoveries, charges, and marketing payment terms. The design of the open pit and internal mining phases will incorporate geotechnical recommendations for safe slope angles, internal ramp development for access to all working areas, and pit wall smoothing to enhance stability and operator safety. Pit slope angles between ramps will vary according to rock strength, lithology and structural controls, but are expected to range between 28° and 48° between ramps. Where possible, catch benches will be spaced on approximately 30m vertical intervals to maximize the effective widths.

ROSINVEST will ensure that the optimum extraction grade and quality is planned to remain "at best" relatively constant throughout the extraction process. Principally, the walls of the mine will be dug out in steps called benches that will provide a safe stable structure to the pit walls, and also will allow earth moving machinery to have access when expanding the size of the pit. In order to expand the size of the pit or to excavate in any certain direction, the rock will be removed nearest the top of the pit, working sideways before moving down to the next bench thus obtaining a safe angle of the pit walls at all times. Before the rock can be removed, it will be broken up into manageable pieces. This will be done by drilling strategic holes into the rock, which will be then filled with explosives. Consideration of the location and depth of the holes will be very important as to fracture the rock in a way that will allow the shape of

the pit to remain constant, prior to any detonation of explosives. Around the pit will be a declining road or haul road to be cut into the walls of the pit that will allow large earth moving machinery and vehicles access to the bottom of the pit floor. The benches will be arranged as steps, with berms and the batter.

The mining design is of critical importance to the operations and therefore ROSINVEST shall ensure that excavation at reasonable distance is started in order to have safe mining practices and be able to maintain the natural angle of repose.

4.2.2.3 Mine Equipment

Machinery to be used will include but not limited to mechanized equipment such as drilling machines, compressors, water pumps, generators, excavators and bulldozers, etc. ROSINVEST will also use dump trucks, and any other heavy duty equipment to be recommended by mining engineers.

The final equipment selection and fleet sizes may vary slightly with vendor selection and future mine optimization studies. Production blast-hole drilling will be performed by diesel- and/or electrically powered rotary rigs. A diesel powered percussion drill (12mm to 15mm diameter holes) will be used for haul road and bench pioneering work and secondary rock breakage. Electrically-powered mining shovels with will perform the bulk of the ore and waste rock loading. Two front-end loaders will augment the shovel fleet and be used for safety berm maintenance, bench pioneering, road construction, bench toe clean-up, and constructing pit-bottom sumps.

Off-highway trucks will be used for the production haulage of all ore and waste rock. These will be diesel powered units with either mechanical or electrical drive systems. The final truck selection will be based on manufacturers' supply capabilities, tire availability, and economic considerations. A computer – based truck dispatch system may be employed to direct haul trucks to available loading units, maximize unit truck productivities, and maintain production and performance records of the mine operations. This might require the use of a high bandwidth radio communication system for data transfer between mobile units and the

computer base station. An electric power line will be constructed around the perimeter of the pit to supply energy to the shovels, pit dewatering systems and, potentially, to a trolley-assist system for the haul trucks. Radial power lines will extend down into the pit to substations located near the working faces.

Large (580- to 850-hp) crawler dozers will be used for road and sump construction, clearing benches, trimming pit wall faces and maintaining the waste rock storage area, re-grading waste rock storage area slopes for reclamation, and other tasks in and around the mine. Rubber-tired dozers (630-hp) will be used primarily for cleaning up the shovel area, patrolling the road, and clearing of blast hole sites. Motor graders (270- to 500-hp) will be used for constructing and maintaining roads throughout the Project area. The 270- hp grader will also be used for maintaining the project access road from SR 83 to the plant site. Water trucks, with tank capacities of up to 110,000 Litres each, will be used to control dust emissions from the mine haul roads. Road water for pit haul roads will be taken from the pit dewatering system or the process water temporary storage (PWTS) pond located near the plant site.
Temporary holding tanks will be used for some limited storage and to fill water trucks close to the main haul roads. Roads external to the pit will be watered using fresh water. Separate water stands and holding tanks will be maintained for this purpose. In addition to the major mining equipment described above ROSINVEST mine operations and maintenance crews will require other support equipment, including, but not limited to, explosive blasting agent delivery trucks, an 8-cy front-end loader, 25- T haul trucks (for stemming deliveries and spreading aggregate), backhoe/loaders, a portable aggregate crushing and screening plant (brought in periodically by a contractor to produce stemming and road surfacing material), an all-terrain and weather crane, fuel/lube trucks, mechanic field service trucks, a 200- T transporter/trailer, a tire handling truck, integrated tool carriers, forklifts, light plants, pickup trucks and crew vans, etc.

The summarised operational phase as explained above shall include the following:

- Removal of the mining waste to access the Tin mineralized ore;

- Mining/ extracting the Tin ore and transporting the ore material to Crushing and Washing Plant.
- Concentrating and Smelting of the Tin ore
- Maintenance of all support facilities that shall be constructed;
- Generation and disposal of waste rock and overburden;
- Dewatering activities;
- Dust suppression activities;
- Progressive backfilling of the pit with waste rock once the vain is accessed;
- Generation of domestic waste and hazardous waste; and
- Environmental Management
- Transportation of diesel to the mine, storage and use.

4.2.3 Decommissioning Phase

The phase shall include the following:

- Stabilizing the open pit to ensure that it remains physically stable.
- Environmental monitoring activities and submission of necessary statutory report about decommissioning and closures activities.
- Stabilizing the overburden dump and re-vegetating sections where overburden material shall be dumped.
- Repairing all the structures to a suitable state for alternative uses.
- Rehabilitating all contaminated sites such as the workshop area and the surrounding for the fuel storage facility.
- Installation of necessary warning signs around the pit and dump sites
- Conducting re-vegetation activities where possible.

4.3 PROJECT INPUTS AND OUTPUTS

Based on the activities listed above, an input-output analyses was done to facilitate understand possible impacts. The table below presents these inputs and outputs.

Table 7 Project Inputs and Outputs

INPUTS	POSITIVE OUTPUTS	NEGATIVE OUTPUT
Fuel	▪ Powering mining machines. ▪ Powering the generator for electricity. ▪ Transportation of water and raw material	▪ Soil, ground water and ▪ surface water ▪ Contamination due to leakages. ▪ Safety hazards
Lubricants	▪ Smooth operations of machines	▪ Generation of hazardous waste
Other mobile equipment consumables (batteries, Filters, tires etc.)	▪ Smooth operation of machines	▪ Generation of hazardous waste
Labor	N/A	▪ Income to employees ▪ Multiplier economic effects ▪ Production of Tin
Mining machinery	▪ Mining activities ▪ Transportation of waste and Tin ore	▪ Vibration ▪ Hazardous waste generation ▪ Generation of used tires ▪ Generation of scrap metal
Mining activities	▪ Production of Tin	▪ Generation of overburden ▪ Generation of effluent ▪ Dust generation. ▪ Land degradation
Light vehicles	▪ Transportation of employees ▪ Transportation of consumables	▪ Generation of hazardous waste Generation of used tires and other related scrap.
Accommodation facilities	▪ Shelter to employees	▪ Construction waste generation

Food for workers	▪ Nutrition supplement to workers	▪ Domestic waste Generation
Explosives	▪ Facilitate mining activities	▪ Noise and vibration

5.0 PROJECT ALTERNATIVES

A variety of alternatives, such as the following, exist for the design and management of the project:

5. 1 NO PROJECT, AVOID OR POSTPONE ALTERNATIVE

Avoid or postpone the need for the proposed development altogether. Under the do-nothing alternative, there will be no possibility to have the much needed mining development at the proposed site. The do-nothing alternative will impact economic development and might hinder developer efforts of mining at the proposed site. Without the implementation of the project, the government and other relevant stakeholders in the project cycle would continually have shortages which can improve the livelihood of the local people and government revenue. This would deprive them the opportunity for benefits to enhance development of the District. The 'Do Nothing' option is clearly not advisable given the heavy socio-economic costs it would entail.

5. 2 SITE ALTERNATIVES

No site alternatives were considered for the project as the proposed site was identified as being suitable for the project. The site is located in a geologically surveyed area and mapped by Ministry of Mines and deemed to contain mineral reserves. With the vast development in the country the project and as such the site was considered viable. The site was specifically chosen due to the occurrence of Tin deposits in the area.

The advantages of the specific site are as follows:

- The site is easily accessible.
- Availability of labor.
- Location of the project site is convenient for the mining.

5.3 MINING METHODS

Two options were considered. That is, open pit mining and underground mining methods. Considering the depth of the mineralized material, it is not feasible to undertake underground mining. The mineral resources are not anticipated to go beyond 200 meters deep and this top section of the earth is highly weathered making underground mining very dangerous.

5.4 ORE PROCESSING

Smelting is a form of extractive metallurgy; its main use is to produce a metal from its ore. This includes production of tin and other base metals from their ores. Smelting uses heat and chemical reducing agent to decompose the ore, carbon ore such as coke, or in earlier time charcoal. Tin production through smelting will follow the process outlined below:

5.4.1 Process

Smelting involves more than just melting out of its ore. Tin is a chemical compound of the metal with other elements, such as oxygen (SnO_2. To produce the metal Tin, these compounds have to undergo a chemical reaction. Smelting therefore consist of using suitable reducing substances that will combine with those oxidizing elements to free the metal. This process follows the chemical process as shown below:

$$\mathbf{SnO_2 \rightarrow Sn + O_2}$$

5.5 HIRING OF MINING MACHINES AGAINST BUYING THE MACHINES

Two options were considered. These are buying the mining machines and hiring. Buying machines was found economical than hiring considering the life of the mine which is anticipated to last for about 40 years.

5.6 MINING WASTE DISPOSAL ALTERNATIVES

Developing a new overburden dumps and waste rock dumps was preferred since it is a new development.

5.7 CONSTRUCTION OF THE WASHING PLANT AND CRUSHER

Construction of a washing plant and crushing plant at the site was considered since it is a new development.

5.8 POWER SUPPLY ALTERNATIVES

A diesel powered generator was considered against connecting the site to the national hydro power supply line. Cost limitations made the use of a diesel powered generation to be the preferred alternative. Therefore, a power line connecting the site to the national hydro-electricity line shall not be done because of the cost and distance where the national hydro power supply is (167km) from the site. It has been estimated that a 250litres of Diesel will be used per day to power the plant and the mine. A 20,000litre surface tank made from mild steel and supplied by Mount Meru Fuel Services shall be installed to feed diesel fuel to the generator.

5.9 FUEL STORAGE ALTERNATIVES

Construction of an above ground diesel storage tanks at the site was considered against use of a diesel bowser to transport diesel. The first option was adopted due to cost limitations considering the distance from the CBD (Kalomo) to the site. (ANNEX 16).

A 20 000 liters diesel storage tank will be installed. The fuel tank will be locally fabricated and constructed using carbon steel plates (300WA). The ends and the barrels of the tanks will be fabricated using 6mm thick plates. The tanks shall be pressure tested at 0.7 bars after thoroughly cleaning it of all loose matter.

The fuel storage tank will be placed 1.5meters from the bund wall. The storage tank will be 6

meters in length and 2.5meters in diameter. The diameters of the inlet and outlet pipes will be 35mm and 20mm respectively. The tank will have a dip pipe inlet and a vent pipe outlet and will be fitted with a ladder with handrails.

5.10 DOMESTIC WASTE DISPOSAL FACILITIES

The first alternative was to have the waste collected in bins for disposal at the nearest licensed disposal facility. The nearest dumpsite in this case is in Kalomo District. Transportation costs limited this option. Therefore, creating a dumpsite at the mine which would then be licensed for domestic waste disposal was the most practical. This dumpsite shall only be used for domestic waste disposal.

5.11 SEWAGE MANAGEMENT

The use of Pit latrine was evaluated against the use of Septic Tanks or installing a Mini Sewerage Treatment Plant. Pit Latrine has their own limitations and is not very good for a huge number of people. There are also legal demands to avoid use of Pit Latrine in Zambia. Therefore, the use of Septic Tanks or installing a Mini Sewerage Treatment Plant was preferred.

5.12 "WITHOUT PROJECT" ALTERNATIVE"

The alternative of not implementing the project was rejected by the proponent for the following reasons;

- The developer would like to contribute to local, regional economic growth through mining of tin ore which may be found at the proposed site.
- By not undertaking the proposed project local community will lose out the social responsibility package the developer intends to initiate as a way of helping the local people facing the challenges of poverty.
- The company may have loss of business from the intended buyers of Tin.

- Not undertaking the proposed project will mean loss of business for various firms that will be engaged by the company to supply goods and services to use at the proposed project site.
- There will be loss of sources of livelihood for families of would-be skilled and unskilled employees at the proposed project site.
- Both central and local government will lose direct and indirect revenue collected through various taxes and levies respectively and
- By not undertaking the proposed project, the much needed growth of Zambian economy will be hampered.

5.13 PROCESS AND MATERIALS

The proposed mining processes, equipment and materials are all environmentally sustainable and hence unlikely to cause any major damages to the environment. Rubble remains during construction will be used for compaction and site leveling, while solid and sewer waste will be managed by the proponent by use of waste bins and septic tanks.

6.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLANS

6.1 OBJECTIVE

The objectives of the EMP are to provide:

- The Project Management Team with evidence of practical and achievable plans to ensure that the project's environmental requirements are complied with.
- An integrated plan for monitoring, assessing and controlling potential impacts;
- Local, Regional and National authorities with a framework to confirm compliance with policies and requirements; and
- The community with evidence that the Rosinvest Mine Project will be managed in an environmentally acceptable manner.

The detailed EMP will be reviewed and periodically updated, if necessary to reflect knowledge gained during the course of the project's construction and operations. Changes to the detailed EMP will be implemented in consultation with the relevant authorities where necessary.

6.2 LEGISLATION, COMPANY POLICIES AND LIMITATIONS

In accordance with Zambian EIA Regulation S.I. No. 28 and the IFC Performance Standards, ROSINVEST is required to present an Environmental & Social Management (ESMP) to reduce or offset and/or eliminate any impacts that have been identified as significant. ROSINVEST will be responsible for implementing the ESMP, which will include the actions, and associated costs, of the mitigation and rehabilitation program.

The Environmental & Social Management Plan for the project is well defined and considers the environmental and social impacts of the entire operation lifecycle (including exploration and planning, evaluation, operation and closure) in addition to occupational health and safety management, describing both mitigation and management measures that are recommended for important functions at various stages throughout the mine life.

ROSINVEST will prescribe all the mitigation and rehabilitation measures for each of the identified activities or operation which may lead to significant impacts during each phase of the project.

This EMP is based on the application of professional judgment to certain facts with resultant subjective interpretations. Professional judgments expressed herein are based on the facts currently available within the limits of the scope of work, information provided by the client or its representative, prevailing secondary data, budget and schedule. To the extent that more definitive conclusions are desired by the client than are warranted by the currently available facts, it is specifically Tropical Environmental Management Experts's intent that the conclusions and recommendations stated herein will be intended as guidance and not necessarily a firm course of action except where explicitly stated as such. We make no warranties, expressed or implied, including, without limitation, warranties as to merchantability or fitness for a particular purpose.

The ESMP is subdivided into sections as appropriate. The plan specifies:

- What needs to be managed? (Environmental Issue)
- Why does it need to be managed? (Environmental Impact)
- How should it be managed? (Management Action)
- Who should manage it? (Responsibility)
- By when should it be managed? (Timeline)
- What tells whether or not it is managed? (Performance indicators) In this report

The ESMP is structured to facilitate environmental auditing of operations. The management actions proposed to mitigate the project impacts are based on industrial best practice and the Zambian regulatory framework.

6.3 PRE-MINING PHASE IMPACTS AND MITIGATIONS

6.3.1 Introduction

This section describes these potential environmental impacts and recommends management and mitigation measures during the pre-mining phase of the Project.

Production and auxiliary facilities to be constructed will include; mining production area: open pits, vehicle repair workshops, mine offices, mine camp and an electric substation;

- Ore crushing facilities: primary crushing to facilitate transfer to the processing plant;
- Processing plant;
- Tailings storage facility;
- Waste disposal areas;
- Mine roads; and
- Water pipeline and water tanks;

These production and auxiliary facilities will be used for the life of the mine. In addition, some temporary facilities will be developed for the pre-mining phase only, such as storage areas for construction materials and construction machinery parking area.

The majority of the impacts identified for the pre-mining phase tend to fall in the *moderate category* in terms of consequence and are *likely* to occur. However, the mitigation measures outlined explain how these impacts can be reduced to acceptable levels.

Construction will have impact on the visual character and landscape in the Project area. There will change land-use in the area. Any encroachment on Chilobe and Chana streams in the area will be avoided. A *Closure and Rehabilitation Plan* and the *Social Management Plan* will be required to manage these impacts to tolerable levels up to mine closure.

There are no *likely* or *very likely* catastrophic impacts during the Project construction phase.

An Environmental & Social Management Plan (ESMP) has been developed which incorporates the findings of this EIS into a series of categories for implementation.

6.3.2 Summary of the Environmental Impacts – Pre-Mining Phase

A summary of the environmental impacts during the pre-mining phase are listed in Table below.

Table 8 Environmental Impacts Pre-Mining Phase

NO.	Potential Impact	Source
1	Landscape & Visual Character(EC1)	Removal of vegetation from construction sites Landscape re-profiling for construction process Construction of surface infrastructure
2	Soil	Loss of soil productivity due to topsoil & vegetation removal Accidental oil / fuel / chemical / reagent spills Contamination from fugitive dust emissions Increased erosion due to vegetation removal Contamination from waste material e.g. scrap metal
3	Land Use	Change of some areas from agriculture to mining activities
4	Air Quality	Construction equipment and vehicles exhaust emissions and dust generation Fugitive dust emissions from mine site construction
5	Noise / Vibration	Construction equipment and vehicles Mine Site facility construction and operation

6	Surface Water	Change in drainage topography due to construction Clearance of riparian vegetation may affect the hydrological regime locally Siltation in water courses due to increased soil erosion from removal of vegetation Fugitive dust emissions may contaminate water Courses Domestic Waste Water Discharge Mine Water Discharge Accidental oil / fuel / chemical / reagent spillages
7	Ground Water	Contamination from accidental spills and oil infiltrating from surface water
8	Ecological Environment	Loss of habitat due to vegetation removal Habitat disturbance due to construction vehicles and plant machinery Increased fugitive dust will reduce biological activity Accidental oil / fuel / chemical Increased hunting and poaching
9	Cultural Heritage / Archaeology	Damage to cultural sites Damage to archaeological relics
10	Solid Waste	Damage to the physical and social environment
11	Customary Land	Conversion of customary land previous utilised by the community to a mining licence area

6.3.3 Pre-Mining Impacts Mitigation and Management

6.3.3.1 Landscape and Visual Character

Cause and Comment

The main components of visual intrusion to receptors around the Project site will be the waste rock dumps and Tailings Storage Facilities. The area is a Greenfield site and there is potential of loss of scenic integrity of the area.

Significance of Impact

Consequence	Probability
Major	Very likely

Mitigation Measures

The following mitigation measures will be carried out to reduce the impact significance:-

- Avoiding removal of vegetation as well as encouraging re-vegetation around the mine facilities;
- Avoid stockpiling the ore at the mine;
- Revegetation programs will be implemented during the course of the pre-mining phase.
- Areas that have been exposed during construction e.g. road cuttings and drainage ditches will be re-vegetated to avoid undue visual impacts; and
- Normal or non-reflective paints and tones that blend with the infrastructure in the area will be used in the finishes on the plant and other buildings, where practically possible.

Therefore, mitigation will enhance the shielding of the mining facilities from the communities.

Impact Classification

The impact on visual aesthetics will be direct and irreversible.

Effectiveness of the proposed measures

The proposed measures are likely to be 98% effective. These measures will be reviewed and periodically updated to enhance their effectiveness to reflect knowledge gained during the course of the project's construction.

Duration: Life Span of the Project

6.3.3.2 Soils

Cause and Comment

The pre-mining and mining phases will most likely reduce the agricultural potential of the soils as well as the land capabilities of the project site. Soil erosion in the rain season is expected to increase after clearing the site. There may also be accidental fuel and oil spillages within the surroundings.

Significance of Impact

Consequence	Probability
Moderate	Likely

Mitigation Measures

- Restrict clearing to areas essential for mining;
- Before construction of the mine camp, workshop, offices and other surface infrastructure, top soil will be stripped and stockpiled. This material will be used for rehabilitation at mine closure;
- Vehicles and other mine machinery will only use maintained tracks and roads;
- Hydrocarbons to be used at the mine will be stored and handled in the heavy equipment workshop to lined with impermeable surfaces, oil traps and bunded;
- At utmost prevent or institute an emergency clean-up of spillage or leakage of hazardous material or any hydrocarbons from mining equipment or vehicles immediately it occurs;
- Potentially contaminated runoff from the equipment workshop and light vehicle car park area will be directed to the settlement ponds. The sludge will be taken for decontamination at the bioremediation facility to be located within the mine licence;
- Storm water and runoff from upstream catchments will be diverted away from active mining and disturbed areas by bund walls to be erected around the facilities. Run-off from these facilities will be contained by these same walls;

- Areas in the project area awaiting rehabilitation will be lower than surrounding landform, which effectively provides internally draining sumps that contain storm water runoff and run-off will be cleared from these areas immediately after the rain event;
- Areas disturbed by mining activities and infrastructure are to be rehabilitated to a stable landform with a self-sustaining vegetation cover and where possible post mining drainage flows will emulate pre mining flows;
- Disturbed areas around construction sites will be rehabilitated promptly;
- Sediment traps will be included as part of the drainage designs at points where haul roads cross watercourses or channels; and
- Fuel storage areas have the potential to cause land contamination through leaks, spills and rupture of tanks. ROSINVEST has elected not to have any fuel storage tank below-ground but above-ground for easy management and monitoring. Tanks will have containments both on the surface and side walls.

Impact Classification

The negative impact on soils will be cumulative and irreversible.

Effectiveness of the proposed measures

The proposed measures are likely to be 95% effective. These measures will be reviewed and periodically updated to enhance their effectiveness to reflect knowledge gained during the course of the project's construction.

Duration: Life of the Project.

The management measures for pre-mining activities within the Project area including access roads outside of the mining perimeter are presented in summary in Table 6-6.

6.3.3.3 Land Use

Cause and Comment

The construction phase will most likely change the land use in the area. Land use conflict is not expected as the project will be implemented within the license area and away from settlements. However, some fields will be affected. Rosinvest will meet the affected people and offer alternative land located in safe areas within its mining licence. It will also help affected people clear these fields.

Significance of Impact

Consequence	Probability
Minor	Likely

Construction in the area may effect change from vegetated areas to mining activities.

Effectiveness of the proposed measure

The proposed measure is likely to be 100% effective.

Duration: Life of the Project.

6.3.3.4 Air Quality and Atmospheric Emissions

Cause and Comment

It is estimated that during the pre-mining and mining phases, ambient dust and exhaust fumes levels in the vicinity of the project are expected to increase due to the use of earth moving equipment and blasting activities. Excavation and Hauling machinery are expected to generate dust and exhaust fumes. No dust and exhaust fumes are expected at post mining phase

Receptors of dust and exhaust fumes coming from the construction works will be the workers on site, people living along the access routes and people walking in nearby footpaths. The impact will be more significant for the workers and people living along access routes.

Significance of Impact

Consequence	**Probability**
Moderate	Likely

The potential sources of air emissions during construction are:

- Mine sites and roads; and
- Exhaust fumes from the operation of construction vehicles and heavy mining equipment

Air Emissions Management and Mitigations

- PM10 dust levels are expected to remain below the Zambian guideline levels during the life of mine.
- ROSINVEST will still implement dust suppression measures to control any dust that may be generated. Good practice will involve implementation of the following dust management measures to minimize health impacts:
- Keeping of on-site and haulage roads moist using water sprayers especially during the dry season. Alternatively, the application of a dusticide or molasses will be considered;
- Implementation of the workplace health and safety plan that addresses health impacts of dust; and
- Providing approved personal protective equipment to the people working in dust prone areas.

Impact Classification

The impact on air quality will be direct and reversible.

Effectiveness of the proposed measures

The proposed measures are likely to be 95% effective. These measures will be reviewed and periodically updated to enhance their effectiveness to reflect knowledge gained during the course of the project's construction.

Duration: Life of the Project.

The management measures for construction activities within the Project area and implementation of mitigation measures for air-emission reduction are presented in summary in Table 6-4.

6.3.3.5 Noise and Vibrations

Cause and Comment – Noise

The sources of noise may vary according to daily activities. The major sources of noise during construction phase will mainly be earth moving equipment, drilling and blasting activities. The other major potential noise sources are transportation of personnel, materials, ore and waste rock. Much of these activities will occur 24 hours a day, the impact of which will be felt most severely at night when meteorological conditions favour noise propagation.

Significance of Impact

Consequence	**Probability**
Moderate	Likely

Continuous and permanent noise will be present in the various working areas of the construction site e.g. open pits, processing plant and on WRDs etc. Some of the control measures are as follow:

- Engineering controls; Engineering controls modify the equipment or the work area to make it quieter. Examples of engineering controls are: substituting existing equipment with quieter equipment; retro-fitting existing equipment with damping materials, mufflers, or enclosures; erecting barriers; and maintenance. Simple maintenance can reduce noise by 50%.
- Administrative Controls; these are management decisions on work activities, work rotation and work load to reduce workers' exposure to high noise levels. Typical management decisions that reduce worker exposures to noise are: moving workers away from the noise source; restricting access to areas; rotating workers performing noisy tasks; and shutting down noisy equipment when not needed; Noisy equipment can be sited as far away as possible from workers and residents; and
- Personal Protective Equipment; Earplugs are the typical PPE given to workers to reduce their exposure to noise. Earplugs are the control of last resort and should only be provided when other means of noise controls are infeasible. As a general rule, workers should be using earplugs whenever they are exposed to noise levels of 70 dB (A) or when they have to shout in order to communicate.

Noise Monitoring Program

Rosinvest will implement a monthly noise monitoring program to ensure compliance with the stipulated IFC noise guidelines. Site-specific monitoring will be conducted at strategic points (areas likely to exceed 70dBA and 55dBA [during the day] and 70dBA and 45dBA [at night] within the mine site and in the communities) when construction begins. All areas that exceed or are within 10dB of the limit will be designated as noisy areas.

These areas will be demarcated and sign-posted.

Cause and Comment – Vibrations

The blasting and movements of machinery will likely induce ground vibrations around the project and surrounding areas. Vibrations have the potential to induce cracking of structures and cause annoyance to the local people.

