ALBIDON (ZAMBIA) LIMITED

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ENVIRONMENTAL IMPACT ASSESSMENT

THE MUNALI UNDERGROUND NICKEL MINING PROJECT

Prepared for

ALBIDON (ZAMBIA) LIMITED
Munali, Zambia

By

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June 2006

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EXECUTIVE SUMMARY

This executive summary relates to the Munali Underground Nickel Mining Project Environmental Impact Assessment carried out by African Mining Consultants (“AMC”) for and in conjunction with Albidon Zambia Limited (“Albidon”) the project developer, with close liaison with the Environmental Council of Zambia, the Department of Mines Safety and the local community.

The Munali Underground Nickel Mining project is located in the Southern Province of Zambia, approximately 60km south west of Lusaka, the capital of Zambia and 16km south of the town of Kafue. The project is located 2.5km from the main sealed bitumen road between Lusaka and Livingstone, with access to Botswana and western Zimbabwe. It is approximately 20km from the Nega Nega railway siding on the Lusaka–Bulawayo railway line with the Kafue River running approximately 20km to the north of the project.

The project developer is Albidon, a Zambian registered company. Albidon is a wholly owned subsidiary of Albidon Limited, an integrated Australian explorer and resources Development Company listed on the London Stock Exchange’s Alternative Investment Market (“AIM”) and the Australian Stock Exchange (“ASX”).

Albidon plans to develop an underground mining operation focusing on the extraction of Nickel (principally), copper, cobalt and Platinum Group Metals (“PGM’s). The mine will be accessed via a shallow box cut and portal with a decline continuing in the footwall of the orebody. The maximum depth of mining operations presently planned is some 500 metres below surface. Ore will be mined using a drill and blast open stoping method and extracted from the mine using 40 or 50 tonne articulated trucks. All vehicles will access the underground workings via the main footwall decline.

The ore extracted from the mine will be processed on surface at the site through a mill and concentrator (process plant). The ore will be crushed and milled before being floated to produce a nickel, copper, cobalt concentrate containing PGM’s. This concentrate will be thickened, filtered and dried before being stockpiled prior to export for smelting. Transportation of the concentrate is expected to be via road or rail to a selected smelter in region or overseas.

The waste product from the concentrator process (tailings) will be pumped to a dedicated area called a tailings storage facility (“TSF”) where it will be stored. The waste rock from underground will be contained in a specially designed waste rock dump on surface. The location of these facilities is outlined in **Figure 2.3.** Additional infrastructure will include a mine workshop for the maintenance and repair of equipment, mine site offices, the Munali ZESCO sub-station, possibly some accommodation for itinerant workers and various mine access roads.

As part of the requirements of the Zambian Environmental and Mining regulations, Albidon is required to produce an Environmental Impact Assessment (“EIA”) which must be approved by the Environmental Council of Zambia and the Department of Mines Safety before Albidon can start construction of the mine.

The EIA must contain the following details; an executive summary, a detailed description of the project, an environmental and social study of the project area (prior to project development), a projection of the environmental and social impacts of the project, an analysis of alternatives to the project, an environmental and social management plan to manage projected impacts and appendices of relevant information. This executive summary forms part of the EIA, which was carried out by AMC for and in conjunction with Albidon between October 2005 and May 2006.

An environmental and social study carried out by AMC between October 2005 and May 2006 established that the project area is located in a greenfield site (no major industry) and partly coincides with a small village called Chinkomba. Site investigations, discussions with local people and village census' carried out by AMC and Albidon established that there are 73 households in Chinkomba Village, of which 18 will be relocated (6 in Phase 1 and 12 in Phase 2). The main livelihood of the people is farming with a number of fields identified on the project area and mapped out by Albidon. Due to the location of the proposed portal and decline part of the village will have to be relocated including farm plots which may increase the total number of households to be relocated (approximately 20 households). In this regard, Albidon has contracted AMC to produce a Resettlement Action Plan ("RAP") which has identified those people affected by the project subject to relocation and fair means of compensation through the development of new homes and purchasing alternative farmland at a location sufficient distance from the project area but accessible to the relocated villagers, as agreed through extensive public consultation.

Data derived from the Zambian Meteorological department defines that climatically, the project lies in a semi arid area known as agro-ecological zone number II, receiving between 750mm and 1,000mm of rainfall every year. The rainfall is concentrated between November and March, with the occasional shower at other times. Average minimum and maximum temperatures range between 15^{o}C from May to June and 38^{o}C in October. Frosts are rare and the prevailing wind is from the south-east. No data is available on air quality in the area. It is considered to be generally good, however dust from cooking fires and the burning of grass during the dry season may cause some short term localised deterioration of air quality.

The topography of the project area is defined by surface drainage to the Kafue River to the west. The main topographical feature in the area is the Munali pass, to the north of the project, which rises to 1,288m above sea level.

An ecological assessment carried out by AMC Ecologist Mr Lishomwa Mulongwe established that the area was once comprised of dense riparian (riverine) vegetation, Miombo and Munga woodland all of which have been greatly disturbed by previous human practices such as charcoal burning, clearing of areas for agriculture and over grazing. Currently there is as a fairly limited amount of vegetation and as such there is also a very low population of animals in the area. The area however supports a diverse population of bird life including species such as the ground hornbill, nightjar, and buzzard, several species of kite, honeyguide, spotted eagle and guinea fowl.