Significance of Impact

Consequence	**Probability**
Moderate	Likely

Mitigation Measures

- Monitor vibration due to mining activities at the open pits in order to determine any adverse effects on facilities near the mine site such as the tailing dam and waste rock dumps;
- Traffic vibrations and noise should be managed by ensuring smooth roadways as far as it is practicable; and
- Blast vibration information will be monitored for every blast and evaluated periodically to ensure that all the blast generated vibrations and acoustic parameters fall within the desired limits.

In terms of vibration management, Rosinvest Mine Project operations will not emit vibrations at ground level higher than 1.25cm/s or air pressures greater than 120 linear decibels.

Effectiveness of the proposed measures

The proposed measures are likely to be 95% effective. These measures will be reviewed and periodically updated to enhance their effectiveness to reflect knowledge gained during the course of the project's construction.

Impact Classification

The impact of vibration will be direct and reversible.

Duration: Life of the Project.

6.3.3.6 Surface Water

Cause and Comment

Clearing of surrounding areas in the project area will likely cause siltation, especially during rainfall events, the runoff around the project site and haulage road, may eventually find its way into the nearby Chilobe and Chana streams.

Reducing the impact of such a discharge is reliant on sound design and good housekeeping measures being maintained throughout the life of the mine. Effective monitoring is necessary to ensure that any impact is rapidly identified so that it can be addressed.

Significance of Impact

Consequence	**Probability**
Major Impact	Unlikely

The potential significant impacts on surface water sources are:

- Landscaping and the clearance of vegetation can affect the hydrological regime locally due to increased erosion and siltation in water courses;
- Soil scouring during floods following site-clearing for the construction of surface infrastructure and widening of the haul road may lead to increased suspended solids in the surface run-off; and
- Fugitive dust emissions can contaminate water courses.

The following mitigation measures will be carried out to minimize risks of surface and ground water contamination during high rainfall periods:

- A perimeter drain will be constructed around the WRDs, TSF and ore handling facilities to control potential water contamination. All the water will be collected in the wastewater ponds to be located near the potential polluting sites and released to the environment when declared safe;
- Surface water will continue to be monitored for pollution levels; and
- Rosinvest will clean any oil and diesel spills as soon as possible.

Impact Classification

The impact on surface water will be direct and reversible.

Effectiveness of the proposed measures

The proposed measures are likely to be 95% effective. These measures will be reviewed and periodically updated to enhance their effectiveness to reflect knowledge gained during the course of the project's construction.

Duration: Life of the Project.

Ground Water

Cause and Comment

A Hydrogeological regime of the area indicated that the area has potential aquifers. This is as a result of the presence of favourable hydrogeology and presence of absence of fractures within the rocks.

Significance of Impact

Consequence	**Probability**
Minor	Unlikely

Mitigation Measures

- The following mitigation measures are recommended to minimize risks of ground water contamination during high rainfall periods:
- Before commencing mining operations, Rosinvest will sink boreholes for monitoring the quantity and quality of groundwater around the mine;
- Results of the quantities and quality of water will be submitted to ZEMA and MSD on quarterly basis;
- All potential polluting sources will be lined with impermeable surfaces; and
- Rosinvest will minimise any spillages of oils, waste material and any other chemical spills that can contaminate groundwater.

Impact Classification

The impact on ground water will be direct and reversible.

Effectiveness of the proposed measures

The proposed measures are likely to be 95% effective. These measures will be reviewed and periodically updated to enhance their effectiveness to reflect knowledge gained during the course of the project's construction.

Duration: Life of the Project

6.3.3.7 Ecological Environment

Cause and Comment

The biodiversity assessment indicated that the project site has good biodiversity. It is an Important Bird Area. The project area has the potential of impacting negative on this environment. If not properly managed, the project can also lead to the degradation of terrestrial

and aquatic ecosystems. The destruction and disturbance is expected to be more on the footprint of the Area of Interest.

Significance of Impact

Consequence	Probability
Moderate	Likely

The terrestrial flora within and close to the project area mainly comprises thick vegetation and forestry cover. Fauna distribution in this area is of minimal significance.

Mitigation Measures

- Rosinvest will engage government in natural resource management to reduce the disturbance on biodiversity in the area;
- Rosinvest will not clear any vegetation along the rivers and streams in the area; and
- Vegetation will only be cleared in areas that will be directly affected by the project.

Impact Classification

The impact on biodiversity will be direct and irreversible.

Effectiveness of the proposed measures

The proposed measures are likely to be 98% effective. These measures will be reviewed and periodically updated to enhance their effectiveness to reflect knowledge gained during the course of the project's construction.

Duration: Life of the Project.

6.3.3.8 Cultural Heritage and Archaeological Sites

Cause and Comment

From a survey of the site and discussions with the people living near the project area, it was revealed that no known affirmed archaeological or cultural sites exist within the areas to be developed for mining activities.

6.3.3.9 Solid Waste

The major solid wastes to be generated at the Rosinvest Mine Project are mine wastes (waste rock, overburden and tailings) and general solid waste. The mine waste will be stored on waste rock and overburden dumps and tailings storage facilities. General waste will be handled in different ways and will need a solid waste strategy for effective management.

Cause and Comment

Rosinvest endeavors to adhere to the Waste Management Regulations, 112 of 2013 Part 4 (SI No. 18). which provides for the control of transportation of waste and management of waste disposal sites.

Significance of Impact

Consequence	Probability
Major Impact	Very Likely

Waste Management Strategy

The waste management strategies proposed for the Project consider waste from the concept and planning stages through design, construction, operation and decommissioning. The strategies aim

to minimise environmental harm that could occur if wastes are not managed properly and contaminants impact environmental values.

The strategy ensures compliance with regulatory requirements as a minimum and incorporates the waste minimisation hierarchy in order of preferred options:

- Waste Avoidance;
- Waste Re-Use;
- Waste Recycling;
- Energy Recovery From Waste, And
- Waste Disposal.

Waste generated on the Project site during the construction, operation and decommissioning phases would be minimised through:

- Assessment of Waste Reduction Opportunities For Identified Waste; And
- Management of Waste In Accordance With the Waste Minimisation Hierarchy.

The strategy would also address monitoring, tracking and reporting of waste. ROSINVEST would consult with the Kalomo District Council and ZEMA waste management strategies for the Project.

Mitigation Measures

General waste

General wastes would be collected regularly and transported for disposal at the Kalomo District Council and ZEMA licensed dump site.

Some solid wastes, such as cardboard packaging and wooden pallets would be reused on-site for other purposes where practical. Scrap steel, batteries, toner cartridges, and other recyclables would be recycled off-site by third parties where feasible.

Regulated wastes would be stored in appropriate locations and conditions, until they can be transported off-site by a licensed regulated waste contractor.

Effectiveness of the proposed measures

The proposed measures are likely to be 95% effective. These measures will be reviewed and periodically updated to enhance their effectiveness to reflect knowledge gained during the course of the project's construction.

Duration: Life of the Project.

6.3.3.10 Customary Land Rights

Cause and Comment

The project site is located in HRH Chief Simwata Chela. The implementation of the project will entail the conversion of the land to a mining licence area and the restriction of activities which the local people have been conducting in the area.

If not properly managed, the project has a potential to bring conflicts between the Rosinvest and the local population.

Significance of Impact

Consequence	**Probability**
Major Impact	Very Likely

The project area has no cultivated fields. Implementing the project will not result in the loss of fields, cultivated crops, human displacements or livelihood.

Impact Classification

The impact on customary rights will be direct.

Effectiveness of the proposed measures

The proposed measures are likely to be 100% effective.

Duration: Life of the Project.

6.4 OPERATIONAL PHASE ENVIRONMENTAL IMPACTS AND MITIGATIONS

6.4.1 Introduction

This section assesses the potential environmental impacts during the Mining (Operational) phase of the Project. The production and auxiliary facilities proposed for this project will be used for the forty-year life of the Project.

This section describes these potential environmental impacts and recommends management and mitigation measures during the operating phase.

The majority of the impacts assessed fall in the *moderate category* in terms of consequence and are *likely* to occur, however mitigation measures are outlined to explain how these impacts can be reduced to acceptable levels.

Operations will have a *moderate* impact on ambient dust levels in the Project area due to mining machinery and vehicles. In addition there will be risks with regards to surface and groundwater

conditions from potential seepage and silt runaways from waste rock dumps.

The majority of catastrophic impacts are related to *unlikely* to *highly unlikely events* such as chemical spills and spills from storage facilities. Strict procedures will be in place for mining operations (*OMP)* to ensure such events remain highly unlikely. There are no *likely* or *very likely* catastrophic impacts from the Project operating phase.

An Environmental Management Plan (EMP) has been developed which incorporates the findings of this EIS into a series of categories for implementation.

6.4.2 Environmental Impacts – Mining (Operational) Phase

6.4.2.1 AIR POLLUTION

Major environmental aspects that contribute to air pollution at the mine will include haulage of waste from the pit to the dumpsites, haulage of the raw material from the pit to the processing plant and road maintenance activities. The matrix table below presents the environmental risk of air pollution without and with mitigation measures.

Table 9:- Air Pollution

Air Pollution Due to Dust Generation from Open Spaces, Pit, OB and Access Roads	
Magnitude (M)	Significant
Frequency (F)	Daily
Duration (D)	40 years
Extent (E)	Local
Likelihood (L)	Definite
Proposed Mitigation Measures	
1) Water shall be sprayed along the ramps, access roads and open spaces using a water bowser. 2) Appropriate protective clothes such as dust masks, goggles and work suites shall be	

provided to workers operating earth moving machines and dumping supervisors. 3) New employees shall be inducted on safety requirements when working in dust prone areas and safety talks shall be conducted frequently. 4) Signs shall be installed to educate workers about the health dangers of inhaling small particles of dust. 5) Annual medical check-ups shall be conducted to determine the levels of dust exposure to workers. 6) Ambient dust around the mine area shall be monitored monthly to ensure that the dust fall-out around mining activities is below the ZEMA limit of 250 mg/m2/day.	
Air pollution After Applying Mitigation Measures	
Magnitude (M)	Negligible
Duration (D)	40 years
Extent (E)	Activity Specific
Frequency (F)	Daily
Likelihood	Definite

6.4.2.2 WATER AND SOIL POLLUTION

Key environmental aspects that will contribute to water and soil pollution are generation of hydrocarbon waste due to servicing of mining machines and distribution of fuel. Other activities are domestic waste water, sewage disposal, dewatering activities and surface water run-off. The overall environmental risk before and after mitigation measures is predicted in the table below.

Table 10:- Water and Soil Pollution

Water and Soil Pollution Without Mitigation Measures	
Magnitude (M)	Significant
Frequency (F)	Daily
Duration (D)	40 years
Extent (E)	Activity Specific
Likelihood (L)	Possible
Proposed mitigation measures	
1) All the de-watering water shall be directed into a settling pond in order to settle solids first before the water can overflow as discharge. 2) The effluent shall be monitored weekly for Conductivity, Dissolved Oxygen, pH and	

Total Dissolved Solids using a potable field water monitoring instrument. Samples shall also be analyzed using a reputable laboratory at least once in three months. 3) A perimeter drain shall be constructed around the camp, pit and the OB to facilitate trapping of all the solids that may be washed by storm water. 4) A standard workshop with a dedicated storage facility and generation facilities for hazardous waste shall be constructed. This shall be concrete lined, signs shall be installed and a water/oil separator shall be installed for all the effluent from the workshop and the washing bay. 5) A wash-bay for heavy machines as well as light vehicles shall be constructed and this shall be concrete lined with a perimeter drain connected to a silt trap for capturing solids from washing activities. The overflow from the washing bay silt trap shall be directed into the central oil/water separator for trapping possible hydrocarbons from washing activities. 6) All the hazardous wastes shall be segregated and stored within the workshop in a dedicated hazardous waste storage room. These wastes shall include used fluorescent tubes, used oil filters, expired fire extinguishers, used batteries and hydrocarbon contaminated waste. 7) Disposal of hazardous waste shall be done using a licensed waste collection company for appropriate disposal. 8) Spills containment facilities such as absorbents, drip trays, wheelie bin, shovel and oil booms shall be made available at all points where hydrocarbons shall be handled. 9) A bio-remediation farm shall be established within the mine area for treatment of hydrocarbon contaminated soils by mixing it with nitrogen based fertilizer, effluent from the modular sewage treatment plant and by frequent aeration. 10) Domestic water and sewage waste are disposed off through septic tanks. 11) All employees shall be subjected to environmental inductions in order for them to be aware of water and soil pollution control measures.

Water and Soil Pollution After Applying Mitigation Measures	
Magnitude (M)	Minor
Duration (D)	40 years
Extent (E)	Local
Frequency (F)	Monthly
Likelihood (L)	Highly Unlikely

6.4.2.3 NOISE AND VIBRATION

Environmental aspects that will contribute to noise and vibration are movement of earth moving machines, drilling activities, operations of the generator and blasting activities. Some of these activities are continuous while others are intermittent. For examples, the generator will run about

12 hrs. per day while blasting will be done only once per day. The table below presents the predicated environmental risk with mitigation measures and without mitigation measures.

Table 11:- Noise and Vibration

Noise and Vibration Without Mitigation Measures	
Magnitude (M)	Significant
Frequency (F)	Daily
Duration (D)	40 years
Extent (E)	Activity Specific
Likelihood (L)	Definite
Proposed Mitigation Measures	
1) Controlled blasting shall be introduced to minimize noise and vibration during blasting. 2) All the machinery shall be serviced according to manufacturer manuals to ensure that they operate according to standards. 3) Noise and vibration monitoring shall be conducted frequently according to the monitoring plan to determine intervention measures. 4) Appropriate Personal Protective Equipment/Clothes shall be provided to all the workers and this shall be used in high noise areas. 5) All activities with potential to generate significant noise and vibration shall be conducted during the normal working hours of the day. 6) The blasting schedule shall be maintained and this schedule shall continue taking about 30 minutes every day when blasting is done.	
Noise and Vibration After Applying Mitigation Measures	
Magnitude (M)	Marginal
Duration (D)	40 years
Extent (E)	Local
Frequency (F)	Monthly
Likelihood (L)	Highly Unlikely

6.4.2.4 LOSS OF FLORA AND FAUNA

Project activities that interact with flora and fauna are disposal of overburden material, extension of the pit, road maintenance activities, maintenance of the surrounding and maintenance of the

firebreak/security patrol road around the camp. The environmental risk for flora and fauna was predicted as explain in the matrix table below**.**

Table 12:- Loss of Flora and Fauna

Loss of Flora and Fauna Without Mitigation Measures	
Magnitude (M)	Marginal
Frequency (F)	Annual
Duration (D)	40 years
Extent (E)	Activity Specific
Likelihood (L)	Possible
Proposed mitigation measures	
1) Site clearing shall be limited to development areas and before any clearing is done, the Mine Manager shall issue a site clearing approval in consultation with the SHES Manager. 2) Biological monitoring of trees and animal species around the mine area shall be undertaken once per year. 3) No charcoal burning shall be tolerated within the mine licence area and the mine shall not buy charcoal from the community as this may promote charcoal burning by the community. All cooking activities shall be done using a stove and only dead-wood shall be collected from the forest as firewood for general purposes. 4) Trapping of wild animals and buying of illegal game meat shall be included in the disciplinary code for all employees and applicable disciplinary measures shall be instituted to erring employees in accordance with Labor Laws. 5) A firebreak shall be prepared every year around the mine licence area before the fire burning season starts to protect flora and fauna within the mine area. 6) Security patrols shall be conducted in the entire mine area to monitor deforestation activities which shall be considered as trespass and necessary legal actions shall be instituted to offenders. 7) Wildlife conservation awareness campaigns shall be conducted once per year for workers and the community. 8) Protection measures for flora and fauna shall be part of the material for environmental inductions.	
Loss of Flora and Fauna After Applying Mitigation Measures	
Magnitude (M)	negligible
Duration (D)	40 years
Extent (E)	Local

Frequency (F)	Annually
Likelihood (L)	Highly Unlikely

6.4.2.5 NON-HAZARDOUS AND HAZARDOUS WASTE MANAGEMENT, CHANGE OF LANDSCAPE AND LAND DEGRADATION

Key environmental aspects that contribute to change of landscape and land degradation will include the open pit, disposal of overburden material at the OB dump, domestic waste from the camp and clearing of access roads. Of significance however are the OB dump and the pit. The table below presents the overall environmental risk before and after mitigation measures.

Table 13:- Non-Hazardous and Hazardous Waste Generation

Non-Hazardous and Hazardous Waste Generation and Disposal and Change of Landscape and Land Degradation Without Mitigation Measures	
Magnitude (M)	Significant
Frequency (F)	Daily
Duration (D)	40 years
Extent (E)	Activity Specific
Likelihood (L)	Definite
Proposed Mitigation Measures	
1) Once production starts, all the material from the mine shall be used as backfilling material for the pit as a measure to reduce the volume of waste to the OB dump. 2) Once backfilling starts, the OB dump shall be re-vegetated with local flora species and this shall add to the aesthetic value of the area. 3) At closure, the OB dump shall fully be re-vegetated and the pit shall be stabilized to let it steadily fill with water. 4) Re-vegetation activities shall be extended to the camp to close up spaces that will be cleared. 5) All the domestic waste from the camp shall be collected in dedicated waste bins and a land fill shall be constructed within the mine licence area for disposal. The landfill shall be licensed by ZEMA and licence conditions for managing it shall be complied. 6) All the hazardous waste from the mine shall be collected by licensed transporters. 7) Hazardous waste that may not have commercial value shall be disposed off at a licensed dumpsite that will be operated at the mine or kept within the storage house awaiting appropriate disposal. 8) Sludge from sewage treatment plant will be dried on a drying pan and thereafter used	

as manure for the re-vegetation of the dump site. The sludge has undergone decomposition and it is no hazardous.	
Non-Hazardous and Hazardous Waste Generation and Disposal and Change of Landscape and Land Degradation After Mitigation Measures	
Magnitude (M)	Significant
Duration (D)	40 years
Extent (E)	Activity specific
Frequency (F)	Daily
Likelihood (L)	Possible

6.4.2.6 OCCUPATIONAL HEALTH AND SAFETY

Main environmental aspects associated with occupation health and safety will include blasting, loading and offloading waste, transportation of waste and raw material and general maintenance activities. Contributing factors to risk assessment are dust, noise, explosions, fire and failure to follow machine operating procedures. The table below presents the risk assessment for occupational health and safety.

Table 14:- Occupational Health and Safety

Occupational Health and Safety Without Mitigation Measures	
Magnitude (M)	Catastrophic
Frequency (F)	Daily
Duration (D)	40 years
Extent (E)	Project Site
Likelihood (L)	Definite
Proposed Mitigation Measures	
1) Annual medical check-ups shall be done for all the workers and where health related problems are advised for some workers by medical experts, jobs may be changed for such workers or they may be retired on medical grounds. 2) Safe working procedures shall be developed following approval of this report for high risk operations such as handling of explosives, haulage of material, working with electrical facilities and servicing of machines. These procedures shall be reviewed annually to keep them up to date with changes.	

3) Safety audits shall be conducted using an independent and qualified Auditor and recommendations in the Audit report shall be enforced. 4) Safety and Environmental weekly discussions shall be conducted to remind all the workers about safe practices. 5) Safe practice observers/spotters shall be appointed and these shall also be responsible for activities such as supervising end-tipping of the overburden. 6) Safety statistics shall be reported weekly and the figures shall be displayed on a notice board that shall be established within the camp. 7) All accidents and near-misses shall be reported to the Safety, Health and Environmental Manager and failure to report shall result into disciplinary measures. 8) For the general safety of employees in the camp, the security manager shall continue being in charge of patrols and inspections within the pit, Overburden Dump and the camp.

Occupational Health and Safety After Applying Mitigation Measures	
Magnitude (M)	Significant
Duration (D)	40 years
Extent (E)	Activity specific
Frequency (F)	Daily
Likelihood (L)	Possible

6.4.2.7 SOCIAL CHALLENGES FOR EMPLOYEES

Employees will be staying in a camp from Monday to Friday and they will be taking a weekend off. In addition, they will be entitled to their annual leave days. This practice shall continue. However, there are social challenges with this schedule mainly family related hence the need to consider the working schedule as an aspect that has potential to cause social conflicts. The risk assessment and mitigation measures are presented below.

Table 15:- Social Challenges by Employees

Social Challenges by Employees Without Mitigation Measures	
Magnitude (M)	Significant
Frequency (F)	Daily
Duration (D)	40 years
Extent (E)	Province

Likelihood (L)	Definite
Proposed Mitigation Measures	
1) A social Counseling Expert shall be engaged once every year to provide counseling services on various social issues to all workers and a separate session shall be organized through the General Manager for all the miner's wives. 2) Employees and their wives shall be allowed to present employment caused social challenges to the General Manager for assistance or referral to counseling experts. This shall be handled with maximum recognition of the human right to privacy and confidentiality, hence only professional and registered counselors shall be engaged to provide the service. 3) The working schedule shall be maintained as this facilitates time for employees to be with their families and annual leave shall be mandatory.	
Social Challenges by Employees After Applying Mitigation Measures	
Magnitude (M)	Marginal
Duration (D)	40 years
Extent (E)	Province
Frequency (F)	Daily
Likelihood (L)	Possible

6.4.2.8 CONFLICTS WITH THE LOCAL COMMUNITY AND NEARBY MINES

For a project with environmental and social impacts, grievances are part of the development process. It does not matter what level or amount of resources have been invested in corporate social activities when it comes to grievances because it is not possible to please everyone in life. Besides, it is human nature to view same issues differently and this difference in perception is what makes social diversity and dynamics.

Rosinvest Zambia Limited recognizes the need to consider and address conflicts with the community because this builds a good relationship, reduces the cost of resolving some conflicts, it is a good alternative to litigation and the approach protects the corporate image.

To avoid subjective decisions, it is imperative to have guiding rules for resolving social conflicts and this is the approach adopted by the company. The table below presents the social risk associated with the project before mitigation measures and after mitigation measures.

Table 16:- Conflicts With the Local Community and Nearby Mines

Conflicts With the Local Community and Nearby Mines Without Mitigation Measures	
Magnitude (M)	Significant
Frequency (F)	Daily
Duration (D)	40 years
Extent (E)	Province
Likelihood (L)	Definite
Proposed Mitigation Measures	
1) A grievance mechanism shall be developed by an independent and competent consultant and shall be implemented within Six (6) months following approval of this report. The mechanism shall be established to receive record and address stakeholder concerns which shall be related to mining activities. The mechanism shall be developed in a participatory manner. 2) The grievance mechanism shall be based on the extent of risk and adverse impacts discussed in this report 3) Grievances shall be addressed promptly, in an understandable and transparent process, which shall be culturally appropriate and readily accessible to all the Interested and Affected Parties (IAPs) including vulnerable groups. 4) A system shall be put in place to ensure that grievance submission does not result into costs and/or retribution. 5) Once the mechanism is endorsed by the General Manager, it shall be publicized through consultative meetings and Community Representatives to facilitate with receipt of grievances shall be appointed.	
Conflicts With the Local Community and Nearby Mines After Applying Mitigation Measures	
Magnitude (M)	Minor
Duration (D)	40 years
Extent (E)	Province
Frequency (F)	Daily
Likelihood (L)	Possible

6.4.2.9 HIV/AIDS RELATED CHALLENGES

It is commonly said that "if you are not infected by HIV/AIDS, then you are affected". The statement is absolutely true and the HIV/AIDS pandemic has since become part of the development process. As such, government through the Ministry of Health has mainstreamed the HIV/AIDS challenge in all sectors of the economy. Large scale mining is not exempted. The table below predicts the HIV/AIDS challenge without mitigation and after intervention.

Table 17:- HIV/AIDS Related Challenges

HIV/AIDS Related Challenges Without Mitigation Measures	
Magnitude (M)	Significant
Frequency (F)	Daily
Duration (D)	40 years
Extent (E)	Province
Likelihood (L)	Definite
Proposed Mitigation Measures	
1) A professional HIV/AIDS Counselor shall be subcontracted once every year to offer awareness, voluntary counseling and testing services to employees. 2) The company shall also extent the voluntary counseling and testing services to the mining area with assistance from relevant institutions offering the service. 3) HIV/AIDS related medical information shall be strictly confidential and shall not affect any form of recruitment. 4) Workers who may voluntarily come out with the aim of creating awareness and stopping stigmatization shall be encouraged. 5) A company policy on HIV/AIDS shall be developed and implemented within Six (6) months following approval of this report and distribution of condoms in toilets shall be part of the policy. 6) Employees on Anti-Retro-Viral treatment shall be supported.	
HIV/AIDS Related Challenges After Mitigation Measures	
Magnitude (M)	Minor
Duration (D)	40 years
Extent (E)	Province
Frequency (F)	Daily
Likelihood (L)	Possible

6.4.2.10 DISEASE VECTOR FROM PITS AFTER CLOSER

After closure, water will accumulate in the pits and form ponds. This may probably be the sources for potential disease vectors such as mosquitoes. The ponds also pose danger to the community who may want to swim and fish in these ponds.

Table 18:- Disease Vector

Disease Vector from Water that Have Accumulated in the Pits	
Magnitude (M)	Significant
Frequency (F)	Daily
Duration (D)	40 years
Extent (E)	Province
Likelihood (L)	Definite
Proposed Mitigation Measures	
1) The proposed project site will be fenced and security will be on guard even after closure. 2) Spraying for mosquitoes will be done at regular intervals according to guidelines from the Ministry of Health. 3) No one will be lowed to swim in the ponds formed in the pits. 4) No one will be allowed to do any fishing in the ponds. 5) Ponding during operation phase will be avoided by putting in place a dewatering and water pumping program. 6) No settlements will be allowed around the pit periphery and inside the mine licence areas. 7) No one will be allowed to use the pond water for domestic and portable water use. 8) Water tests will be carried out to ascertain its quality.	
HIV/AIDS Related Challenges After Mitigation Measures	
Magnitude (M)	Negligible
Duration (D)	40 years
Extent (E)	Activity Specific
Frequency (F)	Daily
Likelihood (L)	Possible

Other Environmental Impacts will include;

6.4.2.11 Reduction in Ground Water Quantity

Nature and Source of Impact: Constant water abstraction from the mine to keep it in workable condition has potential to reduce the ground water levels.

However, the aquifer at the project site is enormous and the amount of water that will be abstracted during operations will not result in any significant reduction in ground water levels.

Impact Significance: Non significant

Proposed Mitigation Measures: Schedule dewatering operations targeting work areas only allow the mine to flood at the end of mining operations.

6.4.2.12 Reduction in Ground Water Quality

Nature and Source of Impact: Indiscriminate disposal of solid and liquid wastes has potential to contaminate ground water through seepage. These may include oil and fuel from operation and servicing of equipment, material spillage, improper disposal of waste, etc.

Impact Significance: Moderate

Proposed Mitigation Measures: Prevent material spillage, contain all wastes and spilled material, dispose of wastes in designated disposal sites, clean up and remediate all contaminated sites.

6.4.2.13 Disturbance to Geological Integrity

Nature and Source of Impact: Mining activities involving blasting and excavation by nature has potential to affect geological integrity by weakening the strata due to vibrations mainly from blasting operations. However, being an open pit mine the effects are relatively minimal as they do not affect much of the underlying strata.

Impact Significance: Low

Proposed Mitigation Measures: Observe standard blasting guidelines for opencast mining and use only explosives with approved power rating.

6.4.2.14 Loss of Soil Fertility

Nature and Source of Impact: Removal of ground cover and top soil on clearing land for Tin mining leads to loss of soil fertility making it difficult for plant growth without remediation.

Impact Significance: Moderate

Proposed Mitigation Measures: Stockpile top soil for re-profiling back progressively after mining each respective area.

6.4.2.15 Reduced Soil Stability

Nature and Source of Impact: Removal of ground cover and top soil on clearing land for limestone and shale mining leads to loss of soil stability making it readily prone to agents of erosion.

Impact Significance: Low

Proposed Mitigation Measures: Minimise area disturbed and ensure all worked areas are adequately compacted and re-vegetated after use.

6.4.2.16 Loss of Biodiversity and Disturbance to Natural Lands and Geographical Resources

Nature and Source of Impact: Loss of land cover and habitat destruction arising from Tin mining results in loss of biodiversity as plant life and animals are lost in the process and their life support systems are disrupted.

Similarly, discharge of high levels of sediments into the aquatic environment also disturbs aquatic life and its productivity thereby limiting biodiversity. However, overall effects on biological diversity, natural lands and geographical resources are negligible. This is due to the relatively small area of project footing and relatively nontoxic emissions. Further, increased supply of water to the nearby wetland is an enhancement factor compensating for the lost biodiversity. The absence of endangered species in the project area and the relatively rich diversity of plant life in the area surrounding the project site is another compensating factor.

Impact Significance: Low

Proposed Mitigation Measures: Limit disturbance of habitat by keeping the plant and mine footing to minimal requirements together with adequate treatment of waste streams and progressive rehabilitation of disturbed areas. Further action will involve planting of flowers, lawn and fruit trees together with some indigenous trees found in the area in a well landscaped manner.

6.4.2.17 Disturbance to Aquatic Life

Nature and Source of Impact: Discharge of process water and sediment loaded storm water into the aquatic environment has potential to disturb aquatic life.

Impact Significance: Low

Proposed Mitigation Measures: Ensure all discharges from the plant and mine sites pass through sediment traps and comply with licensed discharge limits. Regularly maintain sediment traps for efficient operation.

6.4.2.18 Ecological Disturbance and Effect on Climatic Conditions

Nature and Source of Impact: Establishment and operation of the mine will disturb the ecological setting of the area thereby rendering it less conducive a habitat for both plant and

animal life through physical disturbance and discharge of pollutants. On the other hand the presence of a large water-body creates a habitat with favourable conditions for breeding of mosquitoes especially at the end of the project life when disturbing activities will have ceased. Such insects being disease vectors for malaria have potential to negatively affect human health.

Minor changes are likely to have occurred in micro weather conditions within the confines of the factory. The main elements likely to be affected are humidity and temperature while rainfall, wind and sunshine are unlikely to be affected. Although the changes have not been monitored to that effect it is unlikely that the same would be significant enough to affect the climatic conditions of the area. Consequently project impacts on the climatic conditions of the area are considered to be insignificant.

Impact Significance: Low/Moderate

Proposed Mitigation Measures: Limit disturbance of habitat by keeping the mine footing to minimal requirements together with adequate treatment of waste streams and progressive rehabilitation of disturbed areas to enhance life support systems.

6.5 SOCIAL IMPACT ASSESSMENT

6.5.1 Introduction

The identification of the potential social impacts that may result from project development is based on a review of the project design and industry experience. These impacts include aesthetics, noise, air quality (dust and pollutants), vibration, water discharge and runoff, subsidence, waste sources include the open pit and surface infrastructure and access or haul roads. If mining will cause quality deterioration of either surface water or groundwater, remedial and treatment measures must be developed to meet discharge standards.

The potential impacts were also identified through site visits during the collection of baseline data and during interactions with the local communities. Five factors were considered when

assessing the significance of all the social impacts, namely:-

1. Relationship of the impact to *temporary* (relating to measured time) scales - the temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.
2. Relationship of the impact to *spatial* (relating to space) scales - the spatial scale defines the physical extent of the impact.
3. The severity of the impact - the *severity/beneficial* (state or extent of badness or benefit) scale is used in order to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on a particular affected system (for ecological impacts) or a particular affected party. The severity of impacts can be evaluated with and without mitigation in order to demonstrate how serious the impact is when nothing is done about it. The word 'mitigation' means not just 'compensation', but also the ideas of containment and remedy. For beneficial impacts, optimization means anything that can enhance the benefits. However, mitigation or optimization must be practical, technically feasible and economically viable.
4. The *likelihood* (degree of probability) of the impact occurring the likelihood of impacts taking place as a result of project actions differs between potential impacts. There is often no doubt that some impacts will occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.
5. Each criterion is ranked with scores assigned as presented in Table 6-10 (shown below) to determine the overall *significance* of an activity. The criterion is then considered in two categories, viz. *effect* of the activity and the *likelihood* of the impact. The total scores recorded for the effect and likelihood are then read off the matrix presented in Table 6-11, to determine the overall significance of the impact. The overall significance is either negative or positive.

6.5.2 Impacts and Mitigations Measures

6.5.2 .1 Impact on Local Communities and Complaints

Cause and Comment

There is a possibility of complaints from the people from the communities especially those in headman James which are closer to the proposed mine site. The following issues are likely to be the sources of concern: -

- Disturbance of footpaths – People will likely complain that the project will disturb the footpaths that they use in the area;
- Loss of farming plots on the footprint of the area of interest for the mine;
- Fear of drawing water from the local streams perceived to be contaminated by mine operations; and
- Noise and Dust from the mine trucks operating in the area.

Significance of Impact Low to Moderate

Mitigation Measures

- Farming within the area of interest will be discouraged.
- Dust on the haul road will be regularly be suppressed by spraying water;
- People drawing water from local Chilobe and Chana streams will be regularly informed on the quality of the water in these water facilities;
- Only equipment with noise levels up to 82dBA (measured at source) will be allowed to operate at the mine and people will be sensitized on concentrating their daily activities about 24m from the edge of the road;
- Signposts will be erected on all graveyards in the area. ROSINVEST will liaise with the council on the choice of the cemetery which should remain active in the area ;
- ROSINVEST will implement speed retardants and limits on the mine roads to 50km/h for safety reasons;

- ROSINVEST will ensure that roads are kept clear of any debris and are smooth to avoid noise and vibration; and
- ROSINVEST will engage the communities living along the haul road throughout the project life.

Impact Classification

The negative impacts on the community will be cumulative and reversible.

6.5.2 .2 Impact on the Establishment of Sound Relationships

Cause and Comment

Leaders of the people in the area (Traditional Leadership and government leaders) will be involved from the inception to avoid the misunderstanding between the proponent and the local community.

Significance of Impact Low to High

Mitigation Measures

Consultations relating to mine developments and other activities will constantly be relayed to community leaders through ROSINVEST public relations office.

Impact Classification

The impact of establishing sound relationship with the community will be a cumulative and reversible.

6.5.2 .3 Impact on Economy – Local, Regional and National

Cause and Comment

The project will enable ROSINVEST establish a mine in an area which could improve economically once the mine starts operating. This will create jobs in the local area, district and regional level.

Decommissioning and closure unfortunately will be accompanied by possible job losses at the mine. The local economy will likely be affected due to its high dependence on the mining and related activities. If not mitigated or planned for, the impact will be severe for the regional/national economy and the people involved.

Significance of Impact Low to High

Mitigation Measures

- ROSINVEST will continue with its exploration program in order to establish new ore sources; and
- ROSINVEST will continue supporting diversification from mining activities in Chirobi such as crafts, bee-keeping for honey and conservation farming;

Impact Classification

The impact on the regional and local economy will be a cumulative and irreversible.

6.5.2 .4 Impact on Procurement and supply of Goods and Services

Cause and Comment

Procurement of goods and services is expected to continue during construction and operations

stage. Local procurement of materials and equipment is likely to be confined to relatively specialized products which will be needed for the development and running of the mine.

ROSINVEST will procure goods and materials locally to the extent possible to ensure that economic benefits are felt by the local suppliers and their employees.

ROSINVEST will ensure that procurement of good and services takes account of the manner in which the material is produced, stored, transported so that good and services that violet human rights and cause environmental degradation are avoided. Thus ROSINVEST will adopt '*cradle to grave*' concept of monitoring.

Goods and service procurement is likely to be active at regional rather than local level, therefore the spatial scope is defined as 'regional.' However, even at the regional level, the loss of business could have significant negative results.

Decommissioning and closure will be accompanied by fewer contracts for the supply of goods and services. The local economy will likely suffer a significantly set back due to the loss of such contracts. If not mitigated or planned for, the impact will be severe for the economy and the companies/people involved.

Significance of Impact Low to High

Mitigation Measures

It is recommended that diversification of the economy be encouraged as early as possible by both the mining companies and the government.

Impact Classification

The impact on procurement and supply of goods and services will be a cumulative and reversible.

6.5.2 .5 Loss of Employment

Cause and Comment

There is a possibility that people (both from ROSINVEST and Contractors) will likely lose employment, for various reasons, during construction and operations stages of the project. It is expected though that major employment loss will be at Mine closure stage. Loss of employment will negatively impact the affected families, the community (as a result of the economic trickle-down effect) and the government (loss of taxes).

Significance of Impact Moderate to Low

Mitigation Measures

Counseling and skills development as part of closure planning may assist some contractors to sustain their businesses post-closure. Community development initiatives are not to be exclusive for social development, but can encourage business development and the identification of business opportunities in the general mining environment.

Impact Classification

The impact of loss of employment will be direct and irreversible.

6.5.2 .6 Increased Business Activities

Cause and Comment

The development of the Rosinvest Mine Project will provide a lot of in Chirobi area. This will help sustain, and possibly increase the current levels of business within the area and compel government to improve infrastructure in the area.

Significance of Impact High to Moderate

Mitigation Measures

Dissemination of information about the mine and its operation through the corporate communications function (annual reports) will potentially inform local business sentiment. The same mode of communication will be used to alert the local business community to imminent decommissioning and to other mining developments.

Impact Classification

The impact of increased business activities will be cumulative and irreversible.

6.5.2 .7 Increased local risk of HIV/AIDS infection

Cause and Comment

The project is likely to attract a large number of job seekers from outside the community. This population influx has the potential to increase the chances of the spread of HIV/AIDS infections in the area. HIV/AIDS is not just a public health problem; it is a major development crisis and will have implications on the operations of Rosinvest Mine Project. .

Significance of Impact Moderate

Mitigation Measures

ROSINVEST will implement an HIV/AIDS policy based on education and prevention, which will be communicated to all employees. In practice, community, church and education groups will be encouraged to support this initiative

Impact Classification

The impact of increased local risk of HIV/AIDS infection will be cumulative and irreversible.

6.5.2 .8 Employees Health and Safety

Cause and Comment

ROSINVEST considers the safety and health of employees and contractors as paramount and a fundamental requirement for continued operation and growth.

Pre-employment and periodic medical examinations will be conducted on all mine employees. As a minimum, the baseline medical examination would include the following:

- A short medical history of the employee and his family history;
- Full occupational history of the employee;
- Signature of the employee to state that the above information is accurate and correct;
- Examination of:

  - ✓ Weight
  - ✓ Height
  - ✓ Blood pressure
  - ✓ Pulse
  - ✓ Urine test
  - ✓ Eye Test (Snelling Chart)
  - ✓ Chest X-ray (large 35 cm x 43 cm)
  - ✓ Audiometry test - physical and visual inspection of both ears
  - ✓ Lung function
  - ✓ Cardio-respiratory examination (general physical examination)

A Doctor and trained staff will perform the employee medical examinations.

ROSINVEST will provide well-equipped sanitary facilities for its employees. Workers will be encouraged to wash or shower frequently, particularly those employees exposed to dust, chemicals or pathogens.

Workers in areas of high temperature and/or humidity will be allowed to take frequent breaks away from these areas.

The Company's Chief Medical Officer will keep a record of employee medical examinations, specific surveillance records and medical history.

Significance of Impact High to Low

Mitigation Measures

Personal Protective Equipment (PPE) refers to protective clothing, helmets, goggles, or other garments designed to protect the wearer's body or clothing from injury by blunt impacts, electrical hazards, heat, chemicals, and infection, for job- related occupational safety and health purposes. The following mandatory PPE would be required in all external areas within the Project area:

- Safety Helmet;
- Steel-Cap Boots;
- Safety Glasses; and
- High-Visibility Clothing.

6.5.2 .8.1 Dust and Gas

ROSINVEST would implement particulate and gas/vapour exposure controls which would apply to dust, fibres, mist, fume (including diesel particulates), gas, and vapour exposure in the workplace. The controls would cover, amongst other things, evaluation of particulate and gas/vapour hazards, and development of a control program to ensure that employees and contractors do not suffer adverse health effects in the work environment from particulates or gas/vapours, either used or generated by the mine.

6.5.2 .8.2 Noise

The following controls would be implemented throughout construction and operation to ensure employees and contractors would not suffer adverse health effects from noise generated in the workplace:

- all noise sources in their area would be identified and assessed at least quarterly;
- noise sources in their area would be reassessed after any significant change;
- areas where hearing protection is required would be mapped and appropriately signposted;
- where hearing protection is required a range of hearing protection devices that are approved for site would be available;
- training would be provided in fitting, maintenance and the limitations of hearing protectors;
- there would be documented procedures for inspection, assessment, and maintenance of noise reduction devices and noisy equipment to ensure noise levels are minimised;
- employees would be given information, instruction and training regarding noisy environments, including the hazards, potential health effects and control mechanisms;
- a formal review of the practicality of engineering controls would be conducted annually in areas where a hearing conservation programme is required;
- each area where hearing protection is routinely worn (i.e. employees are exposed to noise levels greater than 82dB(A) would have a plan of action for the control of noise; and
- All employees would attend audiometric testing as required.

With the implementation of these control measures, the residual health risks associated with noise and vibration are expected to remain *moderate*.

6.5.2 .8.3 Raw Water

Water pumped from the open pits will be used as raw water for the operations at the mine.

Boreholes will be sunk to supply drinking water.

The risk of unsafe drinking water is considered to remain *low*.

6.5.2 .8.4 Waste

All first-aid facilities would be equipped with gloves and other protective equipment in accordance with standard medical practice. Clinical waste would be segregated and incinerated.

Personnel are also at risk of bacterial or infectious disease when cleaning change houses and toilets. Safe operating procedures would be developed for this work, including the use of appropriate PPE and hygiene practices (e.g. washing hands before consuming food).

With the proposed control measures in place, the risks associated with other biological hazards are considered to be *moderate.*

6.5.2 .8.5 Hazardous Substances

Fuels (predominantly diesel), detergents, lubricants and oils, solvents, chemical for the leaching and other processing chemical, degreasers, paints, resins and domestic cleaning agents would form the majority of chemicals used at the mine site. The following controls would be implemented:

- All chemical will be accompanied with Material Safety Data Sheet (MSDS);
- A register of all approved chemicals would be maintained;
- All chemicals would be labelled and stored according to the requirements of the respective MSDS and relevant Zambian Regulations. Copies of MSDS's would be kept near storage areas;
- PPE (e.g. gloves, face shields or respiratory-protection devices) and first-aid equipment (e.g. emergency showers and eye-wash stations), as identified in the MSDS and/or risk assessment would be maintained and available for use; and

- Training would be provided to employees and contractors through the site induction and specific chemical awareness programs for relevant workers.

With the implementation of proposed controls, the residual health risk presented by hazardous substances is expected to be *moderate.*

6.5.2 .8.6 Manual Tasks

Manual tasks requiring force, repetition or awkward postures can lead to musculoskeletal injuries. As much as possible these types of tasks would be eliminated through good design.

Where required, lifting devices would be provided to reduce manual handling.

Manual Handling System will be implemented by the Project and will provide the following controls:

- good design, layout and practice, to minimise adverse health consequences due to manual handling and vibration factors;
- completion of an assessment of manual handling and vibration risks associated with a task or activity; and
- An assessment of ergonomic, manual handling and vibration risks for new plant or equipment or modifications to existing plant or equipment.

With these controls in place, the risk of injury caused by manual handling injuries is *low to moderate.*

6.5.2 .8.7 Poor Lighting

Poor lighting levels or the lack of emergency lighting in times of power failure or emergency situations has the potential to cause hazard. The following would be provided for both construction and operation phases to provide a safe and comfortable visual environment:

- task lighting;
- access lighting, and
- Emergency lighting.

The Project would implement Lighting System which requires lighting surveys to be carried out in all areas with permanent lighting on a regular basis or following a major change.

With the implementation of proposed controls, the residual risk presented by poor lighting is expected to be *low*.

6.5.2 .8.8 Injury from Vehicles

Vehicles on the proposed mine would include haul trucks, front-end loaders and light vehicles. Collisions between these vehicles have the potential to cause serious injury to mine personnel and members of the community. The following will be implementing to avert the impact:

- Roads would be designed to comply with requirements of the Road Safety Standards in Zambian and roads graded to an adequate safe level for the vehicles;
- Construction workers and mine personnel operating vehicles on-site would be trained and licensed, so that vehicles are driven in a safe and responsible manner;
- Safe work procedures regarding driver safety (including speed limits) and dust control would be implemented;
- Speed limits around the site would be indicated by appropriate signage, and watering of roads and access areas would be undertaken to suppress dust and improve visibility for the driver;
- Adequate lighting would be installed on-site to ensure night driving and operating conditions are safe; and
- Vehicle inspection checks would be undertaken as part of the routine maintenance programme to control the risk.

The potential for injury from vehicles on the Project site during construction and operations is

considered *moderate*.

6.5.2 .8.9 Injury from Machinery

Personnel may be at risk of interacting with moving machinery and vehicles resulting in potentially serious injury. Hazards in this category may occur during the construction of infrastructure, movement of heavy equipment, maintenance programs or repair work.

ROSINVEST's safe work procedure regarding the control of energized equipment and machinery would be implemented incorporating isolation safety systems to reduce the likelihood of exposure to sudden releases of all forms of energy to low levels. Appropriate speed limits and traffic rules would be identified for the Project area. Barricades and visual demarcation would be used to reduce the risk of pedestrian and vehicle interactions, as well as physical interaction with other machinery.

The proposed controls would reduce the likelihood of occurrence personnel interacting with moving machinery and therefore the risk to *low* levels.

6.5.2 .8.10 Fall from Height

There would be times where workers are required to work at height during the construction phase (e.g. mine site building and the operation phase (e.g. maintenance of facilities). ROSINVEST would plan activities so that work is performed at ground level where practical to eliminate the requirement to work at heights. However, where working at heights [6] is unavoidable, ROSINVEST would implement the following controls:

- The hierarchy of controls are identified as follows:
  1. Wherever possible work shall be performed from ground level.
  2. In the event of raised plant and equipment, work shall be performed wherever possible from permanently-positioned safe access to the task and work area.
  3. Where this is not possible access via a temporary platform or elevated work platform

can be used.

4. An alternative option is to use a person-fall restraint system that does not allow the user to fall.
5. Only in the event that none of the above options are possible, the work can be performed by using a fall-arrest system after obtaining a working-at-heights permit.

- Personnel working at heights must be trained and deemed competent.
- Tasks undertaken from elevated work platforms will be accompanied with fall protection equipment to be worn at all times and connected to an approved anchor point.

With these controls in place, the risk of injury caused by a fall from height is *low to moderate*.

6.5.2 .8.11 Failure of Lifting Equipment

Items falling from height can also present a safety risk. PPE that protects against objects falling from height include steel-capped boots and hard hats; will be worn in designated areas.

Failure of lifting equipment can result in serious injury. ROSINVEST will institute the following controls:

- only competent operators can set up, inspect or operate lifting equipment;
- all lifting equipment would be inspected, maintained and stored to ensure the equipment is able to function to its design specifications;
- lifting equipment must be used within their Safe Working Load for the conditions of use; and
- A register of lifting equipment shall be maintained to record periodic inspections.

With these controls in place, the risk of injury caused by failure of lifting equipment is *low to moderate.*

6.5.2 .8.12 Shock from Electrical Installations

ROSINVEST will ensure that workers at electrical installation are protected by implementing the following controls:

- electrical equipment and installations shall be designed, installed and maintained to ensure that:

    1. persons are not able to contact exposed conductors energised at lethal voltages;
    2. under fault conditions persons are not exposed to lethal voltages, currents or arc flash;
    3. under fault conditions equipment does not pose a fire risk;
    4. control systems, including protection systems, emergency stopping systems and safety alarms operate safely under all operating conditions, including power supply instability or failure;
    5. there is an effective means for positive isolation of equipment or an installation; and
    6. Prior to accessing any electrical equipment, the hazards should be well understood and appropriate isolations, permits and PPE identified and implemented.

- electrical workers are competent for the tasks they perform;
- electrical equipment is regularly tested and maintained;
- earthling systems are installed and maintained, and
- Electrical plans are developed and maintained for services on-site.

With these controls in place, the risk of injury caused by electrical energy is *low to moderate.*

6.5.2 .8.13 Risk of Injury in Confined Spaces

A confined space is an enclosed or partially enclosed space which is at atmospheric pressure

during occupancy and is not intended or designed primarily as a place of work, and:

1. is liable at any time to:

   - ✓ have an atmosphere which contains potentially harmful levels of contaminant;
   - ✓ have an oxygen deficiency or excess; or
   - ✓ cause engulfment; and

2. Could have restricted means of entry and exit.

For such working environments, ROSINVEST will implement the following controls and processes required to be in place prior to entry into a confined space, including:

- assess and identify all confined spaces, including gas atmosphere testing;
- ensure only trained and authorised persons are permitted to enter confined spaces through use of a permit system;
- ensure correct PPE is available for personnel working in confined spaces, and
- Rapid recovery procedures.

With these controls in place, the risk of injury in confined spaces is *low to moderate*.

6.5.2 .8.14 Slips and Falls

Slips and falls is mainly associated with poor housekeeping, such as excessive waste debris, loose construction materials, liquid spills, and uncontrolled use of electrical cords and ropes on the ground, are also among the most frequent cause of lost time accidents at construction and decommissioning sites. ROSINVEST will implement the following countermeasures:

- Uphold good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths.
- lifting equipment must be used within their Safe Working Load for the conditions of use;

and

- A register of lifting equipment shall be maintained to record periodic inspections.

With these controls in place, the risk of injury caused by failure of lifting equipment is *low to moderate.*

6.5.2 .8.15 Shock from Electrical Installations

ROSINVEST will ensure that workers at electrical installation are protected by implementing the following controls:

- electrical equipment and installations shall be designed, installed and maintained to ensure that:

    1. persons are not able to contact exposed conductors energised at lethal voltages;
    2. under fault conditions persons are not exposed to lethal voltages, currents or arc flash;
    3. under fault conditions equipment does not pose a fire risk;
    4. control systems, including protection systems, emergency stopping systems and safety alarms operate safely under all operating conditions, including power supply instability or failure;
    5. there is an effective means for positive isolation of equipment or an installation; and
    6. Prior to accessing any electrical equipment, the hazards should be well understood and appropriate isolations, permits and PPE identified and implemented.

- electrical workers are competent for the tasks they perform;
- electrical equipment is regularly tested and maintained;
- earthling systems are installed and maintained, and
- Electrical plans are developed and maintained for services on-site.

With these controls in place, the risk of injury caused by electrical energy is *low to moderate*.

6.5.2 .8.16 Risk of Injury in Confined Spaces

A confined space is an enclosed or partially enclosed space which is at atmospheric pressure during occupancy and is not intended or designed primarily as a place of work, and:

3. is liable at any time to:

   - ✓ have an atmosphere which contains potentially harmful levels of contaminant;
   - ✓ have an oxygen deficiency or excess; or
   - ✓ cause engulfment; and

4. Could have restricted means of entry and exit.

For such working environments, ROSINVEST will implement the following controls and processes required to be in place prior to entry into a confined space, including:

- assess and identify all confined spaces, including gas atmosphere testing;
- ensure only trained and authorised persons are permitted to enter confined spaces through use of a permit system;
- ensure correct PPE is available for personnel working in confined spaces, and
- Rapid recovery procedures.

With these controls in place, the risk of injury in confined spaces is *low to moderate*.

6.6 IMPACT EVALUATION CRITERIA

The objective of this section is to predict and to assess these potential impacts and to recommend mitigating measures to be incorporated into the project design.
The assessment of the issues has been conducted according to a synthesis of criteria required by the integrated environmental management procedure defined below.

6.6.1 NATURE OF IMPACT

This is an appraisal of the type of effect the proposed activity would have on the affected environmental component. Its description should include what is being affected and in what way.

6.6.2 DIRECT IMPACT

An impact that appears immediately as a result of an activity of the project, for example, the loss of ecological habitat is a direct impact.

The direct impacts would be experienced mainly during the site preparation and clearing, and include effects on the physical environment, health and safety of the workers during the developmental phase.

6.6.3 INDIRECT IMPACT

An impact that is related to the project but it's of secondary nature. It only shows in an indirect way. For example, the project may cause indirect impacts on the local economy of a community by increasing accessibility to other markets or increased illegal settlements.
The indirect impacts are primarily socio-economic and extend beyond the project implementation. The indirect impacts include changes in economic activities and long-term changes, such as increased land degradation due to increased settlement and development at and around the project site.

Unlike the direct impacts, which occur in the immediate environment, the indirect impacts would be felt in the adjacent regions.