An archaeological assessment of the area carried out by Mr. Collins Chipote, Archaeologist, National Heritage and Conservation Commission (NHCC), Lusaka, established that there were no archaeological artefacts on site. The nearest cultural resource was the one known as the Munali pass monument which commemorates the voyage of Dr David Livingstone through the Munali pass and his first view of the Kafue River on the 14th December 1855 during his trans-Africa journey from Angola to Mozambique. The pass, "*Munali*" meaning the "*Red One*", is named after him and is located in the Munali hills north of the project.

A hydrological review of the area indicates there are a number of small streams located within the project area. These streams are dry for most of the year. During the time of the baseline study there were no flowing streams within the permit area. A surface water sample was collected from the dam on the mine permit to identify the characteristics of surface runoff during the rainy season. The results indicated that surface water quality was generally good [quantifiable].

Three groundwater boreholes were identified and sampled in the project area. The results indicate that groundwater quality is generally good with a pH of 6.8. However, nickel, iron, chromium and total suspended solids concentrations exceed WHO Drinking Water Quality Standards in all three bore holes sampled. These boreholes are currently used as potable water supply for Chinkomba Village. Nickel and chromium have the potential to be carcinogenic to humans and the slightly high level of lead recorded at one of the boreholes could be a cause for concern. Albidon has identified that water in the project area may not be suitable for potable water supply and is committed to providing clean water to employees during operations. As such Albidon has planned to develop a water tank/filtration/chlorine dosing system to be used a potable water supply for employee's onsite.

The main **positive** impacts identified during the compilation of the EIA were:

- Employment. It is estimated that between 200 and 400 people will be directly employed either directly by Albidon or indirectly through contractors during the 12-month mine construction phase. During the mine operational phase, approximately 250 Zambian nationals and up to 20 expatriates will be employed directly by Albidon. Additional jobs will be generated in service industries in Mazabuka, Kafue, Lusaka and the Copperbelt.

- The project investment is expected to introduce beneficial multiplier effects in the local and regional economy. The project will promote the business of local suppliers and contractors providing goods and services to the mine. A direct favourable economic impact of the project in the area will be the additional employment earnings generated within the local economy.

- Albidon aims to promote economic diversification during the life of the mine and expand opportunities for alternative (and sustainable) economic activity.

- The development will result in the potential electrification of the surrounding area as a result of a dedicated 33kV line from Kafue to the project area.

- The resettlement of parts of Chinkomba Village could result in better housing, education and medical facilities becoming available to resettled Chinkomba Residents at the new site.

The main **negative** impacts identified during the compilation of the EIA were identified as;

- Involuntary Resettlement - the development of the mine will result in the involuntary resettlement of up to 18 households from part of the Chinkomba Village. Albidon is in the process of developing a Resettlement Action Plan and is liaising closely with affected parties, including Chief Naluama. At the date of this EIS Albidon has agreed an alternative resettlement location and is in the process of agreeing a compensation package. The impacts of those moved would be that their cultural links to the land established over twenty to thirty years in the Chinkomba area may be impacted, economic and educational activities will be relocated (however there are educational and clinic facilities in close proximity to the relocated site) and access to markets will be modified as a result of the relocation.

- Acid Rock Drainage – Studies on the mine waste (tailings) have indicated that the waste has the potential to produce mildly acidic water when rainfall flows through it. Albidon will put in place appropriate risk mitigating measures in order to protect groundwater from pollution. When required, the mine will operate a lime dosage system wherein lime will be mixed with the tailings to ensure the tails are fully neutralised and the potential for AMD is mitigated. Albidon will monitor groundwater quality for 5 years after mine closure and if required will implement measures to mitigate any adverse affect on the local groundwater.

- Reduction/ Deterioration in groundwater supply – To facilitate underground mining, groundwater entering the mine area will be pumped out. During mine dewatering the surrounding water table may be affected (i.e. lowered). Since the main water supply in the area is derived from groundwater boreholes, any reduction in the groundwater level in the area could result in a reduction of available potable water in the area. Albidon will monitor groundwater levels around the mine using ground water monitoring bores. If there is a marked reduction in groundwater level impacting the local community Albidon will supplement the local water supply with mine water.

- Noise and Vibration – levels of noise and vibration are likely to increase during operation of the mine. This impact may disturb local people and bird life. Albidon will endeavour to manage these impacts by maintaining equipment and setting up a complaints register where people can register any reasonable complaint including those relating to noise disturbances. If any complaints are made regarding noise and vibration, Albidon will address these complaints on a case by case basis.

- Visual Impacts – The area of the development is generally flat (apart from the Munali pass) and there will be noticeable (surface facilities) from the main road.

- Safety – The mine area may be a potentially dangerous place for both workers and the general public if they enter the mine without authorisation. Albidon will inform the public of the dangers and restrict access to the mine to authorised people only. Albidon will ensure international standards are in place to ensure the risks to personnel are properly managed.

An Environmental Management Plan to manage the above mentioned impacts and other less significant impacts has been developed and is described in detail in the EIA. The approach is based on Albidon's corporate environmental policy, Zambian Environmental Regulations, industry best practice and international standards.

Albidon will implement an Environmental Monitoring Plan prior to project construction that will focus on surface water and groundwater quality and air emissions quality. The plan will monitor environmental performance and compliance with Zambian Environmental Regulations and other relevant guidelines/limits.

Albidon will implement internationally accepted occupational health and safety standards and procedures throughout construction and operation of the project to create a safe workplace thereby protecting its employees and contractors from accidents and illness. The Company will also implement education and support to mitigate the spread of HIV/AIDS and malaria.