6.6.4 SPATIAL EXTENT

The physical and spatial size of the impact is a description of whether the impact would occur on a scale described as follows:-
Site, the impact could affect the whole or measurable portion of the site. Whether it is limited to the immediate area of the proposed project;

Local, the impact could affect the extended area adjacent to the site perhaps a neighbourhood or small town. Whether it would affect environs up to 15km outside the immediate environment;
Regional, that impact could affect the area including the outlying areas of the city, the transport routes and the adjoining towns and National. The impact could be as far as reaching international boundaries.

6.6.5 FREQUENCY

Frequency is the incidence, occurrence, regularity, rate or rate of recurrence of the source of impact. This is measured by the number of times of occurrence of the source of impact due to the proposed development.

Occurs once, where the source of impact will either occur once or disappear with mitigation or will be mitigated through natural process after occurring once due to the proposed development;
Occurs twice, where the source of impact will occur twice at any given phase of project implementation and thereafter it will be entirely negated; and Occurs more than twice, where the source of impact will continue or occur more than two times for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter.

6.6.6 DURATION

The lifetime of the impact; this is measured in the context of the life-time of the proposed development.

Short term, the impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than the preparatory phase,

Medium term, the impact will last for the period of the preparatory phase, thereafter it will be entirely negated,

Long term: the impact will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter,

Permanent: the only class of impact which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.

6.6.7 INTENSITY

A description of whether or not the intensity (magnitude) of the impact would be high, medium, low or negligible (no impact). An attempt will be made to quantify the impacts on components of the affected environment to be described as follows: Is the impact destructive, or benign? Does it destroy the impacted environment, alter its functioning, or slightly alter it? These are rated as follows:-

Low, where the impact will not have significant influence on the environment, and this will not be required to be significantly accommodated in the project design or implementation; the impact alters the affected environment in such a way that natural processes of functions are not affected in any significant way,

Moderate, where it could have an adverse influence on the environment, which would require modification of the project design or alternative implementation schedules; the affected environment is altered, however, function and process continue, albeit in a modified way,

High, where it could have significant influence on the environment but cannot be mitigated or be accommodated by the project environment by introducing alternative mitigation measures, such as realignment at a particular stretch or adoption of different design measures. Function or process of the environment is disturbed to the extent where it temporarily or permanently ceases. This will be a relative evaluation within the context of all the activities and the other impacts within the framework of the project. Note that some impacts have a high intensity and a short duration with no permanent audio effects.

6.6.8 SEVERITY

This describes whether the severity (harshness / gravity) of the impact would be high, medium, low or negligible (no impact). The severity of the impact will be qualitatively determined on the components of the environment to be affected by taking into consideration the following questions. Is the impact harsh, serious or dangerous? Does it degrade the impacted environment, alter its functioning, or slightly modify its natural state? These are rated as follows:-

Low applies where the impact is very little and will not have significant influence on the environment. This will not be required to be significantly accommodated in the project design or implementation and the impact changes the affected environment in such a way that natural processes of functions are not affected in any significant way;

Moderate, applies where the impact could have an adverse influence on the environment and would require some modification of the project design or alternative implementation schedules. In this regard, the affected environment is altered while the function and process continue, albeit in a modified way; and

High, applies where the impact could have significant influence on the environment but cannot be mitigated or be accommodated by the project environment by introducing alternative

mitigation measures such as realignment at a particular stretch or adoption of different design measures. In this regard, the function or process of the environment is disturbed to the extent where it temporarily or permanently ceases.

6.6.9 PROBABILITY

This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:-

Unlikely, the probability of the impact occurring is very low, due to the circumstances, design or experience,
Possible, the impact could possibly happen, and mitigation planning should be undertaken,
Probable, it is most likely that the impact will occur at some or other stage of the development. Plans must be drawn up before the undertaking of the activity,

Definite, the impact will take place regardless of any prevention plans, and only migratory actions or contingency plans can be relied on to contain the effect.

6.6.10 SENSITIVITY

The sensitivity of the element being impacted would be regarded as being high, medium, low or negligible (no impact). An effort will be made to determine the qualitative sensitivity of the element of the environmental components being impacted upon due to the proposed development. Is the reaction of the environmental component due to the impact acceptable or not? Does it destroy the impacted environmental component, alter its functioning, or slightly alter it?
Low, where the sensitivity of the element being impacted will not have significant influence on the environmental component, and this will not be required to be significantly accommodated in the project design or implementation. The impact to the affected environment will be in such a way that natural processes of functions are not affected in any significant way;

Moderate, where the sensitivity of the element being impacted could have an adverse influence on the environmental component, which would require modification of the project design or alternative implementation schedules. The affected environment is altered while the function and process continue and the albeit in a modified way; and

High, where the sensitivity of the element being impacted could have significant influence on the environmental component but cannot be mitigated or be accommodated by the project environment by introducing alternative mitigation measures, such as realignment at a particular stretch or adoption of different design measures. The function or process of the environment is disturbed to the extent where it temporarily or permanently ceases.

6.6.11 DETERMINATION OF SIGNIFICANCE

The community provides information on the characteristics of the impacts and the significance is determined based on this information.

Significance is an indication of the importance of the impact in terms of physical extent, intensity and time scale, and therefore indicates the level of mitigation required.
The classes are rated as follows:-

Negligible, the impact is not substantial and does not require any mitigatory action,
Low, the impact is of little importance, but may require limited mitigation,

Moderate, the impact is of importance and therefore considered to have mitigation. Mitigation is required to reduce the negative impacts to acceptable levels or positive impacts maximised, High, the impact is of great importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential. Positive impacts should be enhanced as a priority. From the baseline information assembled in the previous chapter coupled with the information gained during the consultation stage, the expected environmental impacts can be categorised into positive and negative impacts.

In addition, it is important to consider the duration of the impact and at what phase of the project it occurs, i.e. impacts during site preparation phase or impacts over the life of the (operational phase) and whether the impacts are direct (i.e. removal of vegetation) or indirect (increased sexual diseases as a result of the improved wages).

Table 19 Evaluation of Impacts

Phase	Description of Impact	Type of Impact	Spatial Extent	Frequency	Duration	Intensity	Severity	Probability	Sensitivity	Determination of Significance
Improved Aesthetics of the Area										
Site Preparation and Operational	Enhanced aesthetics of the project area by improving the landscaping and general cleanness of the mine.	Indirect/ Direct	Site	More than twice	Long term	Moderate	Moderate	Probable	Moderate	High
Boosting Supplying Sector										
Site Preparation and Operation	positive boost to the local and national economy through its multiplier effect	Indirect/ Direct	Site	More than twice	Long term	Moderate	Moderate	Probable	Moderate	High
Employment and Enhance Services										
Site Preparation and Operational	Employ about 82 people during all the phases of theof the project.	Indirect/ Direct	Site	More than twice	Long term	Moderate	Moderate	Probable	Moderate	High
Improved local Economy										
Site Preparation and Operational	Impacts on the local economy due to alternative income generating activities, increased employment levels, influx of people to the area, land use changes, increased purchasing power.	Indirect/ Direct	Site	More than twice	Long term	Moderate	Moderate	Probable	Moderate	High

Increased Social Interaction										
Operational	The project will offer variety of social amenities	Direct	Site	More than twice	Medium term	Moderate	Moderate	Probable	Moderate	High
Impacts on Localised Soil										
Site Preparation and Operation	Loss of organic matter and nutrients by removal of top soil and overburden. May result in soil erosion	Direct	Local	Once	Medium term	Low	Moderate	Unlikely	Moderate	Moderate
Impacts on Water Quality										
Site Operation	Siltation of water courses due to soil erosion from mining activities.	Indirect	Local	More than twice	Long term	Moderate	Moderate	Probable	Moderate	low
Impacts on Air Quality										
Site Operation	Temporary air pollution due to dust generated by excavation, vehicle traffic and transportation of materials and fumes from vehicles and equipment	Direct	Local	More than twice	Short term	Moderate	Moderate	Possible	Moderate	Moderate
Impacts on Noise										
Site Operation	Noise generated by mining activities, especially vehicles, earthmoving equipment, excavation	Direct	Site	More than twice	Short term	Low	Low	Probable	Moderate	Moderate

	of construction materials and Blasting									
Impacts of Traffic										
Site Operation	Mining activities could impact on undisturbed areas in the proposed mining area.	Indirect	Local	Once	Medium term	Moderate	Moderate	Probable	Moderate	Low
	Increased noise levels.	Indirect	Site	More than twice	Long term	Moderate	Low	Possible	Low	Low
Impacts of Occupation Health and Safety										
Site Preparation and Operation	Lack of safety and health regulations could impact negatively on the mining workers.	Direct	Site	Once	Short term	Moderate	Moderate	Possible	Low	Moderate
Operation	Workers could be in danger of accidents from machinery such as excavators etc.	Direct	Site	More than twice	Medium	High	Moderate	Possible	Moderate	Moderate

7.0 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

This Section presents the environmental management and monitoring plan. The plan shall be audited annually to assess compliance and non-compliances shall be highlighted to management for taking actions.

To successfully implement commitments presented in this report and specifically in this Section, the Environmental Management Reporting structure below is hereby proposed. The Safety, Health, Environmental and Social Manager (SHES) shall be appointed and this person shall be responsible for coordinating all environmental and social activities. The Mine Manager is in Charge of the Mine and Manager SHES shall report to him. A variety of alternatives, such as the following, exist for the design and management of the project:

Table 20:- Environmental Management and Monitoring Plan (EMMP) and Cost Estimates

No.	Impacts or Aspects	Management and Monitoring Objectives	Management Activities or Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsible personnel	Annual Monitoring Cost (ZMK)
1.0 Positive Impacts of the Project							
	Job creation	To ensure that first priority is given to the local people especially for non-specialized jobs	All recruitments shall be advertised in the local community and a database shall be developed for available local people with special skills	Number of locals employed against the number of foreign employees	Bi-annual	General Manager/Mine Manager (to be done by an independent person)	10,000
1.2	Creation of business opportunities to locals	To facilitate local participation in business opportunities created by Rosinvest (Z) Limited	Local business especially relating to daily consumables required at the mine shall be promoted. Examples include garden and poultry produce. First priority shall be given to local suppliers	Number of local businesses supported by the mine	Bi-annual	Mine Manager/SHES Manager (to be done by an independent person)	20,000
1.3	Increase to the government revenue base through tax	To align the mine development in accordance with government policy on large scale development of mines	Top mine management shall remain committed to the Large Scale Miners Association of Zambia and shall continue providing the necessary support	Active participation in the Association of Large Scale Miners	Bi-annual	General Manager/Mine Manager	N/A
1.4	Increase to the government revenue base through tax	To ensure that all the revenue due to government and the Local Authority is remitted	The company operations shall remain open to external auditors and professional accounting systems shall continue being applied to ensure that all the forms of tax due to government and the Local Authority is remitted.	Total tax paid to government per annum	Annual	General Manager/Director (to be done by an independent person)	10,000
1.5	Profit to the company for reinvestment	To operate the mine in a profitable manner so much that the company can re-invest and expand in Zambia	The holding company shall continue identifying opportunities for reinvestment especially in the mining industry to ensure that the profit realized is shared with other Zambians.	Number of investments undertaken or planned to be Undertaken within Zambia as part of reinvestment	Annual	General Manager/Director (to be done by an independent person)	15,000
1.6	Increased corporate	To formalize the	All contribution to the community	Number of corporate social	Bi-annual	General	20,000

	social responsibility especially in beekeeping activities, malaria control, conservation farming, health and education.	corporate social responsibility and implement activities in a systematic manner and avoid duplicity of effort by other institutions.	shall be documented and publicized The Kalomo District Development Coordinating Committee (DDCC) shall always be consulted for any community development activity of significance	responsibility activities undertaken per year		Manager/SHES Manager (to be done by an independent person)	
2.0 Social Challenges for Employees							
2.1	Weakness in the family structure as a result of spending Five (5) days every week away from the family	To ensure that workers have reasonable time with their families	The work schedule shall be formulated maintained and workers shall be reminded to go home when on break	Number of weekends taken off and leave days taken per employee	Quarterly	General Manager/Mine Manager/Human Resources Manager	5,500
2.2	Risk of marriage break-up and marital problems	To strengthen family ties and avoid creating room for marital problems	Professional counseling services shall be offered	Number of complaints recorded from family members and spouses	Quarterly	General Manager/Mine Manager/Human Resources Manager	5,500
3.0 Conflicts with the Community							
3.1	Land use and mining rights conflicts	To amicably solve mining rights and surface rights issues that may arise without disadvantaging anyone	A grievance mechanism shall be developed within Six (6) months following approval of this report and this shall guide management of all related grievances.	Number of grievances and/or litigations recorded regarding land use and mining rights	Monthly	Mine Manager/SHES Manager (to be done by an independent consultant)	60,000
3.2	Recruitment related Conflicts	To give first priority to the local people and ensure zero tolerance to labor exploitation.	Same as above	Number of grievances recorded Regarding recruitment of local people	Monthly	Mine Manager/SHES Manager	Covered in the cost above
3.3	Encroachment and Trespass	To protect flora and fauna resources in the mining surface area by preventing trespass and encroachment	Same as above	Number of cases of trespass and Encroachment recorded by security personnel	Monthly	Assistant Mine Manager/Security Manager	Covered in the cost above
3.4	Negative perception by the community towards the project	To create a good and transparent relationship with the	Same as above	Number of negative comments about the project officially submitted	Monthly	Mine Manager/SHES Manager	Covered in the cost above

		community and prevent a hostile perception towards the mine by the local people.					
	Discrimination	To give an equal opportunity to all the employees including those living with HIV/AIDS	Same as above	Number of complaints submitted to management regarding discrimination	Annual	General Manager/Human Resources Manager	10,000
4.0 HIV/AIDS Related Challenges							
4.1	Stigmatization	To treat employees living with HIV/AIDS equally especially with other employees	Equal opportunities shall be given, discrimination shall not be tolerated and professional counselors shall be engaged to offer counseling and voluntary testing services	Number of employees submitted complaints to the Human resources department regarding stigmatization	Annual	General Manager/Human Resources Manager	15,000
4.2	Discrimination	To give an equal opportunity to all the employees including those living with HIV/AIDS	Same as above	Number of complaints submitted to management regarding discrimination	Annual	General Manager/Human Resources Manager	15,000
5.0 Change of Landscape and Land Degradation							
5.1	Loss of the natural aesthetic value due to opening up of the area and mining waste disposal	To try and restore the natural built of the area by implementing progressive rehabilitation activities.	Progressive rehabilitation shall be introduced and once production starts, backfilling of the pit with waste rock shall also commence	Volume of waste material used for backfilling purposes. The number of progressive rehabilitation activities conducted per year. Number and type of trees and grass planted as part of rehabilitation activities. The progressive rehabilitation budget spent per year shall also be considered.	Annual	Mine Manager/SHES Manager	2,500
5.2	Loss of land use potential due to mining waste disposal and the open pit development	To minimize land clearing and to ensure that all forms of waste are disposed of in accordance with the	Same as above	Total area cleared compared with the mine licence area. Volume of overburden disposed off. Volume of raw material transported to the washing plant and the volume	Annual	SHES Manager	2,500

		Zambian legal Provisions		of the pit.			
5.3	Hazardous and nonhazardous waste generation and disposal	To attain maximum adherence to the hazardous and non-hazardous waste management Regulations	All the hazardous waste and non-hazardous waste shall be managed in accordance with respective Regulations.	Quantities and types of hazardous waste generated and disposed off. Area of land contaminated by hazardous waste	Monthly	SHES Manager	5,000
6.0 Occupational Health and Safety							
6.1	Exposure to dust causing silicosis	To minimize dust emissions and protect all employees exposed to dust	Periodic monitoring of ambient, safety induction, medical check-ups, dust suppression and provision of protective clothes	Medical reports, ambient dust levels and number of dust protective clothes issued to employees	Annual	Mine Manager/SHES Manager Consultants (TEME)	90,000
6.2	Explosion risk from explosives and fly-of rocks from blasting	To avoid possible accidents due to poor handling of explosives	Only blasting licence holders shall handle explosive, the blasting schedule shall remain at 16:00 hrs and access to the pit shall be highly restricted	Number of accidents and near misses recorded	Monthly	Mine Manager/SHES Manager	N/A
6.3	Bodily injury due to misuse of machines and accidents	To minimize accidents and near misses arising from usage of machinery	Periodic safety talks shall be conducted, safety statistics shall be published, safety inductions shall be compulsory and safety observes shall be appointed.	Number of accidents and near misses recorded	Monthly	Mine Manager/SHES Manager	N/A
6.4	Road traffic Accidents	To minimize possible road traffic accidents by adhering to traffic control standards and procedures	Traffic signs and humps shall be installed not only for the access road to the mine but including other public roads used to access the mine site. All drivers shall be reminded of the dangers associated with careless driving and road traffic offences shall not be acceptable	Number of accidents and near misses recorded	Monthly	Mine Manager/SHES Manager	N/A
6.5	Open pit or dump wall collapsing	To conduct mining and overburden disposal in a standard and professional manner	The pit shall be developed in accordance with the pit design and a qualified Mining Engineer shall always be responsible for mining. Supervised end-tipping shall be strictly followed and the dump shall be managed and developed	Number of tension cracks around the pit and Overburden Dump, accidents and near misses and number of rock/earth fall recorded	Monthly	Mine Manager/SHES Manager	N/A

			according to the proposed design and conditions that shall be prescribed by the Mine Safety Department (MSD)				
7.0 Air Pollution and Air Quality Monitoring							
7.1	Dust emission from the pit, waste dumps and access roads	To minimize ambient dust pollution by monitoring and dust suppression activities	Water shall be used for dust suppression, protective clothes shall be provided, medical check-ups shall be done annually and ambient dust monitoring shall be conducted	Ambient air quality results	Monthly	SHES Manager Consultants (TEME)	130,000
7.2	Exhaust fumes from generators and heavy mobile machines	To minimize air pollution as a result of exhaust fumes by periodic servicing of machinery	The machinery shall be serviced according to the manufacture's specifications and schedule.	Conformance with the servicing schedule	Monthly	SHES Manager	N/A
7.3	Workplace air Quality	To protect employees working in confined areas from air pollutants	Air quality monitoring at various benches within the open pit at the overburden dump shall be conducted monthly to ensure that siliceous dust is below the statutory allowable concentration of 350 parts per cubic centimeter. Dust masks shall also e provided to all employees and it shall be mandatory to use them when working in the pit or at the overburden dump.	Monthly siliceous dust concentration results	Monthly	SHES Manager/Mine Manager Consultants (TEME)	15,000
8.0 Water and Soil Pollution							
8.1	Hazardous waste generation and disposal	To prevent soil and water pollution by proper generation, storage and disposal of hazardous waste	All forms of hazardous waste shall be recorded. Generation and storage shall be in designated facilities and transportation and disposal shall be done by registered companies. Spillage containment facilities shall always be available at points where hydrocarbon wastes shall be generated. All employees shall undergo environmental induction	Quantities and types of hazardous waste generated and disposed of. Presence of generation and storage facilities. Evidence of necessary Licenses	Monthly	SHES Manager	N/A
8.2	Domestic waste Disposal	To prevent water and soil pollution by safe	Waste bins shall be provided for the kitchen and offices and these shall	Quantities of domestic waste generated and disposed off.	Monthly	SHES Manager	N/A

		disposal of domestic waste	always be provided with bin-liners. Littering shall not be acceptable and reminder signs shall be installed to inform workers and visitors that all domestic waste must be thrown in designated waste bins. The waste shall be disposed through a landfill which shall be licensed with ZEMA. Records of the waste disposed off per week shall be maintained.	Adherence to good practices at the landfill (fenced, warning signed, waste back buried with top soil, and facility under lock-and key).			
8.3	Sewage disposal	To ensure that sewage from the camp is disposed off in a nonpolluting manner	Septic tanks shall be constructed with a soak-away system which shall be used for domestic waste water such as water from the laundry as this may affect biological activities if disposed off through the modular sewage management system	Presence of the modular sewage treatment facility and the level of biological parameters in the effluent	Monthly	SHES Manager	N/A
8.4	Effluent generation and disposal	To attain maximum adherence to the effluent standards as enshrined to the Water Pollution Regulations	Perimeter silt traps shall be constructed. All the open pit water shall be pumped into a settling pond before discharge. The discharged effluent shall be frequently monitored.	Weekly field results for pH, Conductivity, Dissolved Oxygen and Total Dissolved Solids. Quarterly results for physical, chemical, total hydrocarbons and biological parameters as analyzed by a reputable laboratory	Weekly for field parameters and quarterly for lab analysis	SHES Manager Consultants (TEME)	50,000
9.0 Noise and Vibration							
9.1	Blasting activities	To minimize noise and vibration by using the right type of explosives	Noise monitoring shall be conducted frequently and controlled blasting shall be applied	Noise results	Monthly	SHES Manager Consultants (TEME)	15,000
9.2	Haulage of material and operations of the generator	To reduce the noise emanating from haulage tracks by having the machines frequently serviced	Same as above	Noise results	Monthly	SHES Manager	N/A
9.4	Workplace noise Monitoring	To protect human Health	Noise monitoring shall be done monthly and where noise levels exceed the international threshold	Noise results	Monthly	SHES Manager/Mine Manager	N/A

			limit value of 85 dBA, use of ear muffles shall be mandatory and warning signs shall be provided				
10.0Loss of Flora and Fauna							
10.1	Loss of flora due to project related site clearing activities	To ensure that site clearing for project related activities is limited to the area required for such developments only	Bio-monitoring shall be conducted annually to determine loss of vegetation. All site clearing activities shall be approved by the Safety, Health and Environmental Manager.	Area cleared within the mine licence and density/diversity of trees preserved	Annual	SHES Manager Consultants (TEME)	8,000
10.2	Deforestation due to charcoal burning and encroachment	To protect forest resources in the mining licensed area by preventing trespass and encroachment	No charcoal burning shall be allowed. Security patrols shall be implemented around the mine area to control deforestation. Awareness campaigns shall be conducted by the Safety, Health and Environmental Manager.	Density of forest cover, number of charcoal kilns, cases of encroachment	Annual	SHES Manager	N/A
10.3	Pit and OB dump extension	To reduce the extent of land cleared for the pit extension	Vegetation clearing for the pit and dumpsite shall be limited to designated areas. The overburden dump shall be vegetated as a way of replacing vegetation loss	Area covered by the pit and overburden dump	Monthly	SHES Manager	N/A
10.4	Poaching and purchase of illegal game meat by employees	To avoid promoting poaching and indiscriminate killing of wild fauna.	Being in possession of illegal game meat or killing of any wild animal shall be a dismissal offence. Buying of illegal game meat will not be acceptable. Awareness regarding this issue shall be conducted for all employees	Number of offences recorded	Monthly	SHES Manager	N/A
10.5	Weather	To collect climatic information for reporting purposes and use in day-today operations	N/A	Rainfall information, temperature information, number of rainy days in the year, humidity, wind speed and direction.	Daily	SHE Manager Consultants (TEME)	5,000
Total Cost							**509,000**

7.1 INSTITUTIONAL FRAMEWORK FOR MONITORING, REPORTING AND SUPERVISION

In order to ensure that the identified environmental issues are addressed throughout the life cycle of the project there will be need for all key stakeholders to collaborate. The main objective of this collaborating network is to ensure that mitigation measures outlined in contracts are being properly implemented by the Project owner. The main responsibilities of the collaborating network will be to:-

- Complement the efforts for continuous monitoring and assessment of the implementation of the environmental management plan.
- Liaise with respective local authorities on environmental issues which may arise during the operation of the project.

7.1.1 MONITORING ARRANGEMENTS

To avoid deliberate creation of gaps between what actually gets implemented on the ground, the contracts must spell out the sanctions for non-compliance with mitigation measures.

The developer is to compile an activity Environmental report from the field visits that will form the basis for assessment of environmental performance.

7.1.2 OPERATIONAL PHASE

The local authority should be responsible for monitoring and management of all indirect impacts occurring in the project area.

The following table illustrates the different stakeholders and their monitoring responsibilities and reporting.

Table 21: Monitoring and Reporting Responsibilities

ZEMA	▪ Overall environmental performance of the Project	▪ Discussions with Project Manager
Rosinvest Zambia Limited	▪ Monitoring the implementation of EMP ▪ Overall environmental performance the Project	▪ Regular environmental progress reports to stakeholders
Contractor / Project/ Site Manager	▪ Mining Methods and Materials ▪ Implementation of mitigating measures for air, water, odour, etc. ▪ Environmental management of worksites ▪ Develop Waste management Plan ▪ Rehabilitation of abandoned worksites ▪ Performance of equipment ▪ Accidents (rock falls, pollution spills, etc.) ▪ Negative social and environmental impacts	▪ Regular environmental progress reports to ZEMA ▪ Incident reports as and when required (Pollution, accidents, etc.) by ZEMA, local authority
	▪ Environmental performance of equipment ▪ Implementation of mitigating measures ▪ Occupational health and safety plan ▪ Traffic and worksite accidents report ▪ Air quality	▪ Maintenance records ▪ Accidents reports ▪ Mitigating actions
Local Authorities	▪ Negative social and environmental impacts	▪ Complaints to Project Manager

8.0 CLOSURE AND DECOMMISSIONING

Closure and decommissioning of the Project would be accomplished in accordance with Zambia's Mining and Environmental Guidelines and the Company's Policy and Standards. Reclamation activities would be designed to achieve, at a minimum, post-mining land use consistent with a level of productivity and biodiversity present at pre-mining levels. Post-mining land use would be determined in consultation with the ZEMA, other Zambian governmental institutions and stakeholders and local communities and is likely to include areas for agriculture, livestock grazing and wildlife habitat.

A detailed Closure and Decommissioning Plan is required to be submitted to the ZEMA. The Closure and Decommissioning Plan would describe reclamation objectives and specific reclamation/closure activities for the open pits, Waste Rock Disposal Facility, Tailings Storage Facility, Water Storage Facility, Crushing, Washing and Process Plant, Sediment Control Structures, storm water management structures and ancillary facilities. Final grading and contouring schemes would also be described for the Project area.

The Closure and Decommissioning Plan would be developed for anticipated operational conditions of facilities, tailings characteristics, site climatic conditions and available construction materials.

The Closure and Decommissioning Plan would also include descriptions of practices to be implemented for post-operational water management and for ensuring long-term stability of reclaimed areas.

The Company's broad reclamation objective for the Proposed Mining Area is to ensure that the site is left in a condition that is safe and stable, long-term environmental impacts are minimised and any future liability to the community and future land use restrictions are minimised.

Specific Reclamation Objectives to be included in the Closure and Decommissioning Plan include:

- ***Legal Compliance*** **-** Meet all statutory requirements.
- ***Landform Stability*** **-** Ensure that land is left in a stable condition that minimises long-term environmental impacts and does not compromise proposed post mining land uses.
- ***Eco-system Re-establishment*** **-** Reclaiming as much of the affected area as possible to a condition where its pre-mining usage can resume and ensuring the eco-system function is representative of this land-use. The primary pre-mining uses include cropland, livestock grazing and small residential development.
- ***Water Quality-*** Ensure that the quality of water that discharges from the reclaimed mine area meets standards for the immediate downstream use.
- ***Public Safety*** **-** Ensure that reclaimed land is physically safe for people to access and does not pose a human health risk.
- ***Infrastructure*** **–** Decontaminate, decommission, salvage or demolish all structures on the site according to the terms of the mining agreement. These include facilities, ancillary equipment and buildings.
- ***Biodiversity*** **–** Ensure that the biodiversity of the Proposed Mining Area is maintained at pre-disturbance levels or improves.

The Company has prepared a Provisional Land Rehabilitation Plan that addresses land stabilization and erosion controls during the life span of the mine. The Company proposes to optimize this provisional plan to address the land stabilization and erosion control issues associated with the broader Project

Notwithstanding the outcome of processes to arrive at a more detailed and sustainable Closure and Decommissioning Plan and Land Rehabilitation Plan, this section of the EIS provides a framework for the closure and decommissioning approach for the Project.

8.1 GENERAL APPROACH

Short-term reclamation goals would be to stabilize disturbed areas and protect disturbed and adjacent undisturbed areas from unnecessary or undue degradation by erosion or sediment

transport and deposition. Long-term reclamation goals would be to ensure public safety, stabilise the site and establish a productive vegetative community consistent with specific and targeted post-mine land uses and in line with the EMA reclamation success criteria. The Company's priority is to decommission and reclaim the Proposed Mining Area in a manner that is protective of human health and the environment, to the maximum extent practicable. General reclamation activities would include the following:

- Contour the surface of the Tailings Storage Facility,
- Place a portion of the waste rock in the open pit,
- Contour the surface of the Waste Rock Disposal Facility,
- Regrade roads,
- Complete grading to ensure adequate drainage control,
- Remove and regrade stockpile areas,
- Replace salvaged topsoil,
- Seed disturbed areas and
- Monitor reclamation success.

Reclamation activities would be progressively completed during the operational phase of the Project as specific areas or facilities would no longer be needed to support operation, and the activities would continue for approximately two years after mining ceases.

Upon completion of reclamation and decommissioning activities, the site would be subject to post-closure monitoring. Post-closure monitoring would continue after the reclamation phase of the Project until such time as all closure objectives and success criteria defined in the final approved closure plan have been met.

8.2 RECLAMATION ACTIVITIES

Several reclamation actions would take place prior to, during and following mine development activities within the Proposed Mining Area. These actions are described below.

8.2.1 TOPSOIL SALVAGE

As the mine, haul and access roads, stockpiles, Waste Rock Disposal and Tailings Storage Facilities are being constructed; the Company would recover available topsoil from these sites for future use in reclaiming disturbed areas. Topsoil profiles vary considerably across the Proposed Mining Area. Recovery depths would be determined through an analysis of soil data collected during baseline studies of the Study Area as verified by on-the-ground reclamation specialists during salvage operations. The overall intent is to obtain only the growth medium (topsoil and subsoil) necessary to achieve the objectives of the Closure and Decommissioning Plan. Topsoil would be salvaged and transported to stockpiles using scrapers, wheel and track dozers, haul trucks and loaders. Subsoil materials, where suitable for use as growth media in reclamation, would be salvaged and stockpiled separately from topsoil.

8.2.2 GRADING DISTURBED AREAS

Prior to replacing topsoil or suitable growth media, facility sites and other disturbed areas would be graded to attain a stable configuration establish effective drainage, minimise erosion and protect surface water resources. To the extent practicable, grading would blend topography of disturbed areas with the surrounding natural terrain.

Angular features, including tops and edges of the Waste Rock Disposal Facility, would be rounded.

8.2.3 REVEGETATION

Prior to initiating the proposed reclamation vegetation plan, the Company would evaluate topsoil replacement depths for various exposures to arrive at a design that accounts for soil replacement depths that may vary according to location and soil type. The variety of replacement depths would provide different vegetation mosaics on reclaimed areas. The regraded surface would be ripped where necessary prior to placement of topsoil. Ripping would reduce compaction,

maximise infiltration, provide a uniform seed bed and establish a bond between subsoil and topsoil. The Company's re-vegetation programme goals would be to stabilize reclaimed areas, ensure public safety and establish a productive vegetative cover based on applicable land use plans and designated post-mining land uses.

8.3 CLOSURE AND DECOMMISSIONING OF MINE COMPONENTS

Using methods described above, decommissioning and reclamation of the major components associated with the Project would occur as described below. Variations to these general descriptions, up to including salvaging much of the infrastructure associated with these facilities, would occur in the event the outcome of the process that engages stakeholders in developing a sustainable land rehabilitation plan for the Project indicates otherwise. The Closure and Decommissioning Plan envisioned represents a more traditional approach to site closure.

8.3.1 OPEN PIT

The open pit would cause a change in land form in the Proposed Mining Area which would be considerably different from current topography. As indicated previously, the Company would concurrently place waste rock in the smaller lobe of the open pit and complete reclamation during mine operation.

The surface of the waste rock placed in the open pit would be stabilized and sloped to promote positive drainage, covered with a growth medium and re-vegetated in accordance with the Closure and Decommissioning Plan. The slope of the reclaimed area trending into the open pit would be stabilized but would remain relatively steep. Access to the rim of the reclaimed area would be limited to ensure public safety is maintained until the pit lake forms.

8.3.2 WASTE ROCK DISPOSAL FACILITY

Following placement of waste rock in the open pit, the remaining waste rock in the Waste Rock Disposal Facility would be graded and recon toured to provide a minimum 3.0H: 1.0V reclaimed slope.

Grading would minimise potential for slope failures or rill erosion, facilitate reclamation activities (seeding, mulching), and provide a surface that would enhance water retention and support vegetation. The top of the Waste Rock Disposal Facility and remaining safety benches would be graded to promote runoff of water (free draining), prevent ponding or impounding of water and limit erosion.

Waste rock would be graded and ripped to relieve compaction from mining equipment. Upon completion of grading, the Company would redistribute topsoil or other suitable growth media over the waste rock. The area would then be seeded according to the Closure and Decommissioning Plan.

8.3.3 ORE STOCKPILE

Generally, ore stockpiles would be removed by the end of mine life and stockpile areas reclaimed by grading and re-vegetating to blend with surrounding topography. Ore stockpiles that are not treated during the life of the project would be reclaimed using methods as described for the Waste Rock Disposal Facility.

8.3.4 PLANT SITE

The mill and process plant would be decommissioned prior to demolition or salvage of any structures. Portable equipment of value including vehicles, furniture and computers would be removed for subsequent reuse or salvage. Decommissioning the crushing and washing plant

would be initiated once the last ore has been processed. The Crushing plant would be decommissioned once all economic recoverable tin solution has been processed.

Contaminated soil from oil spills and lubricants would also be removed and placed in an approved disposal facility. Stripped areas in the vicinity of the mill and process plant would be scarified, covered with topsoil, graded to match contours of surrounding topography and re-vegetated.

8.3.5 TAILINGS STORAGE FACILITY

Reclamation of the Tailings Storage Facility would commence upon termination of tailings deposition. After removal of the pond (through evaporation or direct discharge, depending on the quality and timing of the action) in the low area adjacent to the final spillway, the tailings surface would be allowed to dry to the point where cover placement is possible without excessive deformation of the tailings surface. Drying is expected to take approximately 12 months in the decant/final spillway area followed by installation of a cap during the dry season.

Tailings would be drained via the under-drain system. The under-drain system installed throughout the tailings basin serves to reduce the phreatic surface within the tailings. Drains would report to a collection sump, which would be dewatered by pumping from an access riser pipe. Water treatment may be required during the dewatering process to ensure that water from the facility can be discharged in accordance with applicable standards. Water quality monitoring of the seepage and treated effluent would be conducted during the closure period until such time as seepage meets discharge criteria or until seepage ceases.

The primary focus of reclamation would be revegetation, erosion control and storm water management. The final profile of the tailings surface would slope from the north, east and west embankments toward the final spillway. The low point on the tailings surface would be adjacent to the spillway so that reshaping of the tailings surface would be minimized. The capping material type and configuration would be determined during detailed design of the closure plan for the facility.

8.3.6 WATER STORAGE FACILITY

The Water Storage Facility would either remain as the responsibility of operations and maintenance, given to an appropriate institution or breached and reclaimed, depending on the approved Closure and Decommissioning Plan. Maintaining the facility may be useful for the local community as a source of water for a variety of applications. Ongoing maintenance of the dam and outlets would be required as well as the source water system that would maintain a desired pool elevation.

In the event that the approved Closure and Decommissioning plan requires removal of this facility, an engineered dewatering process would be developed to either direct the water into the downstream drainage (depending on water quality) or into the open pit. The dam creating the reservoir would be removed with material to be used for reclamation cover material (if suitable) or hauled to the waste rock disposal facility prior to reclaiming those sites. The impoundment area would be allowed to dry and the resultant land surface would be scarified, shaped to blend in with surrounding topography, covered with suitable growth media and re-vegetated.

8.3.7 SEDIMENT CONTROL STRUCTURES

Upon completion of closure and reclamation activities, accumulated sediment would be removed from areas upstream of the sediment control dams. Where possible, sediment and topsoil collected from the base of the sediment control structures would be redistributed in areas requiring additional reclamation growth media. The sediment control structures would then be breached to restore free flowing conditions and the area reshaped to blend with the surrounding topography.

8.3.8 ROADS

Roads associated with the Project would be reclaimed concurrently with cessation of operations in each individual area. Roads remaining at the end of mining operations would be reclaimed

when no longer needed for reclamation and/or monitoring access. Reclamation of haul roads would be by grading to provide proper drainage, replacement of topsoil and revegetation. Reclaimed roads would be graded, to the extent practical, to re-establish the original topography and drainage of the site in order to minimise erosion. Haul roads associated with the waste rock disposal facility would be reclaimed concurrently with closure of the disposal site.

Exploration roads, drill pads, sumps and trenches would be reclaimed in conjunction with ongoing operations. Exploration roads are constructed by stripping topsoil and using the topsoil as a safety berm at the edge of the exploration road. Topsoil in the berm would be redistributed back onto the graded surface during reclamation.

8.3.9 ANCILLARY FACILITIES

At the end of the Project mine life, the explosives magazine would be removed in consultation with the MSD and fuel tanks and other mine support structures with significant salvage value would be dismantled for salvage or used for other operations in the area. Unused explosives would be returned to the vendor or used at other mine sites. Some Project facilities, such as the accommodation and administration structures, may be turned over to an agreed upon end user or may be dismantled at the government's discretion.

8.4 MONITORING

Procedures for short- and long-term monitoring of the Proposed Mining Area after closure would be established as a continuation of the operational monitoring programme to ensure that mining activities do not affect surrounding areas. The items scheduled to be monitored should not be considered as an all-inclusive monitoring list, and would be updated as mining and reclamation activities progress. Periodic environmental reporting would be undertaken as required by the appropriate statutory authorities.

Short-term monitoring would consist of monthly monitoring of groundwater, fugitive dust, revegetation progress, surface water run off quantity and quality, open pit condition, pit lake water quality and Waste Rock Disposal Facility and Tailings Storage Facility effluent quantity and quality. Monitoring would be performed routinely for the life of the Project. Monitoring groundwater, surface water and pit lake water would consist of sampling for a selected list of parameters. Air monitoring stations would be installed and sampled for fugitive dust. Revegetation would be inspected for erosion, biodiversity and growth.

Long-term monitoring would be conducted on a quarterly basis and would consist of a combination of observations, well measurements and sampling for water and air quality. Groundwater and surface water sampling and site observations would be conducted in accordance with a schedule agreed upon in discussions with the appropriate agencies.

Table 22:- Decommissioning and Closure Activities and Cost Estimates

Project Facility	Activity	Responsible Organisation/Personnel	Cost (K)
Direct Costs			
Open Pit	Groundwater filling of open pit; construct spillway and decant System; grade and place topsoil on selected areas; establish erosion control vegetation; establish initial soil stabilizing and nitrogen fixing vegetation; establish final land use vegetation on selected areas.	Developer/Site Manager	80,000
Total Waste Rock Disposal Facility	Reshaping/topsoil placement of selected areas(1), establish erosion control vegetation – slopes, tops, and benches, establish initial soil stabilization and nitrogen fixing vegetation, establish final land use vegetation	Developer/Site Manager	45,000
ROM Zone	Reshaping, topsoil and growth media placement, establish erosion control vegetation, establish initial soil stabilizing and nitrogen fixing vegetation, establish final land use vegetation	Developer/Site Manager	15,000
Plant Site (Treatment plant; Mine Services; Explosives Magazine)	Demolition and removal of treatment plant, structures, concrete footings; backfill foundation areas; removal of affected soil; re-spreading of topsoil/overburden; establish erosion control vegetation (flat surface); establish initial soil stabilizing and	Developer/Site Manager	20,000

	nitrogen fixing vegetation; establish final land use vegetation.		
Haul & Access Roads	Rip and grade, place topsoil in selected areas, establish erosion control vegetation, establish initial soil stabilizing and nitrogen fixing vegetation, establish final land use vegetation	Developer/Site Manager	25,000
Sediment Control Structures and Process Water Ponds	Remove sediment – place on reclaimed areas ; remove and dispose of liner; rip and grade compacted surfaces; replace growth media on selected areas; establish erosion control vegetation; establish initial soil stabilizing vegetation and nitrogen fixing vegetation; establish final land use vegetation.	Developer/Site Manager	18,000
Tailings Storage Facility Area	Reclaim oxide waste from dump, truck, and place & spread topsoil; final grading for water management; water treatment as necessary; establish erosion control vegetation; establish initial soil stabilizing and nitrogen fixing vegetation; establish final land use vegetation.	Developer/Site Manager	8,000
Sub Total			**211, 000**
Indirect Costs			
Mobilization and Demobilization	Developer/Site Manager		12,000
Consulting services	Developer/Site Manager/Consultant		10,000
Management	Developer/Site Manager		50,000
Repairs and Maintenance	Developer/Site Manager		50,000
Monitoring/Decommission Report	Developer/Site Manager/Consultant		60,000

Sub Total	**180, 000**
Grand Total	**391, 000**

9.0 CONCLUSION AND RECOMMENDATIONS

9.1 FINDINGS OF THE EIA

The proposed Rosinvest Zambia Limited Mine is located within the Southern Province, and within the Kalomo District Municipality. The study area is underlain by the Tin deposits. Activities in the surrounding areas include mining activities as well as farming.

The proposed mine will be developed on a land constituting a total area of approximately 40km^2. The site is previously undisturbed with activities consisting of a combination of vacant, wilderness land and subsistence farming. Sensitive areas were identified prior to the development and conceptual design of the mine layout, which therefore takes cognisance of the environmental sensitivities of the study area.

The main impacts associated with the development include impacts on the groundwater, including seepage from the tailings dam and dewatering of the mine. Impacts on the air quality are significant without mitigation measures; however, with the implementation of appropriate mitigation measures as outlined in this report, the impact significance is reduced to "low". Impacts on the terrestrial ecology are significant and have a rating of "medium" for the loss of vegetation of medium ecological importance, as well as fragmentation of natural habitat. Other impacts assessed include impacts on the aquatic ecology of the Chirobi area, impact on soils, noise, heritage resources, visual and impacts on health and social wellbeing.

9.2 RECOMMENDATIONS

The mitigation measures proposed by the specialists were incorporated into the Environmental Management and Monitoring Programme (EMMP) and must be adhered to by the mine.

Roles and responsibilities were assigned to each mitigation measure. Monitoring will take place for the groundwater and atmospheric emissions. Monitoring measures are included in the EMMP.

It is recommended that an Environmental Management System is developed by the mine, which should be incompliance with ISO14001. The mine should aim to acquire ISO14001 accreditation.

9.3 CONCLUSION

It is recommended that the mine is authorised to proceed for the following reasons:

- The new mine will be located in an existing mining region and therefore will not induce an unexpected disruption to the social environment.
- The mine will be located outside of areas of environmental. However, vast expanses of the vegetation type occur in the surrounding areas, thus in the event that the mine proceeds, it is anticipated that the impact will be of medium significance.
- The impacts of dewatering of the underground aquifer, as well as seepage from the tailings dam are significant; however, these impacts can be mitigated to a certain extent, and therefore do not represent fatal flaws.
- Other impacts can be mitigated to levels which are acceptable, and therefore will not have a detrimental impact on the environment.
- The proposed mine will induce positive socio-economic impacts within the area and the Province, which is currently characterised by high levels of unemployment.

LIST OF ANNEXTURES

ANNEX 1

ATTENDANCE REGISTER

TROPICAL ENVIRONMENTAL MANAGEMENT EXPERTS

CONTACT NO. 0977 864057

REGISTER FOR ROSINVEST

SCOOPING MEETING IN KALOMO DISTRICT OF SOUTHERN PROVINCE

CHIEF: SIMUNTA CHOLA
CHOLOBE VILLAGE
HEAD: JAMES SIKALOBE

DATE: 13 MARCH 2014

	NAME	ORGANISATION/ADDRESS/CONTACT NUMBER		NRC NO.	SIGNATURE
1.	MATHEUS SIMUMBA	TEME	0977948647	429081/41/1	
2.	JOHN BANDA	"	0978210231	236637/16/1	
3.	MICHAEL SAKA		0972449089	370342/61/1	
4.	MAXWELL SILUNGWE	ROSINVEST	0977925432	192085/68/1	
5.	MUTALE CHAKO	ROSINVEST	0976084064	292140/71/1	
6.	SINJALE JOEL	ROSINVEST	0979033883	182673/66/1	
7.	YASA CHOMBA	ROSINVEST	0969338588	293312/66/1	
8.	MUTALE MOSES	ROSI NVEST	0976183739	218358/66/1	
9.	INNOCENT MWANSA	ROSI NVEST	0954570880	276715/66/1	
10.	STEPHEN LINJOMI	ROSI INVEST	0979245671	146661/22/1	
11.	LEANIAH CHIKONGA	ROSI INVEST	0977453919	131363/79/1	
12.	SILVIA SIMUMBA	VILLAGER	NIL	249869/76/1	
13.	CHISOMO SIKALOMBE	CHOLOBE	0977107936	235954/76/1	
14.	RIFFINS R KABONDO	CHANA	0976487161	239265/76/1	
15.	COSTEN SIEGWENGWA	CHANA	255679/76/1	0976734061	

Siananga Blues	V. Makangala	239266/76/1	B Sianaga
Chality Siabunfele	V. Chisikili		Siabuntele
Milden Simalimbu	V. Chana		M Simalimbu
Loice Siakayaaya	V. Sikalubi		SiaKAYAAYA.
Loveness Maulaka	V. Mweebele		Lovenes
Laiza Simangolwani	V. Chana		LAIZA
Mufinda Mainza	V. Simalundu		mainza
Doroth Siakwekwe	V. Simalundu	255651/76/1	Dorothy
Siansowa Alace	V. Chana		ALSi
Eva Kanchele	V. Chisikili		Eva
Mesia Bbela	V. Simalundu	198582/76/1	Bbela
Staines Mafuba	V. Chilobe		Mafuba
Aneby Siampolomba	V. Chilobe		ANEY
Precios Gaula	V. Chilobe		Precious
Freeciamuler Siandluba	V. Chilobe		SheiLia
Eness Kabenda Siabili	V. Chana		ENESS
Emelder Siamununqu	V. Chilobe		Emelder
Chality Gaula	V. Chisikili		ChaLiti
Unice Siabunfele	V. Chisikili		UNICE
Regina Siambolyoma	V. Chilobe		Regina
Olpa Mudenda	V. Chana		OLUPA
Mety Moonga	V. Chisikili		Moonga
Jelifa Siabuntele	V. Chilobe		Jelifa
Ahness Poyipoyi	V. Makangala		Poyipoyi
Viola Siamucho	V. Chana		Viola
Lozimely Zelengana	V. Kayaba		Zelengana
Jailosi Sialanga	V. Siampondo	223352/76/1	[illegible]
Philson Simandongo	V. Kabimba		Filison
Julias Poyipoyi	V. Chisikili	178506/76/1	J. Poyipoyi
Staph Siazongo	V. Chisikili	280305/76/1	S. Syezongo

	NAME	ORG/ADDRESS	CONTACT Nº PHONE	N.R.C	SIGN
1-	SIANSOWA AREX	VILLAGER			[illegible]
2	CURENT- Siankumbo	VILLAGER	NIL	272981/76/1	Staue
3-	James SikaLogwe	CHILOBE	NIL	255968/76/1	Sikalogwe
4	KACHEYAKANTU SAMUEL	CHILOBE	NIL	106997/76/1	S Kacheyakantu
5	CHRISWELL [illegible]	CHILobe	NIL	235543/76/1	[illegible]
6	SINAKOBA GILBERT	CHISIKILI	NIL		G Sinakoba
7	KETSON. SIANANGA	CHILOBE	NIL	152659/76/1	KS
8	Jailos Syandongela	Sikalubi	NIL	239461/76/1	[illegible]
9	LACKSON SIAKASYU	Makangala	NIL	223178/76/1	[illegible]
10	anciety Sindeke	Simalundu	NIL	239884/76/1	[illegible]
11	OBERTY Manjimela	ManJimela	NIL	219972/76/1	[illegible]
12	Siamoobwe Kelvin	Simalundu	~~0977147694~~ 0954027619	219601/76/1	[illegible]
13	Daniel ManJimela	ManJimela	0954028512	178599/76/1	[illegible]
14	SIAKAYAYA MARSHALL	CHANA	0973764061	274339/76/1	[illegible]
15	Kaloonda Tomas	CHANA		274409/76/1	[illegible]
16	CAIVE Sibbesela	mbina	nil		Chaveley
17	Morriss Mampio	chilobe	Nil	259077/76/1	[illegible]
18	Emmanuel Siampalo	MWEEBELE	0954365610	219929/76/1	[illegible]
19	Vital - Siansowa	Siyangoma	NIL	200391/76/1	[illegible]
20	Kenson Siabuuzu	Mweebele	NIL	221418/76/1	Kenson
21	Simiwonga, makkowa	Makangala	NIL	178406/76/1	Simiwonga
22	Teddy Simalemmwe	Chilamba	NIL	220066/76/1	[illegible]
23	PANSSON CHICABA	SIMALUNDU	NILL	154547/76/1	Chicaba
24	Andrew wendo	Simalundu	Nil	171534/76/1	Andrew
25	Sianga Sianga	Chisikili	0973153277	186182/71/1	[illegible]
26	Sunford Simoonbde	makangala	NIL	239397/76/1	[illegible]
27	dolis TIKI	Makangala	NIL	192748/76/1	DOLIS
28					
29					

TROPICAL ENVIRONMENTAL MANAGEMENT EXPERTS

CONTACT NO. 0977 864057

REGISTER FOR ROSINVEST

SCOOPING MEETING IN KALOMO DISTRICT OF SOUTHERN PROVINCE

DATE: 13 MARCH 2014

NAME	ORGANISATION/ADDRESS/CONTACT NUMBER	NRC NO.	SIGNATURE
Emson Jek Silozi	V. Chilobe 0977871417	367974/11/1	[signature]
Joseph Paipai	V. Chisikili	239511/76/1	JS paipai
Edson Siansolwa	V. Chisikili	168419/76/1	[signature]
Maxwel Kabanda	V. Chana	154307/76/1	M Kabanda
Phinias Sinyemba	V. Sikaalubi	151037/75/1	P. Singemba
Maicheal Duku	V. Makangala	213249/76/1	[signature]
Joster Siangalu	V. Chilobe	120296/76/1	JoSita
Evansi Silozi	V. Chilobe		[signature]
Stephern Lasi Kabanda	V. Chana		Kabanda
Riphias Kabanda Lasi	V. Chana	239265/76/1	Riphias
Rabson Sikaloqwe	V. Chilobe	235954/76/1	[signature]
Costern Sigwangwa	V. Chana	255679/76/1	Costen
Judith Manjimela	V. Chilobe	239247/76/1	Judt
Mutinta Chikwayi	V. Chilobe		Mutinta
Lister Kafwamba	V. Makangala		L. Kafwamba

ANNEX 2

MINUTES OF THE SCOOPING MEETING

MINUTES OF THE SCOOPING MEETING FOR ROSINVEST (Z) LIMITED TIN MINING PROJECT KALOMO DISTRICT

Date 13th March, 2014,

Venue: Chirobi Village

Attendance: See attached schedule

Chairman's introduction remarks

The Chairman (Mr. John Simumba Director Tropical Environmental Management Experts (TEME)/Mr. Silungwe interpreter (Rosinvest Zambia) called the meeting to order at exactly 12:30hrs. He begun by welcoming everyone present at the meeting. He introduced himself first and then introduced the developer to the gathering. He told the meeting that his company has been contracted to carry out an Environmental Impact Assessment (EIA) and prepare an Environmental Impact Statement (EIS) afterwards which will be submitted to the Zambia Environmental Management Agency for approval of the project before commencement. He told the meeting that his area of concern is the environment. He said that before any submission to ZEMA a meeting like this needed to take place so that all views and concerns regarding the project would be taken into account and incorporated in the document.

Mr. Simumba

Mr. Simumba talked about the environmental part of the project and mentioned that the meeting was called because the government requires that the public meeting be conducted before development could take place. He quoted The Environmental Management Act (EMA) No. 12 of 2011 which came into force after repealing the Environmental Protection and Pollution Control Act (EPPCA) of 1990 cap 204 of the laws of Zambia. This Acts states that the Agency shall conduct surveys on the state of the environment and research and forecast environmental changes and undertake other studies that may contribute to the formulation of policies and

preparation of action plans and strategies with regard to environmental protection, conservation and management. It also provide for the prevention and control of pollution and environmental degradation.

He said that in 1997, the EPPCA established regulations for conducting and reviewing of Environmental Impact Assessments as well as detailing the types of projects that require Environmental Impact Assessment. Mr. Simumba stated that the project under consideration came under section 4 of the Second Schedule Regulation7 (2).