Albidon will implement a Mine Reclamation Plan at closure. The plan will focus on the reclamation of the tailings dam, ore pads, process plant and workshops. The reclamation plan will include re-vegetation of any heavily impacted areas and making safe of any areas providing access to the underground workings. The main objective of the plan will be to return the land to conditions capable of supporting the former land use or an alternative sustainable land use, and to prevent adverse effects on adjacent water resources.

Albidon has initiated a comprehensive public consultation process, and this will continue in parallel with project development and operation.

Signatures of Persons Involved in the Compilation of the Environmental Impact Assessment for the Munali Project

Mr Dale Rogers — Managing Director, Albidon Limited.

Mr Martin Broome — Principal Consultant African Mining Consultants

Mr Mbita Chifunda — Environmental Engineer African Mining Consultants

Mr Nyundo Armitage — Environmental Consultant African Mining Consultants

Miss Angela Duerden — Environmental Scientist African Mining Consultants

Dr Mitulo Silengo — Associate Cohort 9 Leadership for Environment and Development (LEAD) Southern Africa/African Mining Consultants

Mr Lishomwa Mulongwe — Principal Research Officer, Division of Forest Research / African Mining Consultants

Mr Collins Chipote — Archaeologist, National Heritage Trust,

1. POLICY, ADMINISTRATION AND REGULATORY FRAMEWORK

1.1 PROJECT DEVELOPER

The Munali Nickel Project is owned by Albidon Zambia Limited ("Albidon"), a Zambian registered company. Albidon is a subsidiary of Albidon Limited, an integrated Australian explorer and resources development company listed on the London Stock Exchange's Alternative Investment Market ("AIM") and the Australian Stock Exchange ("ASX"). Albidon successfully listed on both the AIM and ASX on 25th & 26th March 2004 having raised a total of AUD$15 million to develop its portfolio of nickel-platinum exploration projects in south-eastern Africa and copper-gold and zinc-oxide projects in North Africa.

Albidon Limited was incorporated on 11th April 2000 in the BVI under the International Business Companies Act for the purpose of holding mineral exploration and development assets in Africa, with an emphasis on nickel. The initial funding for these projects was provided by the founders of the Company, and also by joint venture partners Falconbridge Limited for the exploration properties in Zambia, and Goldstream Mining NL for the Luwumbu project in Tanzania (more recently funded by Lonmin Plc). African Lion Limited ("AFL") became a major investor in Albidon in May 2002 and has continued to make substantial additional investments in the Company up to the present time.

The major shareholders in Albidon are African Lion Ltd, a number of institutional investment groups in the UK, Australia and Canada and the founders of the Company (Donal Windrim, Alasdair Cooke and Craig Burton). Albidon has no producing mines and is principally engaged in the exploration and development of nickel projects in southern Africa. The founders of the Company have successfully developed a similar nickel mining project in Western Australia. Albidon's exploration projects are located within the Company's large tenement portfolio that spans the countries of Zambia, Botswana, Tanzania, Malawi and Tunisia.

1.2 CORPORATE ENVIRONMENTAL POLICY

Albidon is committed to pollution prevention and responsible environmental stewardship at all stages of the Project from initial development through construction, operation, decommissioning, closure and post closure monitoring. The Company is also committed to working closely with the local community and promoting independent sustainable economic development.

Albidon's corporate environmental policy is detailed in **Appendix I**.

1.3 REGULATORY FRAMEWORK

1.3.1 Preparation of an Environmental Impact Assessment

This Munali Nickel Project Environmental Impact Assessment ("EIA") has been undertaken in accordance with the requirements of the Zambian Environmental Protection and Pollution Control ("Environmental Impact Assessment") Regulations, 1997. The Environmental Council of Zambia ("ECZ") established under the Environmental and Pollution Control Act, 1990 is responsible for EIA review and approval, and for monitoring the implementation of the Developer's Environmental Management Plan.

Albidon management has maintained close contact with the ECZ and the Department of Mines and Minerals Development throughout the preparation of the EIA document, keeping both bodies informed of project design changes and other developments.

It is normal procedure under Zambian EIA Regulations for the Developer to first produce an Environmental Project Brief (detailed Scoping Study Report), which is submitted to the Mines Safety Department ("MSD") and the ECZ for review. After reviewing the project brief the ECZ assess whether or not the project environmental impacts are likely to be significant. If significant, the Developer is requested to undertake a full EIA. Due to the nature of the project and planned large-scale mining operations the ECZ instructed Albidon not to produce a project brief and to proceed directly to the EIA stage. Albidon compiled draft Terms of Reference ("TOR") which were reviewed and approved by the ECZ. The scope of work required to complete the EIA was indicated in those TOR's prior to the EIA commencement.

1.3.2 Review of an Environmental Impact Assessment

The Developer is required to submit 12 copies of the EIA to the ECZ. The Council will distribute the EIA to relevant authorising agencies who will make comments on the report within 30 days of receipt.

The Council will distribute copies of the EIA to relevant government ministries, non-government and community based organisations and all interested and affected parties. Copies of the EIA will be placed in public buildings in the vicinity of the proposed project for public perusal. The Council will advertise in the national press and broadcast on national radio information detailing the availability of the EIA to the public for inspection and the procedures for submitting any comments. If deemed necessary the Council may organise or instigate public meetings in the vicinity of the project.

After considering the EIA document and comments from all interested and affected parties the Council will decide whether to issue a decision letter or hold a public hearing.

In arriving at its decision the Council will take into account:-

- Impact predictions made in the EIA;
- Comments from interested and affected parties;
- The report of a person presiding over a public hearing (where applicable); and
- Any other factor the Council considers crucial in the particular circumstances of the project.