He stated that the law required that the developer had to meet certain requirements and also had to follow them as they were in the document so that environmental impacts on mining would be minimal.

He also mentioned that there were a lot of things that take place during mining like disturbing the livelihood of the people, habitat of the area, and noise and air pollution from moving vehicle if the mining was not done in a controlled way. He retaliated that trees would not be cut unnecessarily to avoid soil erosion. He pointed out that there will be little disturbance to the eco-system of the area in order to maintain the habitat.

Mr. Simumba mentioned that as neighbours and stake holders they needed to know what will be happening and if they had any comments, complaints or questions concerning the project they would be addressed and there comments would be put in the document that would be produced as Environmental Impact Statement (EIS).He also mentioned that the EIS document would be advertised in both the print and electronic media for more than 2 weeks.

He then listed issues that the study will address surrounding the following aspects of the environment;

- Land and soil;
- Air quality and noise environment;

- Surface water;
- Underground water and quality;
- Occupational health and safety;
- Public health and safety;
- Traffic, road safety and public access;
- Local Ecosystem, vegetation and habitat; Land use/ Aesthetics;
- Employment and multiplier effects

In conclusion he mentioned the benefits of the project and the development that will be brought to the area and how as neighbors they would be able to benefit from the project during life cycle of the project.

Then Mr. Simumba called upon Mr. Banda to outline the Social-Economic Impacts that will result when the project is implemented.

Social-Economic Impacts outlined by Mr. John Banda

Mr. Banda talked about the social impacts of the project like creation of employment of about 80 people will be employed construction and operation of the mine. He stated that most of the work will be given to local people. He also talked about the multiplier effects that would come with the project where other businesses would benefit like suppliers e.g. food suppliers and benefits that would go to government department like Kalomo District council from collection of levies. He also mentioned benefits to the insurance industry, Napsa, Workers compensation ZRA and the banking sector. He mentioned the benefits to local people both skilled and unskilled who would earn a living during the project implementation phase. He also mentioned that the road network will improve.

Negative Social Impacts

Mr. Banda also advised the local community to get involved in all project phases and monitor any irregular conduct by the developer in order to minimise negative impacts of the project.
He also talked about the negative impacts of the project. Since the mine will attracted a lot of different people he mentioned that diseases such as H.I.V and other STIs would increase. He outlined how the developer would put up measures to sensitize workers on the dangers of H.I.V and the frequency of that sensitization that would be at least quarterly in a year.

Views and Comments Session

Mr. Simumba next welcomed questions and comments from the audience.

Question 1

Mr. Sinyangwe a Villager wanted to know what will happen to the fields since the mining area has been for some time used for mining.

Answer 1

Mr. Simumba responded that it will be upon agreement between the developers/the chief and the owners of the fields for resettlement.

Question 2

Mr. Marshal asked if the company will help the community in building Schools, Clinics and Roads.

Answer 2

Mr. Simumba answered by saying that it will be a deliberate policy by the company to help the community.

Question 3

Mrs. Eness asked the promises from the company.

Answer 3

Mr. Simumba referred to the Social-Economic impacts as highlighted by Mr. Banda.

Mr. Kabonda

Mr. Kabonda wanted to know if the consulting company (TEME) will continue to monitor the operations of Rosinvest.

Mr. Simumba agreed that the company (TEME) will continue as it will be engaged I monitoring the management and auditing the company's operations (Rosinvest). He also said that other government institutes such as MSD, ZRA and ZEMA will be visiting the company to monitor its operations.

Mr. Trust

Mr. Trust recommended the company as it had the consulting company (TEME) representing the government institute (ZEMA). However he asked if the company will continue helping the community.

The Developer Mr. Simukonda assured him that the company will continue helping them as they will be the company's priority.

Mr. Silozi

Mr. Silozi was concerned about the road network since the access road is too small and the pits left unattended.

The developer said that they will differentiate roads for public and mining equipment.

Mr. Simumba also added that all road networks will have signage e.g. explosives heavy duty equipment and slow down humps.

He also said that there will be a management and decommissioning plan over the pits and its cost.

Mr. Gabson/Mary Moonga

Mr. Gabson was concerned about the resettlement since there are squatters within the area.

Mr. Simumba said that it will be agreement between the developer, the chief and the directly affected people. He also said that the developer will engage the consulting company to do the resettlement plan.

Mr. Simumba also emphasized that the developer has explored the area and knows the points of mining area and knows exactly who are within.

Mr. PoiPoi

Mr. PoiPoi wanted to know the area covered by the mine.

The developer said that the all mine is approximately 20km^2.

Remarks from Chief's Representative Mr. Patrick Champe

Mr. Champe asked if the community welcomed the company to which all agreed. He also told them that there were lucky as words said by the chief reflecting back that many companies had cheated them. He asked them if they had seen any difference with Rosinvest to which they said yes. He highlighted that illegal miners never went to the chief but Rosinvest did. He also said that the chief agreed with the company that they will build for the community a Dam and a Hand Pump.

He then called upon the Advisor of the Chief who thanked the community for welcoming the company and advised the community to avoid theft, vandalism and witchcraft. He highlighted the benefit the community will derive from the project such as employment, good road network and public facilities such as schools and clinics.

Conclusion

Mr. Simumba

Mr. Simumba thanked everybody for coming and attending the meeting. He emphasized that the document will be available for all to see and read.

The meeting came to an end right about 16:00hrs.

Secretary Signature **Chairman Signature**

ANNEX 3

LETTER OF TERMS OF REFERENCES

ZAMBIA ENVIRONMENTAL MANAGEMENT AGENCY

Head Office
Corner of Church & Suez Roads
P.O. Box 35131
Lusaka, Zambia
Tel: +260- 211-254130/254023/254059
Fax:+260-211-254164/256658

Northern Regional Office
Jacaranda Road
P.O. Box 71302
Ndola, Zambia
Tel: +260-212-621048/610407
Fax: +260-212-610246

Livingstone Office
Plot No. 555
Junction Obote / Neru Roads
Livingstone, Zambia
Tel / Fax:+260-213-321297

Chirundu Border Office
Lusaka Road
P.O. Box CRU31
Chirundu, Zambia
Tel/Fax: +260-211-515261

In reply please quote

No:

ZEMA/INS/101/04/1

April 28, 2014

The Director
Rosinvest (z) limited
P.O.BOX 50725
LUSAKA
Tel: 0977864057

Dear Sir,

REF: TERMS OF REFERENCE FOR THE PROPOSED TIN MINING ON LICENCE NUMBER 16395-HQ-LPL IN CHIROBI VILLAGE OF MAPATIZYA CONSTITUENCY OF KALOMO DISTRICT.

Reference is made to the Terms of Reference (ToRs) for the proposed Tin mining on Licence number 16395-HQ-LPL in Chirobi Village of Mapatizya constituency of Kalomo District that you submitted to Zambia Environmental Management Agency (ZEMA) on April 04, 2014

Kindly be advised that the review of the ToR's indicates that the general objectives are acceptable. The Agency therefore has **no objection** in you proceeding with the study.

Kindly find attached to this letter the list of issues that your EIA study should address.

Please do not hesitate to contact the undersigned should there be any issue during the study needing our attention.

Yours sincerely,

Edwin Soko
Acting Director General
ZAMBIA ENVIRONMENTAL MANAGEMENT AGENCY

ANNEX 4

CVs OF THE EIA TEAM

CONTACT DETAILS

31 Kakosa Street Kamenza Township, Chililabombwe
+260 979 505404 or +260 955 098166
moses.kapala@gmail.com

CAREER OVERVIEW

Qualified and experienced Environmental Engineer with broad knowledge in environmental management. Over two years of energy, environmental and safety management in the mining industry. I am a Certified auditor and implementer of BSI ISO 14001:2004 Environmental Management System and internal Safety and quality audits.

PERSONAL ATTRIBUTES

- Technically competent/qualified in energy and environmental management.
- Calm, reliable and dependable in meeting organisational objectives.
- Energetic and physically very fit; quick to respond to opportunities and problems.
- Strong planning, organising and monitoring abilities - an efficient time-manager.
- Strives for quality and applies process and discipline towards optimising performance
- High level computer skills in Microsoft office including Excel, Word, PowerPoint, publisher, Micro Station Design Software, SAP Business Management Software and Harrington Quality Management system.

KEY STRENGTHS

- Over Two years of experience in development and implementation of ISO 14001 Environmental Management System (EMS).
- Identification and development of energy saving opportunities/initiatives to reduce cost.
- Over one year of Laboratory and analytical experience and expertise.
- Audit skills based on British Standard Institute (BSI).
- Lead auditor in internal Environmental and Safety audits and inspection based on the ISO 14001:2004 EMS and OHSAS 18001 SMS.
- Designing and conducting Health, Safety, and Environmental management trainings and awareness.

CAREER HISTORY

October, 2011 – To present - Environmental Officer-Konkola Copper Mines Plc

Key Responsibilities

- Track and report on effluent quality to ensure proactive and timely decision making to prevent water pollution and increase the efficiency/life of underground pumps.
- Ensure 100% closure of BSI ISO14001 Environmental Management System nonconformities raised to ensure continuous improvement and Certification of the mine.
- Assist with the development, maintenance and implementation of environment and safety standard operating procedures (SOPs) and related plans for mine facilities.
- Track and report on energy usage and propose improvement initiatives/corrective actions to ensure 5% reduction.
- Ensure 100% compliance with Zambia Environmental Management Agency (ZEMA) licence conditions.
- Writing Environmental statutory reports to ZEMA and MSD monthly, quarterly, annually and bi annually for continuous improvement and compliance monitoring.
- Coordinating trainings, Environmental awareness and mentoring others in the implementation of the ISO 14001:2004 and also to meet legislative requirements.
- Conducting internal EMS and OHSAS audits and inspections on all the sections of the mine including suppliers as well as sub-contractors.
- Developing environmental aspect/impact registers, Objectives and Targets and monitoring the implementation of environmental management programs.
- Developing scenarios for possible emergence situations and then coordinate emergency drills i.e. Flooding of the mine and Tailings Dam wall failure.
- Coordinate the Investigation of incidents and non-conformances to establish the root cause and institute corrective action to ensure 100% closure is achieved.

Key Achievements

- Improved mine effluent quality by reducing the amount of suspended solid from over 100ppm to less than 65ppm the statutory limit being 100ppm.
- Successful implementation and Certification of the mine to the BSI ISO 14001:2004 EMS.

- Ensured 98% compliance to ZEMA Licence conditions.
- Ensured 100% closures to non-conformances raised during external audits and achievement of over 90% of the annually set objectives.

January, 2011 – October 2011 – Environmental Engineer (Mine Ventilation)-Konkola Copper Mines Plc

Key Responsibilities

- Emissions sampling from underground machinery and on surface plants to ensure the levels fall below MSD and ZEMA statutory allowable limits.
- Proposing, planning and designing Ventilation systems and set ups using micro-station software and manually.
- Conducting Underground ventilation air flow surveys, smoke shifts and setting re-entry periods for blasted ends.
- Writing ventilation statutory reports to ZEMA and MSD monthly, quarterly, annually and bi annually.
- Coordinating and proposing ventilation emergency preparedness situation by means of drills in case of an underground gassing incident.
- Conducted Occupation Hygiene measurements for Noise and Gas Emissions from the newly commissioned KCM Diesel Power Plant to assess its impacts in the immediate and surrounding Environment.

Key Achievements

- Effectively designed and implemented a ventilation system at No.1 Shaft 2650'L by introducing more fresh air by reopening the Ventilation Shaft VS1D which improved ventilation conditions by 30%.
- Effectively achieved 100% compliance to ZEMA statutory compliance of emissions from the New Diesel plant by facilitating the approval of sampling procedures.

March, 2010 – December 2010 – Assistant Water Quality/Laboratory Officer (Temporal) - Ministry of Mines, Energy and Water Development-Department of Water Affairs (DWA) HQ

Key Responsibilities

- Water quality sampling of both surface and ground water aquifers to assess the water quality and pollution levels if any.
- Worked hand in hand with Zambia Environmental Management Agency (ZEMA) Staff in the water sampling campaign of the Kafue River (Lower and upper Kafue River) and other streams to ascertain environmental pollution levels in Lusaka.
- Further laboratory testing and analysis of the collected water samples at the Department of Water Affairs National Laboratory to quantify compliance to set standards.

Key Achievements

- Introduction of new laboratory procedures through research.
- Development of an organised record keeping system in the laboratory through document filling.

EDUCATION AND QUALIFICATIONS

1. Bachelor of Engineering in Environmental Engineering with a major in Combustion and Energy Engineering with Distinction- Copperbelt University, Kitwe.(2005-09)
1. Examination Council of Zambia School Certificate – Nchelenge Secondary School, Nchelenge.(2000-02)
2. Examination Council of Zambia Junior Secondary School Leaving Certificate- Mansa School for Continuing Education, Mansa.(1998-99).

PROFESSIONAL QUALIFICATIONS/DEVELOPMENT

I have undergone various trainings during my graduate training program with KCM and these include;

- BSI Environmental Management System (EMS ISO14001:2004) Internal Auditors Training.
- Occupational Hygiene and Ventilation Controls Certificate Elementary Certificates.
- Total Quality Management (TQM) and Harrington Quality Management System (HQMS) Internal Trainings.
- Root Cause Analysis Techniques (RCat) Internal Training.

- Holder of Clean valid Driver's Licence.
- Holder of a valid Mining Blasting Licence.

RESEARCH AND PUBLICATIONS

3. Final year Project: An Evaluation of Water loss in a typical Urban Distribution System- A case study of Bulangililo Water Treatment Plant and Riverside Township Water Network with NWSC in the year 2009.

4. Fourth year research project: How the scaling up of Indoor Residue Spray (IRS) of DDT in malaria control can be a trade barrier to Zambia.

REFERENCES

1. **Mr Mwila Chitoloma**

SHE-Environmental Coordinator

Konkola Copper Mines Plc

Konkola Mine, Private Bag KCM (K) 2000,

Chililabombwe, Zambia. Cell: +260 977 844929

E-mail: Mwila.chitoloma@kcm.co.zm

2. **Mr Isaac Chongo**

Manager – Ventilation

Konkola Copper Mines Plc,

Konkola Mine Private Bag KCM (K) 2000

Chililabombwe, Zambia. Cell: +260 968 338 937

E-mail: **isaac.chongo@kcm.co.zm**

3. **Prof. Nkonde G.K.**

Lecturer-Department of Chemical Engineering

Copperbelt University, Zambia.

P.O. BOX 21692,

Kitwe.

Cell: 0977 879 986.

Email: **gnkonde@cbu.ac.zm**

D O R E E N N V M U K U B E

Zambia Institute of Mass Communication Educational Trust
P.O. Box 50386 RW, Lusaka
Mobile: 097 7 859676; 097 7 607225
E-mail: doreennasilelev@yahoo.co.uk

doreen.mukube@gmail.com

PERSONAL INFORMATION

Marital Status: Married
Nationality: Zambian
Date of Birth: January 10, 1980

PROFILE

I am a hardworking, self-motivated individual with great initiative. I am also a self-starter who is able to handle pressure, achieve results and reach targets. Furthermore, I am a self-starter, with a mind for corporate image building.

EDUCATION

2012 **University of Zambia**

Certificate in Project Planning, Monitoring, and Evaluation

2012 University of Wisconsin – Madison Global Health Institute, USA

Certificate in Communicating Public Health Information Effectively

- I was trained in communicating health messages effectively and planning communication strategies pertaining to public health concerns, which included, among other things, writing letters to the editors, lobbying policymakers, coming up with a testimonial that I delivered before the representatives of senators in the State Capital of Wisconsin in Madison

This involved researching on particular topics assigned to us and preparing a presentation for a television interview

2000 – 2004 **University of Zambia**

Bachelor of Arts, Development Studies & Mass Communication (*Major & Minor respectively*)

1994 – 1998 **Roma Girls Secondary School**

General Secondary School Certificate

WORK EXPERIENCE

2011 to date ***Zambia Institute of Mass Communication Educational Trust, Lusaka***

Specialist - HIV/AIDS (Project Coordinator for the Health Communication Media Project Funded by USAID)

- I arrange logistics such as car hire and accommodation for foreign partners
- Furthermore, I organise workshops, which involves calling up participants, writing letters and making budgets for workshops, booking conference halls, and so forth
- I have in the recent past organised a DJ's training workshop in HIV/AIDS, which was attended by DJs from several community radio stations
- I do the budgeting for the project activities
- I write concept papers and project proposals for the proposed activities in the department and marketing these to prospective sponsors
- I preparing work-plans, following through to ensure activities actually take place as planned
- I also carry out monitoring and evaluation of project activities
- I write reports and engage in productions of radio and television programmes and messages on HIV and AIDS
- I coordinate meetings for our partners with government officials and other stakeholders
- I organise and participate in community outreach activities for the HIV/AIDS project

Public Relations

- I arrange for and participate in activities to profile my institution such as participating in the Agriculture and Commercial Show
- I market the courses at ZAMCOM on radio, television and newspapers
- I am a consultant for Public Relations for Government Departments
- I carry out other Public Relations communications and functions both within and outside ZAMCOM, in addition to producing materials such as brochures and documentaries for ZAMCOM

Gender

- As the gender focal person at ZAMCOM I lecture on gender and the media
- I arrange for the students (both pre-service and in-service) to participate in events aimed at exposing students to gender in the media. Last year I successfully arranged for the pre-service students to participate in a cyber-dialogue that was organised by Gender links and involved students and lecturers from various countries conversing via internet to mark 16 Days of Activism against Gender Based Violence
- Arranged ZAMCOM's participation in Women's Day activities last year and organised a ceremony to award an outstanding woman at ZAMCOM

Lecturer

- I am a lecturer in Community Development, with a focus on gender issues, community development, population, and poverty
    - This involves preparing notes and lesson plans, maintaining records of students' assignments, and organising field trips

These accomplishments are indicative of my abilities to reach audiences with a message primed towards influencing a change in people's thinking

2011 Western Union, Ndeke Road, Lusaka

- I started from Jacaranda Mall, Ndola
- My accomplishments included customer service, handling customer queries, carrying out money transactions, handling petty cash and reconciliation
- I also performed end of day writing of reports on the daily cash control

- I compiled a weekly report at the end of the week showing the branch's financial situation for the week
- I further compiled a monthly report showing the financial activity for the month
- Additionally, I did record-keeping and filing of documents that were used in my daily operations

These successes show my propensity towards storing information and paying attention to detail

2007-2010 Sitas Boutique, 470 Shopping Mall, Cairo Road, Lusaka

- I ran the boutique for three years, indicative of my ability to use initiative

August 2008 Consultant for Napsa/Esco Complex

- I worked in conjunction with the Environmental Council of Zambia to draw up an environmental impact assessment of the Napsa/Esco Complex
- I shared in a stakeholders' briefing on the same, the stakeholders being the Lusaka City Council, the Lusaka Fire Brigade, the Ministry of Tourism, among others

May 2006 Consultant for Oddy's Works

I did an environmental impact assessment and helped compile detailed report for the same

September – October 2005 Project Concern International

Research Assistant

I carried out a community-based baseline study, involving extensive travel and visits to community schools

The consultancy services I offered and the work I did at Project Concern evidence my ability to carry out research and organise useful information

January – June 2000 Ronsmoen Trading (now defunct)

Receptionist/Sales Assistant

I handled phone calls and visitors
I arranged meetings and performed marketing work for the firm

The work I did here shows that I have people skills

RESEARCH

July – August 2004 Germany Technical Assistance to Zambia (GTZ)

- I took part in the decentralisation program of local government carried out with the help of GTZ. The research involved conducting a baseline study of local organisations in the district of Sinazongwe with a view to making the Sinazongwe District Council a self-sustaining organisation

- The other aim of the study was to identify the capacity needs of the community with a view to future capacity building

- I gathered data and wrote a report on the findings of the baseline study

CONFERENCES/WORKSHOPS

I was usher at the International Conference on Health Reforms organised by the Central Board of Health and World Health Organisation, among others

COMPETENCIES

- I am able to coordinate with a team and work under minimum supervision
- I am computer literate
- I am able to carry out research (such as baseline studies) and compile reports
- I have excellent interpersonal skills
- I am skilled in public relations such as image building, media communications work, and advertising and marketing work
- I am able to do gender analysis and planning as well as economic policy analysis
- I am knowledgeable in project planning, implementation, and analysis
- I worked as a research assistant in relation to office love affairs and the effects of such on the performance of industries, evidence of my social awareness

INTERESTS

- Reading, music and poetry, research, home-making

LANGUAGES

- English, Silozi, Chinyanja

REFERENCES

- Mr John Simumba, Director, Tropical Environmental Management Experts, Findeco House, 18th Floor, Room 19.Email:Tropicalenvironmental123@yahoo.com, Phone: 097-7864057
- Mrs Annie Mumbi, Country Director, American International Health Alliance (AIHA, a ZAMCOM partner). Email: Amumbi@aiha.co.zm. Phone: 096 6 784790
- The Dean, School of Humanities & Social Sciences, University of Zambia, Box 32379, Lusaka, Zambia. Tel: 021 1 291381

JOHN SIMUMBA

Cell: +260-0977 864057
E-mail: izukanji123@yahoo.com

Born: 21/09/1969
Sex: Male
Marital Status: Married
Nationality: Zambian
NRC No.: 276200/61/1

Professional Career: *Environmental Consultant and Project Manager through training and experience.*

Professional Qualification: 1Metallurgical Engineer

University: University of Zambia School of Mines, Department of Metallurgy

Year: 1991-1996

Professional Qualification 2: Environmental Science

College: Metropolitan Johannesburg

Year: 2003-2005

Work Experience:

1997: Cobalt Plant in ZCCM-Nkana Division

1999: Alamo foundry-American company dealing in ferrous and nonferrous materials

2004: Found own company; Tropical Environmental Management experts.

Languages

1. **English**
2. **Namwanga**
3. **Bemba**
4. **Lamba**
5. **Lala**

6. **Mambwe**
7. **Lungu**

Work Experience.

- Coordinator and Director of Environmental Impact Assessments and Environmental Project Briefs of the following Companies.

	NAME OF COMPANY	ENVIRONMENTAL JOBS	OTHER JOBS
1.	**HYBRID (Z) Ltd**	Environmental assessment for the Establishment of Hatcheries throughout the Country.	
2.	**MEDI-CARE (Z) Ltd**	Environmental Impact Assessment for the Construction of the Hospital in Lusaka	
3.	**LAMASAT AND LAMISE INVESTMENTS**	Environmental Impact Assessment for the Construction of a Factory dealing in PVC Pipes, Plastic Tanks and Polythene bags in Lusaka	
4.	**CHEVRON (Z) Ltd**	Environmental Impact Assessment for the Expansion of the Fuel Depot to accommodate a new 2 million Liter Fuel Tank - Lusaka	
5.	**MEDICAL STORES**		Assessment, sorting, destruction, treatment and transportation of the treated Pharmaceutical products to the dumpsite.
6.	**INTERNATIONAL DRUG COMPANY**		Assessment, sorting, destruction, treatment and transportation of the treated pharmaceutical products to the dumpsite.
7.	**NGASA PHARMACEUTICALS**		Assessment and destruction of 22000 packets of expired

	LIMITED		pharmaceutical Latex Gloves-100pairs/packet
8.	**PHARMACEUTICAL REGULATORY BOARD**		Assessment, sorting, destruction, treatment and transportation of the treated pharmaceutical products to the dumpsite and the incinerator.
9.	**WATCHTOWER BIBLE & TRACT SOCIETY OF ZAMBIA**		Assessment and disposition of 210 litres of Hypsin Hydraulic oil, 80 litres of Heat treatment oil and 440 litres of Trash liquids from a mixture paints and thinners
10.	**AUCHIM ZAMBIA LIMITED**		Assessment, sorting, destruction, treatment and transportation of the treated pharmaceutical products to the dumpsite. About 1.5 tonne of expired pharmaceutical Products were destroyed.
11.	**SAFINA PHARMACCEUTICALS**		Assessment, sorting, destruction, treatment and transportation of the treated pharmaceutical products to the dumpsite.
12.	**B.O.C GASES**	Assessment of the existing environment and preparation of an Environmental Project Brief.	Construction of a new Steel Shelter or Filling Doc for extra gas cylinders at the Lusaka Plant for BOC GASES (formerly ZAMOX).

13.	**MEBMARK TRANSPORT**	Assessment of the existing environment and preparation of an Environmental Project Brief.	Construction of fuel tank stand and bund wall, Installation of fuel tank, Construction of a 4 bed roomed house ,servants quarter, wall fence and installation of sewer system in Makeni
14.	**BARLOWORLD PLASCON LTD**	The Designing of the Environmental Monitoring Plan and carrying out its implementation according to ISO 14001. The project ran from 2005 to 2007.	
15.	**BARLOWORLD EQUIPMENT**	The Designing of the Environmental Monitoring Plan and carrying out its Implementation according to ISO 14001. The project ran from 2006 to 2008.	
16.	**KWAKUWAHI LODGE-MWINILUNGA**	Environmental Project Brief	
17.	**SOLWEZI HOTEL-SOLWEZI**	Environmental Project Brief	
18.	**REEDBUCK LODGE-KABULONGA**	Environmental Project Brief	
19.	**PAPER TREE LODGE-SIAVONGA**	Environmental Project Brief	
20.	**FALLS WAY LODGE – LIVINGSTONE**	Environmental Project Brief	
21.	**KOBIL SERVICE STATION-KITWE**	Environmental Project Brief	
22.	**CHAIMAN MANUFACTURING (MANGANESE MINE KABWE)**	Environmental Project Brief	
23.	**RAILWAY SYSTEMS –**	Environmental Project Brief	

	KABWE		
24.	**RAINBOW TRADING-LUSAKA**	Environmental Project Brief	
25.	**ASHIA HAULAGE-LUSAKA**	Environmental Project Brief	
26.	**CHISTEEL ZAMBIA-LUSAKA**	Environmental Project Brief	
27.	**ROCKWOOD QUARRY-LUSAKA**	Environmental Project Brief	
28.	**CHAT 3 BREWERY-LUSAKA**	Environmental Project Brief	
29.	**CHIMELA BREWERY-LUSAKA**	Environmental Project Brief	
30.	**KHOLOWA SERVICE STATION PETAUKE**	Environmental Project Brief	
31.	**CALIFORNIAN BEVERAGES-LUSAKA**	Environmental Project Brief Production of plastic bottles	
32.	**NAC 2000-LUSAKA AIRPORT**	Environmental Project Brief	
33.	**LAMASAT COMPANY-LUSAKA**	Environmental Project Brief	
34.	**LAMISE –LUSAKA**	Environmental Project Brief	
35.	**FORM CAP –LUSAKA**	Environmental Project Brief Production of plastic bottles	
36.	**MWANANSHIKU AND COMPANY**	Environmental Project Brief Manganese Mining	
37.	**SIWAYA LODGE**	Environmental Project Brief Building of Lodge	
38.	**JODAM MINING**	Environmental Project Brief Manganese mining	
39.	**MATCH CO. (Z) LTD**	Environmental Project Brief Eucalyptus Plantation	

40.	**BIWORLD (Z) LTD**	Environmental Project Brief Installation of a Diesel Tank	
41.	**PREMIER HOTEL**	Environmental Project Brief Renovation of existing building	
42.	**KEREN MOTORS (Z) LTD**	Environmental Project Brief Installation of a Diesel Tank	
43.	**KRONOS HOSPITAL**	Environmental Project Brief Construction of a private Hospital	
44.	**HAUCHANG RED BRICK**	Environmental Project Brief production of red bricks	
45.	**KINGFISHER MILLING**	Environmental Project Brief Mealie Meal production	
46.	**LIMBE PROPERTIES**	Environmental Project Brief Construction of a storey building	
47.	**DOLOMITE AGGREGATE**	Full- Environmental Impact Assessment of the effects of Lime Production on the surrounding Environment in Lusaka West	
48.	**FLY DRAGON (CHAMA DISTRICT)**	Full Environmental Impact Assessment of wood harvesting and Saw Milling	
49.	**NASLA CEMENT**	Full-Environmental Impact Assessment for the construction of the cement plant in Lusaka with the Capacity of 1500 tonnes per annum	
50.	**LEVY PARK – FORMER ESCO.**	**Full Environmental Impact Assessment Construction of multiuse building.**	
51.	**ODY'S HOTEL**	Full-Environmental Impact Assessment on the construction of Premier Hotel with 200 bed capacity in Lusaka.	Construction of a pump house, Installation of sewer line stretching about 2.8km, Plastering of hotel rooms and painting lots and Construction of oil (fuel) separators for Oddy's service stations.

52.	**FLAME ARAB CONTRACTORS**	Full-Environmental Impact Assessment on the construction of the five Star hotels with 200 bed capacity in Lusaka.	
53.	**SWASCO (LIBUYU SANITATION PROJECT LIVINGSTONE)**	Full-Environmental Impact Assessment for construction of sewer line and bio digesters.	
54.	**DONCROFT INVESTMENTS (CHELSTONE)**	Full-Environmental Impact Assessment for provision of residential serviced plots.	
55.	**FLY DRAGON (SIKONGO SIAVONGA)**	Full-Environmental Impact Assessment for Timber harvesting.	
56.	**FLY DRAGON (LUANGWA)**	Full-Environmental Impact Assessment for Timber harvesting.	
57.	**BANTU PARK SALES CENTER-LILAYI**	Environmental Project Brief Sales Center	
58.	**WAMUKUPIKA**	Environmental Project Brief Lodge-Emmasdale	
59.	**MICMAR INVESTMENTS**	Environmental Project Brief Office block-Along Great East Road	
60.	**OFIA INVESTMENTS**	Environmental Project Brief Mineral Exploration-Solwezi	
61.	**KALABA**	Environmental Project Brief Mine-Kitwe	
62.	**DOLPHIN**	Environmental Project Brief Lodge-Emmasdale.	

Technical Corporation and Professional Support

Tropical Environmental Management Experts is registered with the Zambia Environmental Management Agency (ZEMA)-the Statutory mandated body responsible for regulating Environmental Management., Local Authorities and other professional bodies in the country.

Tropical Environmental Management Experts also has Technical Corporation with SAVA – Sonderabfallverbrenunganlage of Germany and enjoys professional support from Sustainable Environmental Management Institute (SEMI) of Germany.

It also includes Dr. Heino Vest - International Consultant on Waste Management and formerly Director GTZ sub-Saharan Africa.

Prof. Simukanga – Metallurgist and Vice Chancellor, University of Zambia and Dr. Edward Lusambo – Head of Department, Dept. of Agricultural Engineering, Sch. of Engineering, UNZA.

Computer Knowledge

Proficient in;

- Microsoft Office.

E-MAIL:tropicaenvironmental123@yahoo.com

REF:

1. Vice Chancellor Professor Simukanga
2. Professor Jere
3. Professor Whitker
4. Professor Nkonde

SIGNATURE

FELIX CHABALA

Curriculum Vitae

NAME:	**Felix Chabala**
PROFESSION:	Civil /Environmental Engineer
DATE OF BIRTH:	7th July 1969
SEX:	Male
NATIONALITY:	Zambian by birth
LANGUAGES:	English (Fluent)
MOBILE NO:	+260 955 880216
	+260 966 880216
E-MAIL	felixchabala@yahoo.com

Affiliations:

- Member of the International Association of Impact Assessment (IAIA)
- Engineering Institution of Zambia (EIZ)

Key Qualifications

Felix Chabala holds a Master's Degree in Water Engineering from the University of Perugia in Italy as well as a Bachelor's Degree in Civil Engineering from the University of Zambia. He has over 15 years' experience in the construction industry and environmental management, compliance monitoring and enforcement in Zambia. He has supervised various infrastructure developments like Roads, Bridges and Water related projects.

Relevant working experience from present and previous assignments includes:

2001 –Jan 2010 Working as **Principal Inspector - Environmental Impact Assessment (EIA**) at the Environmental Council of Zambia (ECZ). He was in charge of the implementation of a component on Environmental Management and Compliance Monitoring of various mining related projects under the Nordic

Development Fund/World Bank Funded Copperbelt Environment Project (CEP). In addition, Felix spearheaded the review, carried out verification inspections and made recommendations for decision making of over 100 Environmental and Social Managements Plans as well over 1000 environmental Project Briefs many of them donor funded. He has also carried out compliance inspections and environmental audits on all companies that submitted ESMPs to the ECZ.

EDUCATION AND PROFESSIONAL QUALIFICATIONS

Year	Qualifications	Institution
2007	Master of Engineering – (Water)	University of Perugia - Italy
1994:	Bachelor of Engineering Degree in Civil Engineering (B.Eng.)	School of Engineering, University of Zambia
1989:	'O' Level, School Certificate Lusaka, Zambia	David Kaunda Sec Tech Sch.

PROFESSIONAL COURSES ATTENDED

Environmental Monitoring December 2007

Strategic Environmental Assessment (SEA), South Africa August 2006

Risk Management in Development Planning at Charmers University Gothenburg, Sweden April – May 2002

Advanced Certificate in **Environmental Impact Assessment** (EIA), Sweden Stockholm June – July 2003

Environmental Auditing and Communication November 2002

DETAILED DESCRIPTION OF PROFESSIONAL EXPERIENCE

2011 to date

The following table indicates some EIA studies projects undertaken:

Name of Project	Client	Year
Environmental Impact Statement for Mopani Copper Mines Area D extension open Pit in Kitwe	Mopani Copper Mines Plc	2013
Shimzu Corporation Quarry in Lusaka	Shimzu Corporation	2013
Huate International Construction Asphalt Plant in Lusaka	Huate International	2013
Environmental Impact Assessment for an Iron Ore Project in Nampundwe	Universal Mining and Chemicals Industries Limited	2012
Resettlement Action Plan for Twashuka and Mukulumpe Communities	NFC Africa Mining Plc	2011
Preparation of a Chapter on Land for the Zambia Environment Outlook Report	Zambia Environmental Management Agency	2011
Evaluation of innovative environmental project proposals for possible funding	Civil Society Environment Fund	2011
Auditing of Environmental and Social Management Plan	Albidon Zambia Limited	2011

2001 –Jan 2010 Environmental Council of Zambia (ECZ) LUSAKA–

Position: Principal Inspector -Environmental Impact Assessment (EIA)

Achievements

- As head of the Environmental Impact Assessment (EIA) Unit, I was responsible for reviewing all EIA submitted for approval, arranged for public hearings, conducted disclosure meetings and made recommendations for board approval.
- Participating in the planning, training, organizing and review of the DANIDA Strategic Environmental Assessment (SEA) for the Phase II of the Mongu – Senaga Road Project.
- Coordinated the preparation of the draft 2006 Zambia Environmental Outlook chapter on Mineral Resources
- Reviewed the Environment Programmes and Natural Resources Component of the Fifth National Development Plan (FNDP)

- Did peer review of the Repackaging of Environment and Natural Resources Programmes of the Fifth National Development Plan DRAFT Natural Resources Concept Note
- Coordinates the various Government Departments/Ministries that are stakeholders in the Environmental Impact Assessment Process.
- Carried out public disclosure of all donor/GRZ funded projects that are subjected to Environmental Assessment
- Coordinates the activities of Environmental Management Component of the NORDIC/World bank funded Copperbelt Environment Project.
- Carried out statutory environmental Audits on the following Approved Environmental and Social Management Plans (ESMPs) in order to meet the output indicators for the CEP:
    - First Quantum Mining and Operations Limited – Bwana Mkubwa Mine Site
    - Konkola Copper Mines Plc – Nampundwe Mine
    - Konkola Copper Mines -Nkana Smelter
    - Konkola Copper Mines Plc – Nchanga Mine Site
    - Kansanshi Mine
    - Chambishi Smelter
    - Over 30 Tailings dams owned by ZCCM –IH Plc
- Provided legal guidance, carried out reviews, inspections and recommendations of the following **Environmental and Social Management Plans** for the following facilities:

    - Konkola Copper Mines Plc (KCM)Heap Leach project in Chingola Zambia,
    - Mopani Copper Mines Plc underground in-situ leaching project in Mufulira,
    - Mopani Copper Mines Plc underground in-situ leaching project in Mufulira
    - KCM Plc – Chingola Heap Leach Project
    - KCM Plc Fitwaola Open Pit
    - Mopani Copper Mines Plc in Mufulira and Kitwe
    - Bwana Mkubwa Mine in Ndola
    - Chambeshi Metals Plc in Chambeshi
    - Kansanshi Mine Plc in Solwezi

- KCM Plc Nkana Smelter
- KCM Plc Nchanga Smelter
- KCM Plc Nampundwe Mine
- KCM Plc Nchanga Mine
- KCM Plc Konkola Mine

- Supervised the implementation of the following Resettlement Action Plans: KCM Kawama Project funded by World bank and, Zambia Electricity Supply Rehabilitation project funded by world bank

- Supervised the following public disclosure meetings for the following mine projects ZCCM – IH Counterpart Environmental Management Plans for Bwana Mkubwa, Luanshya, Chibuluma, Nchanga, Nkana, Chililabombwe, Mufulira and Several abandoned Tailings Dams and Mine Dumps in all Towns on the Copperbelt province of Zambia.

- Carried out environmental ***Compliance monitoring*** on over 200 facilities over a period of 8 years
- Carried out environmental Licensing (Waste Generation, air Pollution, Pesticides and Toxic Substances) on over 500 facilities in Zambia
- Carried out review and made recommendations on over 1000 Environmental Assessment Reports over a period of eight years.
- Carried out the review of Environmental Impact Assessment for the Mulungushi Dam in Kabwe for National College of Management
- Carried training in Environmental Management for the following Companies: Chilanga Cement Plc, KCM Plc, all local Authorities in Zambia, Zambia National Tourism Board
- Carried out national wide training of all local authorities in Zambia under the support from the World Bank in 2002 - 2003

1997 - 2001 RANKIN ENGINEERING CONSULTANTS
KASAMA, ZAMBIA

POSITION: SECTION ENGINEER (Infrastructure)

- Draft tender documents, invite bid and made recommendations to national Roads board on various small scale road works in Northern Province.
- Supervised the construction of the Vitondo dam in Isoka funded by the Economic Expansion in Outlying Areas (EEOA)
- Designed the small earth dam and weir. The design involved material specs. i.e. grade of concrete for the weir., materials for dam walls , angle of dam walls.
- Designed 3 culvert bridges and supervised their construction.
- Designed earth roads (Over 1000 km) in the following districts of Zambia:
  - Chinsali
  - Nakonde
  - Mpika
  - Isoka

This involved design for drainage, small bridges, material specs, and levels.

- Carried out road surveys in terms type and density of potholes, drainage, road Deformation, type and width of cracks.
- Prepared tender documents and did tender adjudication for labour based Road contractors

1995- 1997 ZCCM, KONKOLA DIVISION - CHILILABOBWE

Position Held: Section Engineer- Civil, Mechanical Construction and Contract Management

Achievements:

- Carried out contract administration for the Mine involving, Invitation to Tender, Tender Evaluation, made recommendation for Award of Contract and draft Contracts for successful bidders
- Carried out the routine maintenance of the Lubengele Tailings dam, pipeline, surface water management structures in Chililabombwe for KCM/ZCCM
- Constructed the Lubengele embankment across the Lubengele River in Chililabombwe
- Constructed an emergency earth embankment to link Kawama Township with the rest of Chililabombwe when the Lubengele Tailings dam flooded.
- Carried out road surveys (density of pot holes, drainage, types of cracks and size etc.) to determine amount of repairs required.
- Carried out Road resurfacing (8.0Km) in the townships using bitumen.

- Carries out Maintenance of roads (60 Km tarred and 100Km gravel) and buildings in the townships (over 5000 structures).

REFEREES

1) Mr Patson Zulu
Manager – Inspectorate

Environmental Council of Zambia

P.O Box 35131

LUSAKA

Mobile Number: 260 955 833581/0977 470849

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2) Mr Yoram Simbeye

Bicon Zambia Limited

4 Omelo Mumba Road

P.O Box 39528

Lusaka

Zambia

Cell 0977 - 873970

Office: 0211 232978

3. James Tembo

Senior Lecture – Department of Civil and Environmental Engineering

Great East Road Campus

P.O Box 32379

LUSAKA

Zambia

Office: 0211 290962

CURRICULUM VITAE

Manda Noah M.C

PERSONAL DETAILS

Surname: Manda

First Name: Noah M.C

Sex: Male

Date of Birth: 12th October, 1983

Place of Birth: Ndola

Marital Status: Single

Nationality: Zambian

NRC No: 333797/61/1

Mobile: 260 977 693 543

Email: noahmcm@yahoo.com

Postal Address: C/o Mr George C. Mumba
Ministry of Finance and National Planning
P.O. Box 50062.
Chimanga Road
LUSAKA

QUALIFICATIONS

UNIVERSITY OF ZAMBIA, SCHOOL OF NATURAL SCIENCES

Bachelor of Science Degree in Natural Resources (2005-2009)

Certificate in Planning, Monitoring and Evaluation (PM&E) (May, 2009)

DETAILS OF EDUCATIONAL BACKGROUND

SCHOOL	QUALIFICATION ATTAINED	YEAR
The University of Zambia- Lusaka	BSc. Natural Resources	2005- 2009
Chongwe High School- Chongwe	Grade 12 School Certificate	2003
Chifubu High School- Ndola	Grade 9 Certificate	2000
Malasha Primary School- Ndola	Grade 7 Certificate	1998

POSITIONS HELD

UNZA

University of Zambia Natural Resources Society (UNZANARSO) Executive Committee member (Trustee): (2007-2009)

Chongwe High School

Academic Prefect (Grade 12: 2003)

Red Cross President (2003)

School Tack shop Chairperson (2002-2003)

JETS Chemistry and Biology Coordinator (Grade 12- 2003)

WORK EXPERIENCE

- Environmental Council of Zambia- UNEP/GEF-IAS project: Attachment (November, 2008)
- Q &B Books and Tuition Centre- Part-time Tutor in Science and Commercial subjects.
- Participant for the training workshop on procedures and Guidelines for Risk Analysis, Early Detection and Rapid Response System for Invasive Plant Species Management in Zambia. Contributed to the Preparation of the training workshop report.

SKILLS AND ABILITIES

Computer Skills:

MS word, MS power point, MS Excel, Internet explorer and Special Package for Social Scientist (SPSS).

Research Skills:

Project proposal writing, Research Instrument Design, Data collection, Data entry, Data analysis, Report writing.

Planning, Monitoring and Evaluation Skills:

M&E plans and systems development, Construction of M&E indicators, Data systems, Results Based Management (RBM) and Use of Participatory M&E

Geography skills:

Able to work with the Global Positioning System (GPS), proficient in cartographic skills (Mapping techniques), air photo interpretation and Geographical Information Systems (GIS) data layers interpretation. Climatology, Environment and Development, Natural Resource Economics, Land Resources Survey and Soils Geography.

PERSONALITY

-Adaptive-fast learner	- Creative and Innovative
-Self-motivated	-Able to work with minimum supervision
-Able to work under pressure	- Able to work with others-team player.

Languages

Able to speak clearly English, Nyanja, Bemba, Lamba and Tonga

Workshops/ Conferences Attended/Training

- Projects presentation on bio-fuels and renewable energy by Mr. G. Musonda, (UNIDO project officer) held at UNZA, (2009).
- Procedures and Guidelines for Risk Analysis, Early Detection and Rapid Response System for Invasive Plant Species Management in Zambia (2008).
- World Environment Day 2008, (presentation on effects of climate change in agro ecological zones I&III of Zambia and adaptation options).
- The Access Initiative (TAI) Zambia Coalition team formation workshop. Trained to assess government response to disasters. (2007)
- Invasive Plant Species Management in Zambia held at UNZA by the environmental council of Zambia (2007).
- Paramedic trainee officer at Chainama Community Police Post, Ambulance Response Unit (2004)

REFEREES

Dr. Henry M. Sichingabula,
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Mr. Brian Nkandu,
National Project Coordinator, UNEP/GEF-IAS,
Environmental Council of Zambia,
Corner Suez/Church Roads,
P.O. Box 35131.
Lusaka.
Tel: 254023/254059

INTERESTS

Keep fit sports such as football, running and gym work outs. Monitoring world events ranging from environmental news, political developments, technological (Computers) advancements and business fluxes. Reading widely i.e. current affairs, magazines motivational books and religious publications. Interested in surveying cultural diversity and meeting new people.

CURRICULUM VITEA

SURNAME: LUNGU
OTHER NAME: HENRY
DATE OF BIRTH: 25TH JULY 1985
ADDRESS: C/O MR P. LUNGU,
NRDC RANCH FARM,
P.O BOX 310099,
LUSAKA.
CONTACT: 0977981988
E MAIL: henrylungu85@gmail.com

PROFESSIONAL QUALIFICATION

YEAR: 2006_2008

INSTITUTION: Natural Resources Development College

ACHIEVED: University Diploma in Water Engineering

ACADEMIC QUALIFICATION

Year	School	certificate
1993-1999	Kapwelyomba primary school	grade (7) certificate
2000-2001	Katete day high school	grade (9) certificate
2002-2004	Chadiza boarding high school	grade (12) certificate

WORK EXPERIENCE

CAMCO EQUIPMENT ZAMBIA LIMITED

Position: sales engineer
Reporting to: senior sales engineer
Period: January 2009- June 2009

JOB DESCRIPTION

- Providing technical information to clients on different pumps.
- Advising clients the best and economical methods of water supplying systems
- Reticulation of domestic and municipal water systems
- Agricultural equipment identification and sales.
- Going in the field to find new clients

MINIMAC

Position: sales manager
Reporting to: the director
Period: July 2009-October 2009
Job description

- Supervising staff for the firm
- Developing new clients and providing after sales services so as to maintain our clients
- Teaching staff how to determine pump sizes and factors that are considered for any water supply designs
- Providing solutions to problems that some sales engineers fail to handle

IRRIGATION WORLD ZAMBIA LIMITED

Position: sales engineer
Reporting to: The director

JOB DISCRIPTION

- Finding new clients for the company
- Assessing the site and providing the quotation to clients in need of our services
- Coming up with borehole reports after drilling
- Supervising plumbers and electricians as they equip the borehole
- Design and installation of irrigation systems
- Assessing and coming up with the bill of quantity for different water projects

Hobbies

- Playing chess
- Playing music
- Making new friends

Referees

1) Mr. Joseph Matambo
Managing director
Irrigation world
P.O box 359o06
Lusaka

TEL +260 211243806
CELL + (260) 977651543
+ (260) 966436868

2) Mr. Fred kabamba
Assistant sales manager
CAMCO Equipment Zambia Limited
P.O BOX 39558
Lusaka.

Tel: +260 211273263_4
Cell: +260 977785910
Email: fred.kabamba@gmail.com

3) Mr. C.S Chisakuta
Natural resources Development College
Head of department water engineering
P.O box 310099
Lusaka

P.O BOX 34933, LUSAKA, ZAMBIA.
PHONE +260 979 301544 • E-MAIL CHIBS23@HOTMAIL.COM

NCHIMUNYA HIMUNYANGA

PERSONAL INFORMATION

Age – 23 years

Sex - Female

Nationality - Zambian

NRC # - 880388/11/1

OBJECTIVE

To create an accurate presentation of myself for the application for employment.

EDUCATION

[1990 - 1996] Lumuno Primary School
Attended grades one to seven at the named school.

[1997 – 2001] St Mary's Secondary School
Attended grades eight to twelve at the named school
Obtained GCE O'level Certificate.

[2003 – 2004] University of Zambia
Attended first and second year in the School of Natural Sciences.

[2005 to date] The Copperbelt University
Attended first, second, third and fourth and final years of study
Completed a Bachelor of Science degree in Forestry.

WORK EXPERIENCE

[15th January 2007 – 28 February 2007] Copperbelt Forestry Company
Intern at the Copperbelt Forestry Company's Kalibu plant in Kitwe.
Carried out quantity and quality analysis, for the purpose of quality

control, on several company products.

Compiled a report written to highlight some of the shortcomings of the various departments at the company.

Compiled a final report establishing standard consumptions and quality control system in various sections.

[15th September 2008 – 28 September 2008] Martin Sampa & Associates

Enumerator for Environmental Baseline Study.

Compiled a legal and policy framework for mineral exploration.

Carried out data collection required for the compilation of an Environmental Project Brief, in concerned areas.

[29th August 2008 – January 2009] New Kaloko Pilot Project in Urban Agriculture.

Enumerator for Pilot Project Impact Assessment.

Carrying out monthly assessments in the project area on the themes of gender, socio-economic and the community environment.

Conducting focus group discussions to be used in gender, economic, environment, and health and nutrition scheme.

EXTRACURRICULAR ACTIVITIES

Vice President of the Copperbelt University Natural Resources and Environmental Society (CUNARES) 2006-2007.

Trustee of the Copperbelt University Natural Resources and Environmental Society (CUNARES) 2007-2008.

The society is a group of students from the School of Natural Resources at the Copperbelt University, a leading force in the coordination and unity of all its members in carrying out natural resource management projects and advancing public awareness of the beneficial influence of our environment.

HOBBIES

Reading various literatures and playing volleyball.

Mr. S. Mwewa
Operations Manager
Copperbelt Forestry Company (+260 977 844508)

Mr. R. Kasubika
CUNARES Patron
The Copperbelt University (+260 979 319871)

Mr. K. Mwelwa
Assistant Dean – School of Natural Resources
The Copperbelt University (+260 966 909250)

Mr. Martin Sampa
Managing Associate
Martin Sampa & Associates-Environmental Advisory Services
P.O Box 90885,
Luanshya, Zambia. (+260 977 437612)

Dr. J. Mwitwa
Project Coordinator
New Kaloko Pilot Project (+260 977848462)

ANNEX 5

MINING LICENSE

Kalomo

Form XVI
(Regulation 23)

REPUBLIC OF ZAMBIA

The Mines and Minerals Development Act, 2008
(Act No. 7 of 2008)
The Mines and Minerals Development (General) Regulations, 2008

LICENCE NO. **16395-HQ-LPL**

PROSPECTING LICENCE

(*Section 16 of the Mines and Minerals Development Act, No. 7 of 2008*)

Holder's name: **Daled Mining Limited**

Address: **Post Net 400, Private Bag E 017 Crossroads, Lusaka**

The prospecting area shall be the area described in the Schedule and annexed hereto and bordered **Blue** on the Plan.

The licence relates to the following minerals: **Tantalum and Tin.**

The licence is granted for a period of **2 Years** commencing on the **27th** day of **May, 2013**

The conditions of grant of the licence are as shown in the Annexures attached hereto.

Issued at **Lusaka** this **6th** day of **June, 2013**.

.....

C. Mukofu
Director

ENDORSEMENT OF REGISTRATION

This **Prospecting Licence** has on this **27th** day of **May, 2013** been registered in the Register.

.....

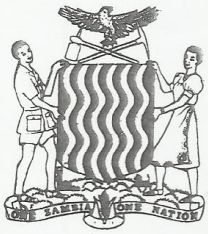
C. Mukofu
Director

ANNEX 6

DALED CERTIFICATE OF INCORPORATION

66398

pacro - lcofm 7 - 6430 Company Registration No.....



Republic of Zambia

CERTIFICATE OF INCORPORATION OF A PRIVATE COMPANY LIMITED BY SHARES

(Section 10)

This is to certify that

DALED MINING

.....Limited (full name of company)

is on and from the 20th day of April, 2007

Incorporated as a private company limited by shares.

Given under my hand and Seal at Lusaka, Zambia, this

20th day of April, 2007

A.M. Banda-Bobo

Registrar of Companies

[Note that this certificate is not valid unless the official Seal of the Registrar of Companies has been affixed]
Stocked by the Office of the Registrar of Companies

ANNEX 7

ROSINVEST CERTIFICATE OF INCORPORATION

Companies Form 7

Company Registration No. 120174
Serial No. 2548446

Republic Of Zambia

CERTIFICATE OF INCORPORATION
OF A PRIVATE COMPANY LIMITED BY SHARES

(Section 10)

This is to certify that ROSINVEST ZAMBIA LIMITED is on and from the **26th day of February, 2014** incorporated as a private company limited by shares.

Given under my hand and seal at Lusaka, Zambia, **26th day of February, 2014.**

N. J. Moola

.....

Assistant Registrar of Companies

(Note that this certificate is not valid unless the official seal of the Registrar of Companies has been affixed)

0117876

We, the several persons whose names and addresses are subscribed, wish to be formed into a **PRIVATE JOIN VENTURE COMPANY LIMITED BY SHARES** in pursuance of this application, and we respectively agree to take the number of shares in the capital of the company set opposite our respective names. Company: **ROSINVEST ZAMBIA Limited**.