The Council will approve the project with or without conditions or reject the project. When a project is approved an authorisation licence/permit is issued, signed by the Director of the ECZ.

If there is no public hearing the Council will make its decision within 60 days. In the event of a public hearing the Council's decision could take an additional 95 days.

The Zambian Environmental Regulations specify that a review fee must be submitted together with the EIA document. The review fee is calculated on the basis of the project's capital cost. The schedule of fees payable is summarised in **Table 1.1**.

Table 1.1 Schedule of Fees for Review of EIA by the ECZ

Project Capital Cost US$	EIA Review Fee US$
< 100,000	1,000
100,000 - 500,000	10,000
500,000 - 1,000,000	25,000
1,000,000 - 10,000,000	50,000
10,000,000 - 50,000,000	100,000
>50,000,000	150,000

Zambian Environmental regulations require the EIA to be updated annually to reflect any changes to the mining operation and/or the Environmental Management Plan (EMP). The regulations further specify that an environmental audit of operations be undertaken between 12 and 36 months after project commencement. This audit will focus on environmental performance and implementation of the environmental and social management plans. The ECZ will advise on the frequency of subsequent audits.

1.3.3 Zambian Environmental Regulations Applicable to Mining Projects

The Zambian Environmental Regulations applicable to the Munali Nickel Project include, but are not limited to the following:-

- Statutory Instrument No.31 of 1995 - The Mines and Minerals Act;
- Statutory Instrument No.299 of 1997 - The Mines and Minerals (Environmental) Regulations;
- Statutory Instrument No.20 of 1997 - The Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations;
- Statutory Instrument No.72 of 1993 - Water Pollution Control (Effluent & Waste Water) Regulations;
- Statutory Instrument No.141 of 1996 - Air Pollution Control (Licensing and Emission Standards) Regulations;
- Statutory Instrument No.71 of 1993 - Waste Management (Licensing of Transporters of Wastes and Waste Disposal Sites) Regulations;
- Statutory Instrument No.20 of 1994 - Pesticides and Toxic Substance Regulations;
- Statutory Instrument No.102 of 1998 - Mines and Minerals (Environmental Protection Fund) Regulations;
- Statutory Instrument No.125 of 2001 - Hazardous Waste Management Regulations;
- Statutory Instrument No.271 of 1993 - Environmental Regulations; and
- Statutory Instrument No.171 of 1992 - Ionising Radiation Protection Regulations.

Albidon is committed to comply with all of the above legislation, which regulates most aspects of interaction between the project and the natural environment.

Albidon currently holds prospecting licence PLLS199 (Mvuma Hills Prospecting Licence) under the Mines and Minerals Act, 1995 covering an area of 737km^2. This licence was granted to Albidon in September 2002 for a period of 2 years and was renewed in September 2004 for a further 2 years. Kabeswa (PLLS213) is another prospecting licence held by Albidon. It has an area of 295km^2. Mugoto (PLLS250) is another prospecting. Portions of these licences have recently been replaced by a Large Scale Mining Lease approved by the Ministry of Mines and Minerals Development on 12th of June 2006. Additional prospecting licences cover large portions of the surrounding region.

Under the Environmental Protection Fund Regulations, 1998, the Developer is required to contribute to an Environmental Protection Fund. This fund exists to ensure that the Developer implements the progressive mine rehabilitation plan and mine decommissioning and closure plan as described in the EIA. The regulation specifies that the Developer will contribute 20%, 10% or 5% of the estimated project environmental protection costs to the fund. The actual fund contribution is dependent on the Developer’s proven track record in responsible environmental management.

Prior to project commissioning, the Developer will apply to the ECZ for all operating licences required under the Zambian Environmental Regulations. These include:-

- A Waste Disposal Licence for the tailings storage facility (TSF) and waste rock dumps;
- A Waste Transport Licence for the tailings delivery pipeline from the concentrator to the tailings storage facility; and
- An Effluent Discharge Licence for the discharge of mine effluent to surface waters. Effluent quality shall comply with the statutory limits for effluent discharged to the environment.

1.3.4 Project Development Agreement

Under the Mines and Minerals Act the Minister of Mines and the Developer have entered into a Development Agreement with the Government of the Republic of Zambia (“GRZ”). The purpose of this agreement is to encourage and protect large-scale investments in Zambia, such as the Munali Nickel Project. In the agreement, Albidon states its corporate environmental policy and reaffirms its EIA commitment to comply with all of the Environmental Regulations of Zambia and to implement its Environmental Management Plan. The agreement is dated 12th June 2006.

1.4 INTERNATIONAL EIA GUIDELINES

Most international financial institutions and banks have introduced regulations and guidelines, which compel project proponents to undertake an Environmental Impact Assessment. These regulations/guidelines are usually based on the World Bank Guidelines for Environmental Assessment (Operational Policy 4.01 - January 1999). The World Bank’s environmental policy reflects international environmental standards, which are collectively known as the World Bank Group (“WBG”) standards.

Although alternative protocols and standards do exist, the WBG standards are considered to be the international benchmark for environmental assessment. An EIA performed to WBG standards will satisfy most financial institutions.

The content of a Zambian EIA is analogous to that of a World Bank Environmental Assessment Report for a Category A Project i.e. a project *likely to have significant adverse environmental impacts that are sensitive, diverse or unprecedented*.

The content of a Zambian EIA and World Bank environmental assessment are summarised in **Table 1.2**.

Table 1.2 Content of Zambian EIA and World Bank Environmental Assessment

Zambian EIA	World Bank Environmental Assessment
Executive Summary	Executive Summary
Detailed Project Description	Policy, Legal and Administrative Framework
Baseline Environmental Study	Project Description
Environmental Impacts	Baseline Data Collection
Mitigation Measures	Environmental Impacts & Mitigation Measures
Analysis of Alternatives	Analysis of Alternatives
Environmental Management Plan (EMP)	Environmental Management Plan (EMP)
Appendices	Appendices

World Bank environmental guidelines and Zambian standards for effluent discharged to the environment are the same except for the emissions containing copper, cadmium, zinc, free cyanide and total suspended solids. For these parameters Albidon will adopt the more stringent World Bank Standards.

1.5 EIA ADMINISTRATION AND STRUCTURE

Albidon appointed African Mining Consultants (“AMC”) as project environmental consultants in August 2005. Mr. Mbita Chifunda - AMC Senior Environmental Engineer co-ordinated and managed the Munali Environmental Impact Assessment.

The Munali EIA was primarily undertaken as part of the Project’s Bankable Feasibility Study (“BFS”) which began in August 2005 and is scheduled to finish in mid 2006. The EIA document is an important part of the BFS and will provide substantial input into the way in which the project will be managed. This EIA was undertaken in close consultation with the ECZ and in accordance with the requirements of the Zambian Environmental Regulations to ensure that an appropriate environmental assessment report is available for submission to the ECZ should the project proceed to the development stage.

A 6-month baseline environmental data collection programme was begun in September 2005 and finished in March 2006 and the EIA completed in May 2006. AMC assembled a multi-disciplinary team of specialists/consultants from within Zambia to collect baseline environmental data and assist in EIA preparation.

A project description and details of planned mining and metallurgical operations were obtained from Albidon and JR Roche Mining who undertook or managed most of the engineering design work for the project.

In line with Zambian EIA Regulations, Albidon organised a public consultation meeting, which was held at Munali on 9th November 2005. The meeting was advertised in the Zambian national press. Relevant government departments, non-governmental organisations and the general public were invited to attend. The Munali Nickel Project was described in detail by Albidon and answers to questions posed by the public on the project operational, environmental, socio-cultural and economic aspects. Minutes of the public consultation meeting and a list of attendees are presented in **Appendix II**. ECZ approved the draft EIA TOR on 3rd October 2005. Copies of the draft TOR and ECZ approval letter are presented in **Appendix III**.

Comments by the various participants will be taken into consideration during preparation of the draft EIA/SIA, which will be submitted to the ECZ.

Formal submission of the EIA to the ECZ will occur as part of Project permitting. This is expected to occur in the near future in conjunction with the completion of detailed design work.

1.6 PUBLIC CONSULTATION

Throughout the process of the EIA Albidon has endeavoured to involve the local community as much as possible. Regular meetings with selected stakeholders have been undertaken on a regular basis and three official public consultation meetings have been carried out.

Table 1.3 Summary of Public Consultation Meetings

Date of Meeting	Type of Meeting
Wednesday 1ST June 2005	Tour of the Nickel Project in Munali Hills and meeting with Mazabuka member of parliament and local dignitaries
Monday 25TH July 2005	Tour of the Nickel and irrigation Projects in Munali Hills
Sunday 21ST August 2005	Tour of the Nickel Project in Munali Hills
Wednesday 9th November 2005	Munali Environmental Impact Assement (EIA) Public Consultation Meeting
Friday 12th May 2006	Munali Environmental Impact Assessment (EIA) Public Consultation Meeting

Three meetings have been conducted between senior Albidon staff and selected stakeholders see Appendix II. Aspects of the project have been discussed with community leaders and the community has been informed of project developments throughout the EIA process. An additional two public consultation meetings have been undertaken to review and discuss the Environmental Impact Assessment and provide a forum for the community to express any concerns.

During operation an area will be allocated as a public information centre at the project which will contain relevant project information and a complaints / suggestions book will be available for the public to make comments. Albidon will endeavour to involve the local community as much as possible and have regular consultation meetings throughout the course of the project.

2. PROJECT DESCRIPTION

2.1 INTRODUCTION

The Munali Ni-Cu-Co-PGM project is located approximately 60km south of Lusaka in Zambia. The Project's location is shown in **Figure 2.1**.

Albidon acquired the Prospecting Licence covering the Munali Project in late 2002. Initial exploration work included validation of and building on previous work, which had been carried out intermittently following discovery of mineralisation in 1969. Desktop analysis in late 2004 indicated that an underground operation with an on site concentrator might be viable assuming a resource of 4Mt @ 1.3% Ni and approximately 1g/t combined PGM's. This gave encouragement to continue exploration work in the area.

Extensive diamond drilling in 2004 led to the identification of a higher grade nickel sulphide breccia, which is semi-continuous over approximately a 750m strike length, in the south western corner of the Munali Intrusive. This Resource located in this area of the Munali Intrusive is now called the "Enterprise Deposit". This area had been the subject of previous resource estimates for the project. Based on the updated drilling database a new geological interpretation and resource estimate were completed in early 2005. The undiluted resource estimated at that time, some 4Mt at 1.35% Ni of Inferred material, formed the basis of a Scoping Study completed early-2005. That study evaluated Munali as a mechanised underground mining operation. Two production scenarios were considered, at 500ktpa and 750ktpa, feeding a sulphide flotation plant to produce a bulk Ni-PGM concentrate on site. Concentrate grades were expected to be in the range of 10-15% Ni.