Forenames and surname	Nationality and NRC Number or passport number	Residential address	Postal address	No. and class of shares to be taken		Signature of subscriber (On behalf of Company)
				Ordinary	Preferential	
VIDAYU HOLDINGS CORPORATION ZAMBIA LTD.	Certificate of Incorporation № 86125	Plot 6786 , Chiwalamabwe Rd., Olympia, Lusaka	P.O.Box 320112 Woodlands, Lusaka, Zambia	2,500		
DALED MINING LIMITED	Certificate of Incorporation № 66398	Plot 5176, Chishango Rd., Villa Elizabetha, Lusaka, Zambia	P.Bag E 017, Cross Roads, Lusaka, Zambia	2,500		

VIDAYU HOLDINGS CORPORATION ZAMBIA LIMITED REG. No. 86125 REPUBLIC OF ZAMBIA

DALED MINING LIMITED email: daled-mining@email.com 25 FEB 2014 POST.NET 400 P/BAG E017, LUSAKA

Dated the ……24…… day of…… February …… 2014

Witness to the above signatures:

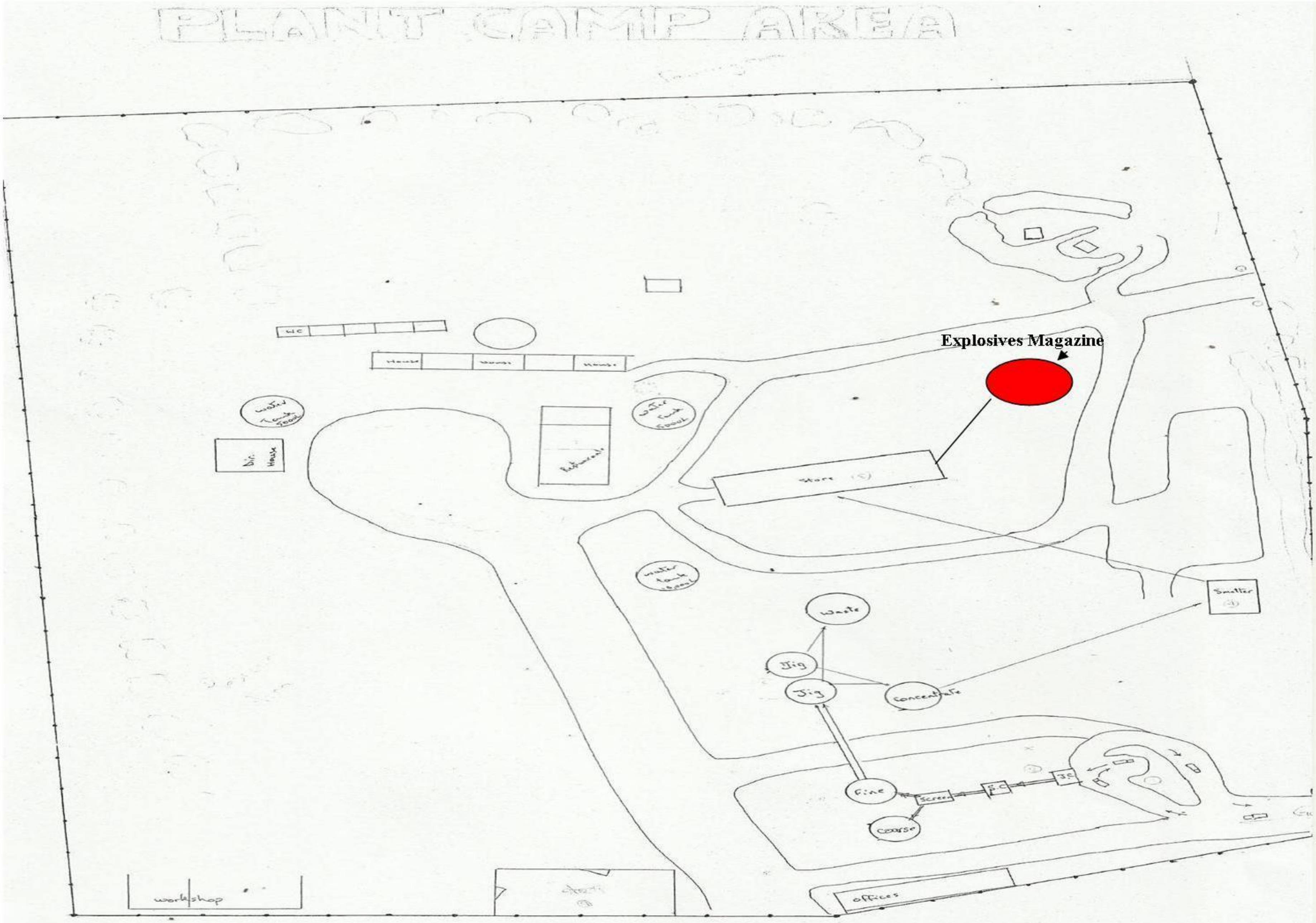
…V.Mikhaylichenko….. …Chivalamabwe Rd., Plot 6786, Olympia ……. Businessman……..
Name Address Occupation Signature

Name and address of individual lodging the application:

…Yury Zhukov, ……Central Street, Plot 66, Jesmondine……

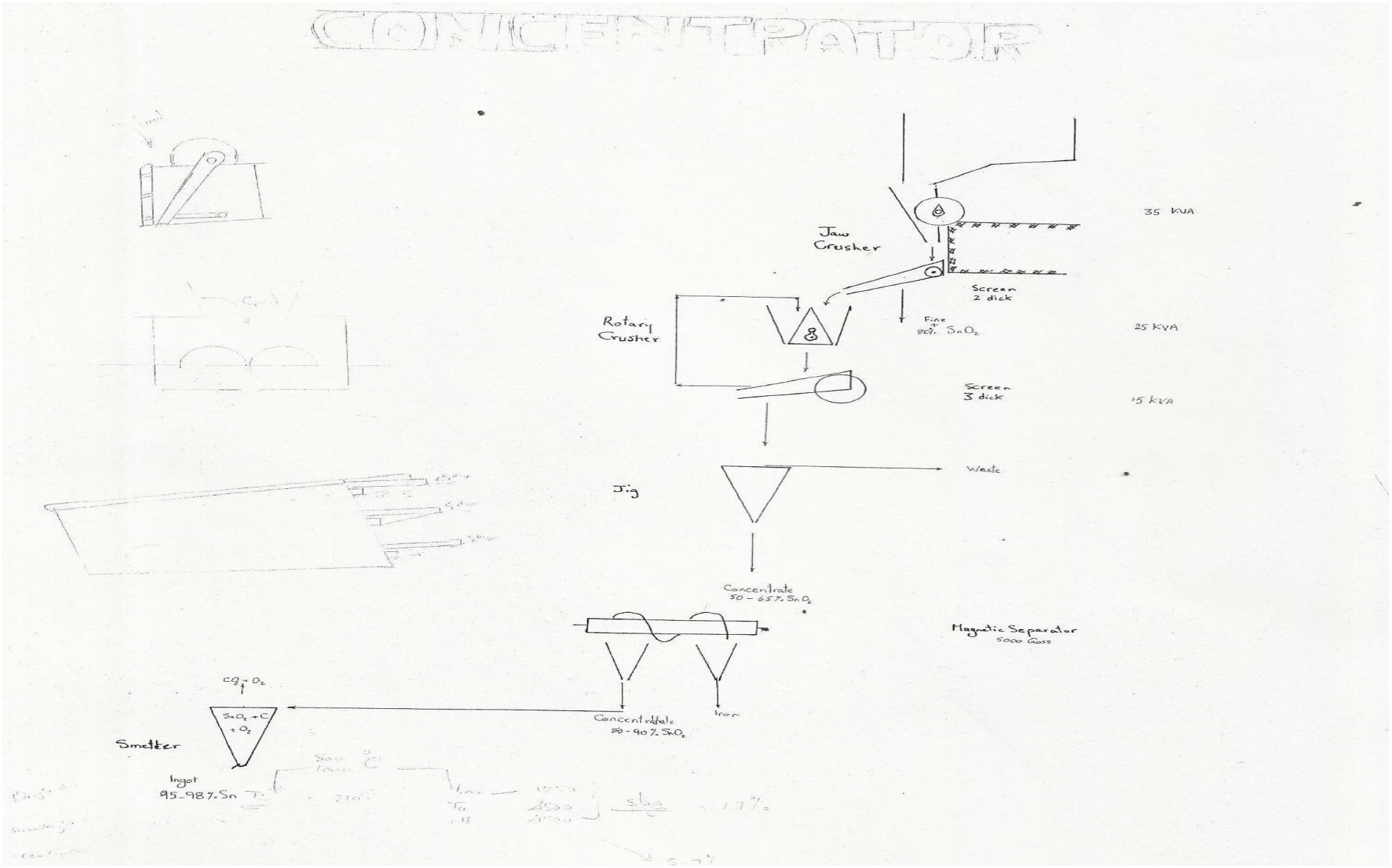
ANNEX 8

MINE LAY OUT PLAN


PLANT CAMP AREA
Explosives Magazine
W.C
House
House
House
water tank
water tank
Restaurant
Store
Smelter
water tank
Waste
Jig
Jig
concentrate
Fine
Screen
S.C
J.C
coarse
workshop
offices

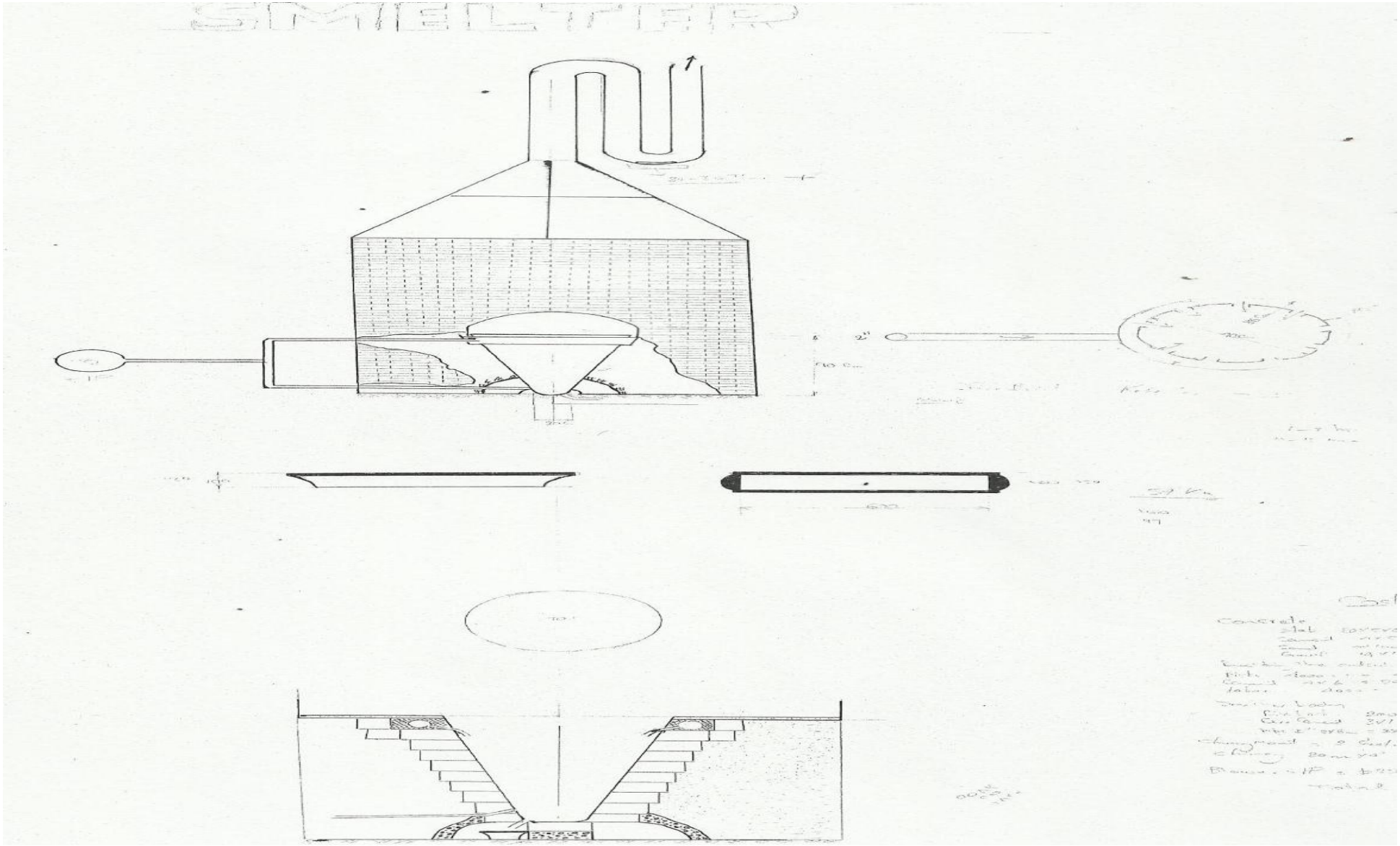
ANNEX 9

CONCENTRATOR DESIGN


CONCENTRATOR
35 KVA
Jaw Crusher
Screen 2 dick
Rotary Crusher
Fine
80% SnO_2
25 KVA
Screen 3 dick
15 KVA
Jig
Waste
Concentrate
50 - 65% SnO_2
Magnetic Separator
5000 Gauss
$CO_2 + O_2$
$SnO_2 + C + O_2$
Smelter
Concentrate
80 - 90% SnO_2
Iron
Ingot
95-98% Sn

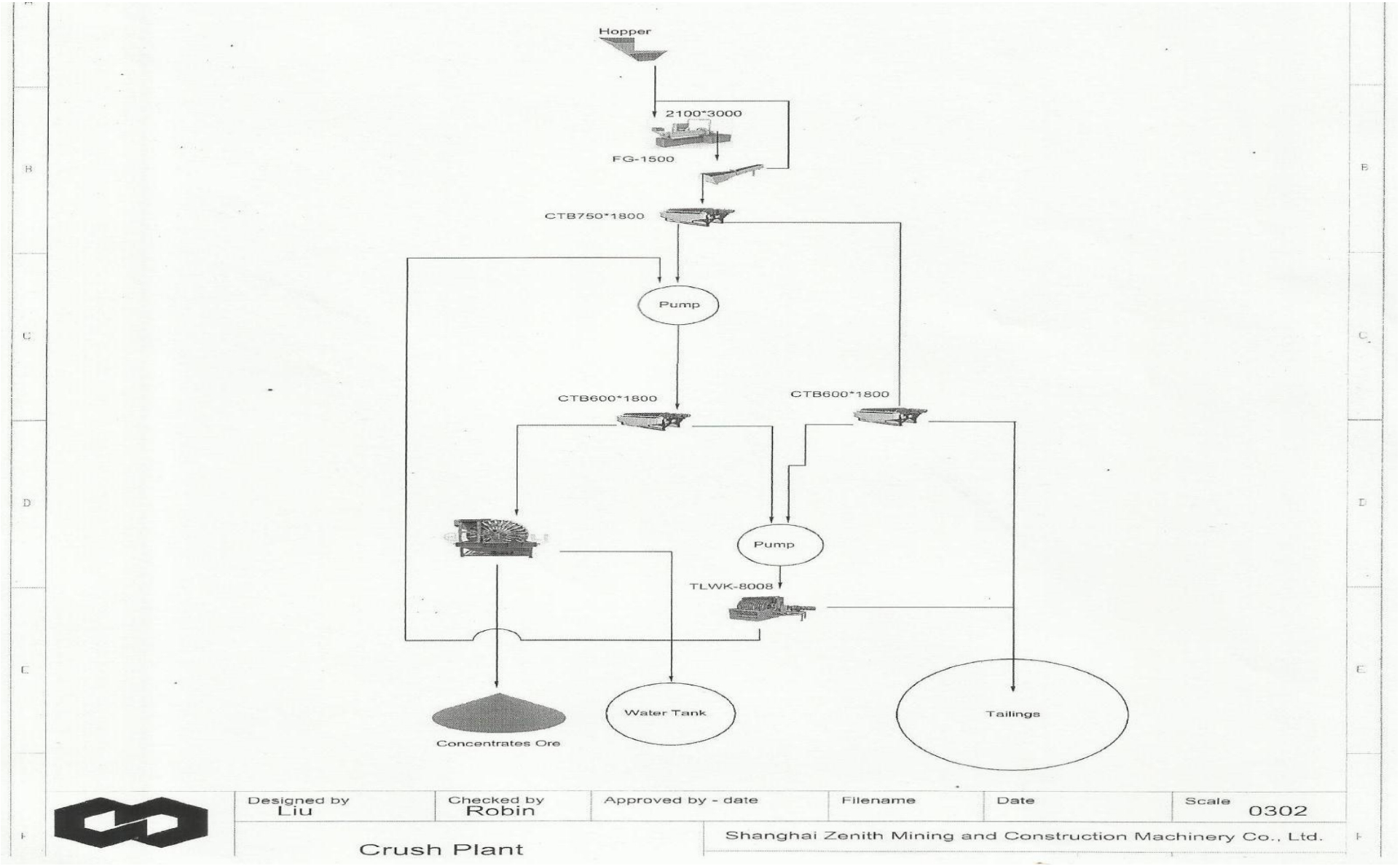
ANNEX 10

SMELTER DESIGN



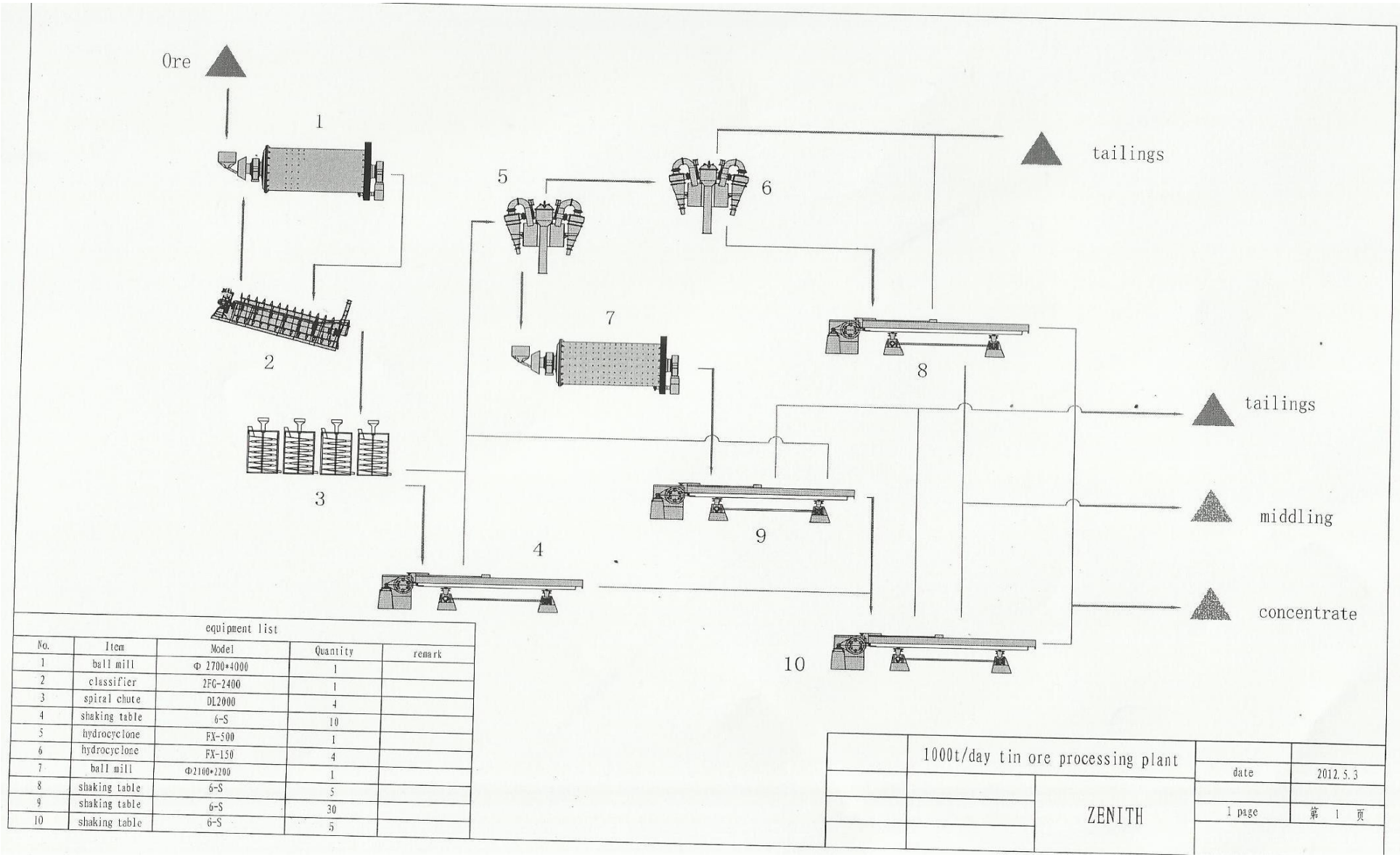
ANNEX 11

CRUSH PLANT


Hopper
2100*3000
FG-1500
CTB750*1800
Pump
CTB600*1800
CTB600*1800
Pump
TLWK-8008
Water Tank
Tailings
Concentrates Ore
Designed by
Liu
Checked by
Robin
Approved by - date
Filename
Date
Scale
0302
Crush Plant
Shanghai Zenith Mining and Construction Machinery Co., Ltd.

ANNEX 12

TIN PROCESSING PLANT



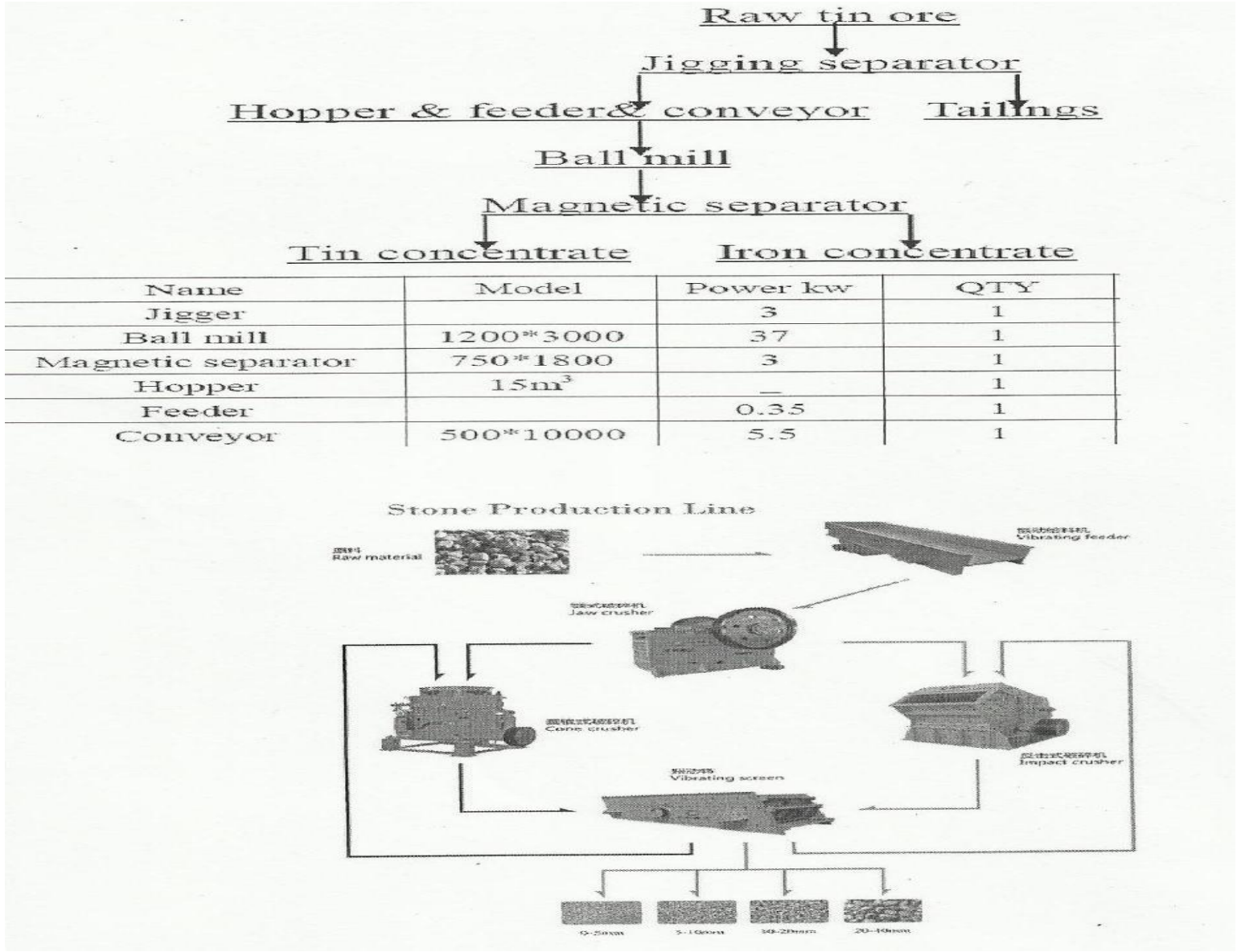
equipment list

No.	Item	Model	Quantity	remark
1	ball mill	Φ 2700*4000	1	
2	classifier	2FG-2400	1	
3	spiral chute	DL2000	4	
4	shaking table	6-S	10	
5	hydrocyclone	FX-500	1	
6	hydrocyclone	FX-150	4	
7	ball mill	Φ2100*2200	1	
8	shaking table	6-S	5	
9	shaking table	6-S	30	
10	shaking table	6-S	5	

	1000t/day tin ore processing plant		
		date	2012.5.3
	ZENITH	1 page	第 1 页

ANNEX 13

STONE PRODUCTION LINE



Name	Model	Power kw	QTY
Jigger		3	1
Ball mill	1200*3000	37	1
Magnetic separator	750*1800	3	1
Hopper	15m³	—	1
Feeder		0.35	1
Conveyor	500*10000	5.5	1

ANNEX 14

GRAVITY CONCENTRATOR CIRCUIT

ANNEX 15

ROCK CRUSHING CIRCUIT

ANNEX 16

TANK DESIGN

ANNEX 17

UNZA LABORATORY RESULTS

ANNEX 18

LETTER FROM THE CHIEF

ANNEX 19

SITE LOCATION MAP

ANNEX 20

TOPOGRAPHICAL MAP

ANNEX 21

GEOLOGICAL MAP