Following additional drilling throughout the remainder of 2005 a revised resource of the Enterprise deposit was completed in mid-December. In round numbers, the Indicated Resource was a total 4.5Mt at just under 1.4% nickel. In addition to this there was a further 2.5Mt of Inferred Resources at a similar grade.

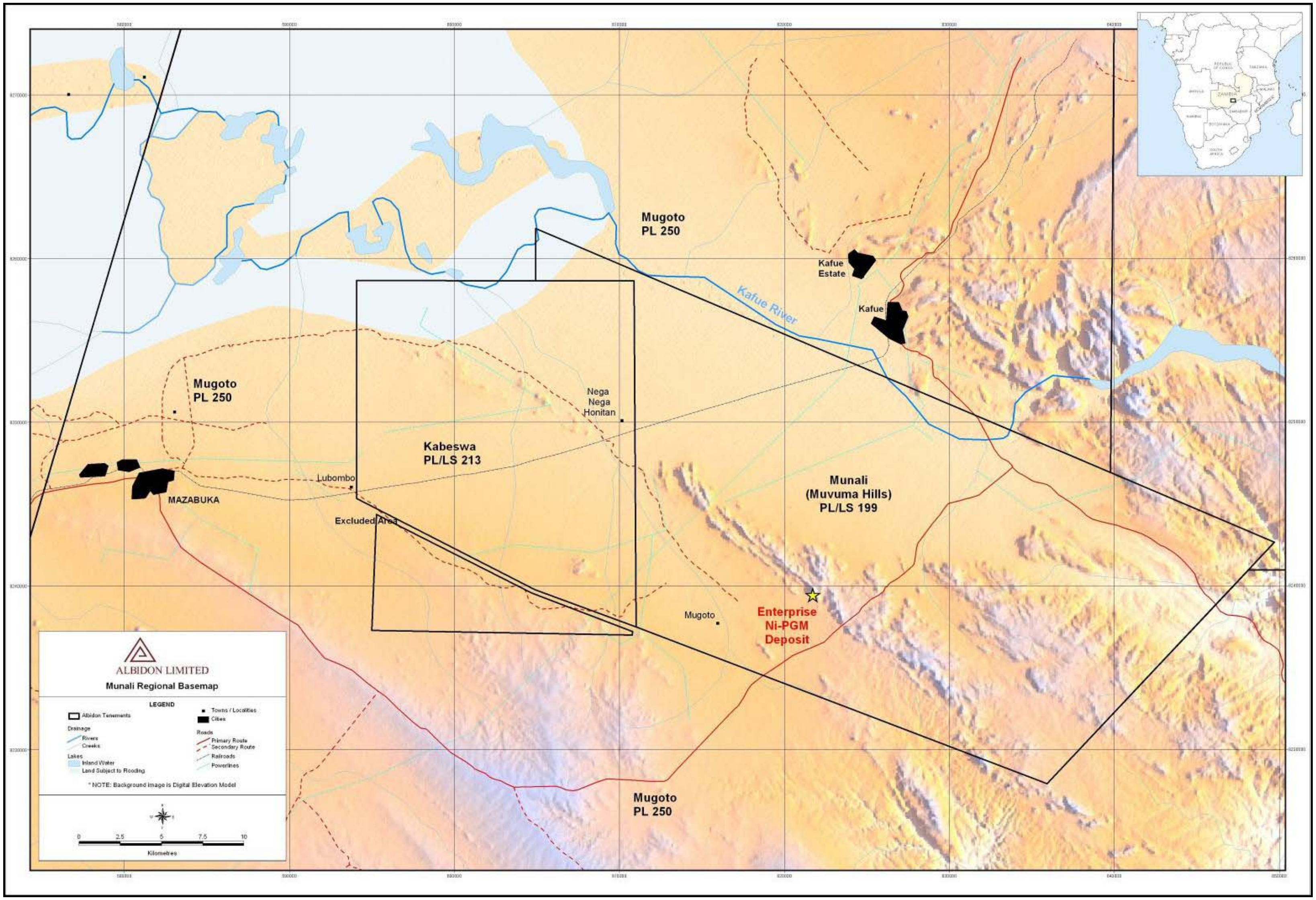


Figure 2.1 Location of the Munali Ni-PGM Project and related tenements

2.2 PROJECT TIMING

The Bankable Feasibility Study on the Enterprise Resource commenced in Mid-2005 with drilling in and around the Enterprise Resource. The timetable for development of the Project is estimated to be as follows:-

- 1st Quarter 2006 – Commenced concentrate marketing negotiations and Development Agreement negotiations with GRZ;

- 2nd Quarter 2006 – Geotechnical, hydrological, Environmental, Social, flora and fauna studies completed;

- 2nd/3rd Quarter 2006 – Completion of the BFS and Development Agreement negotiations. Commence preliminary financing discussions;

- 3rd/4th Quarter 2006 – Complete Project financing;

- 4th Quarter 2006 – Commence recruitment, commence mobilisation to site, importation of equipment, vehicles and concentrator components, commence infrastructure construction and commence excavation of the Box cut and decline development;

- 1st/2nd Quarter 2008 – Concentrator commissioning and first Concentrate deliveries.

2.3 PROJECT OVERVIEW

The Munali Nickel Project was one of the initial prospects contained in the Albidon Limited Prospectus in February 2004. Since the initial Prospecting Licences were granted in Albidon's favour exploration activities have continued throughout the area.

2.3.1 Location

The Project is located at a greenfield site in the Southern Province of Zambia, approximately 60km southeast of Lusaka, the capital of Zambia. The town of Kafue is approximately 16km northeast of the deposit. The border with Zimbabwe is approximately 75km southeast of Munali. The Project area is located 2.5km from the main sealed bitumen road between Lusaka and Livingstone, with access to Botswana and western Zimbabwe, and approximately 20km from the station at the Nega Nega siding on the Lusaka–Bulawayo railway line. The Kafue river, located about 20km to the north, is a large, permanent water course, and 33kV power lines from both the Kafue Gorge and Kariba hydro-electric schemes pass close by the Project.

The Enterprise deposit is therefore close to the main highway, national power grid and a relatively large skilled work force. **Figure 2.2** shows the location of the Project.

The project lies within his Royal Highness Chief Naluama's Chiefdom. Portions of Chinkomba village are close to the planned mining activities and hence there will be need for resettlement of some of the villagers.

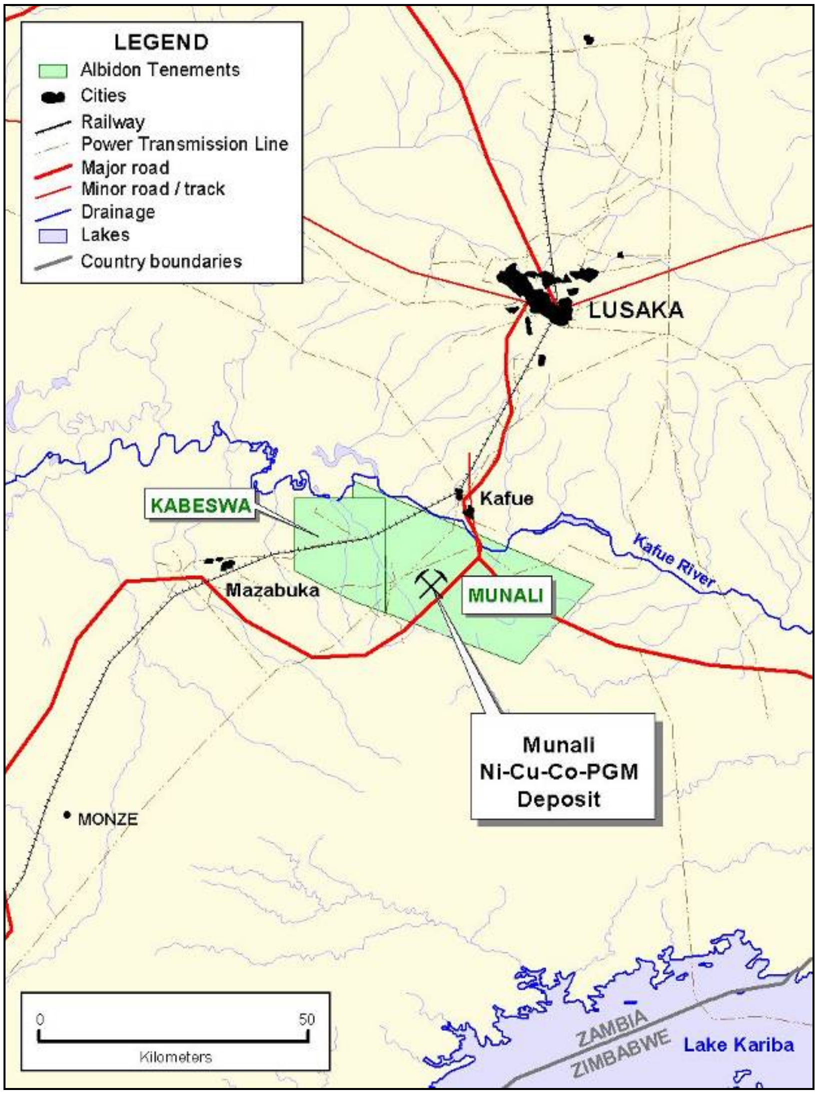


Figure 2.2 Location Plan of Munali Project showing drainage areas and regional infrastructure

The main geological feature in the Munali district is an intrusion of gabbro which has an oval shaped surface projection. This Munali Intrusion is located, at its closest point, approximately 2.5 kilometres from the main sealed bitumen road between Lusaka and Livingstone. As such there is access south to Botswana and west to Zimbabwe via the Chirundu road.

The project area is also in close proximity to the Kafue hydroelectric power station, with power lines for the Kafue generators passing within 10 kilometres of the intrusion.

The Cape class railway line, from Lusaka south through Botswana to South Africa, runs approximately 15km to the northwest.

2.3.2 Project History

Small scale exploration for gold and silver was carried out during colonial times, with minor excavations being the only remaining visible remnants of that activity. The Munali nickel deposit was discovered in 1969 by Charter Exploration Ltd as a result of a broad investigative programme of anomalous nickel values in stream sediments. From 1970 to 1977 Zamanglo Exploration Ltd carried out extensive regional exploration and drilling at Munali. 68 drill holes with over 21,636m of sample rock were drilled in the deposit and an informal mineral resource of 10.4 Mt at a grade of 1.13% Ni and 0.16% Cu was estimated.

In 1988, Apollo Mining Ltd was granted a prospecting licence covering the deposit, they engaged Mineral Resources Development Inc (“MRDI”) to undertake a series of development studies, which were conducted up to 1995. This included completion of pre-feasibility reports in 1989 and 1992 based on Zamanglo’s field data and resource, and a limited programme of resource checking with 11 new drill holes in 1994. No further work was completed after 1995.

Albidon acquired the project in September 2002 and in October of the same year commenced exploration work with ground geophysical surveys and a 3-hole drill programme. This work was intended to create confidence in the previous exploration work carried out at Munali and to investigate alternative development scenarios that might lead to enhanced economics for the project. Two metallurgical composite samples of the drill cores were taken for milling and flotation test work.

A preliminary scoping study was completed by Albidon in 2003, based on the compilation of past exploration and the drilling results of work carried out in 2002. The potential for open pit mining and eventual underground mining of deeper resources to produce a 10% Ni concentrate to be marketed to smelters and refineries in the region was investigated.

In 2004, a smaller scale underground operation with an on site concentrator was indicated to be viable through detailed desktop studies. This assumed a resource of 4Mt at a grade of 1.1% Ni and approximately 1g/t combined PGM's (platinum & palladium).

During 2004, more extensive drilling was carried out by Albidon and a detailed Scoping Study was completed in 2005 to assess the economic potential of an underground mine. The development strategy for this operation was based on the ability to selectively mine higher grade portions of the resource (0.7% Ni cut-off grade) to improve the overall average mining grade and provide an acceptable margin.

Subsequent to the Scoping Study, Albidon committed to a phased Bankable Feasibility Study (“BFS”). A continuous drilling programme to improve confidence and understanding of the resource was the major component of the Scoping Study. Additional work included: metallurgical testwork; hydrological studies; commissioning of social and environmental impact assessments; design and engineering of the proposed concentrator and associated infrastructure; geotechnical drilling and study; concentrate marketing and logistics, negotiation of a Development Agreement with the Government of Zambia, initial discussions with debt funding providers and negotiation of an acceptable power supply agreement.

2.3.3 Geology

2.3.3.1 Local Geology

The Munali nickel deposit is hosted within the Munali Intrusion, a largely gabbroic body which forms an elongate rectangular body of about 2.7km length and 0.5km width at surface, concordantly intrusive into Neoproterozoic sediments (**Figure 2.4**).

The Munali intrusion is interpreted to be a stratabound sill-like magma conduit hosted within a locally folded recrystallised Katangan (ca 850Ma) limestone (marble) with local graphitic horizons. The intrusion has stoped into, and separated the marble in the middle and therefore a “rind” of marble can be found on both sides of the intrusion. Immediately outward of the marble, a thin (<5m) calc-silicate horizon is developed possibly representing either a sandy limestone or a contact metasomatic front present up to about 15m adjacent to the mafic-ultramafic sill. Both the marble and calc-silicate horizons are hosted within a banded, weakly haematitic quartzite. Above the haematitic quartzite is a thick package of biotite-andalusite schist, whilst below the quartzite the footwall stratigraphy includes scapolite and kyanite schists which overly a basal (west-facing) conglomerate. The conglomerate is in contact with porphyritic granite (Munali Hill’s granite) which intrudes ca 1,100 Ma granite gneiss basement.

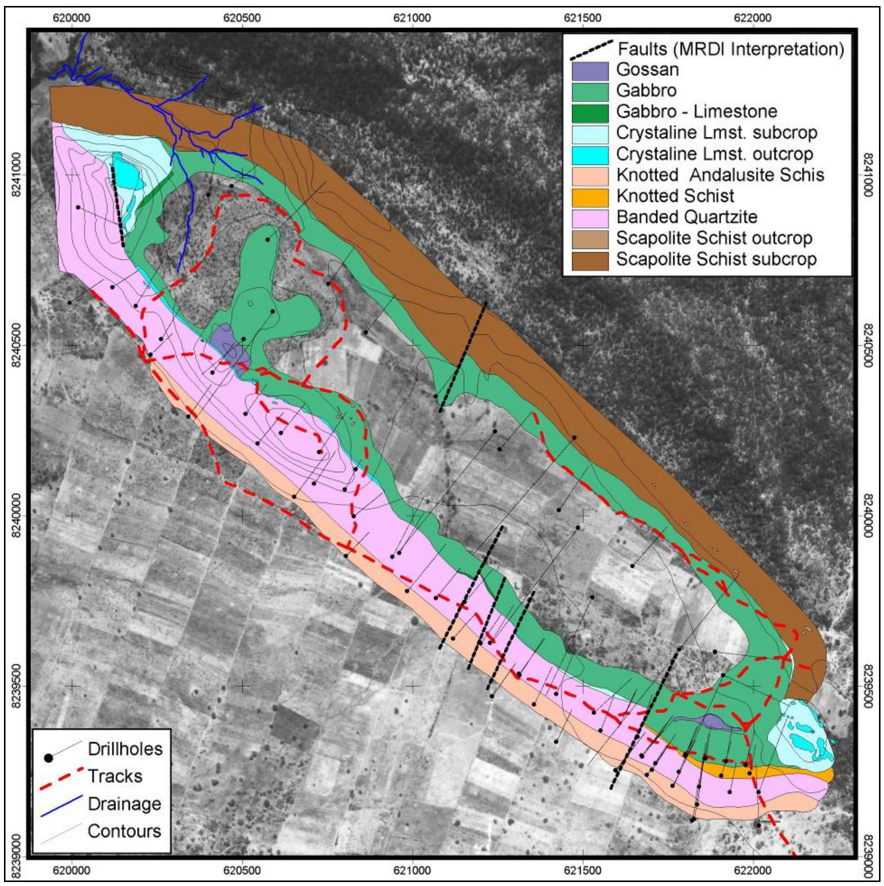


Figure 2.4 Aerial Photograph showing Surface Projection of Geology

2.3.3.2 Mineralisation

An extensive diamond drilling programme carried out in 2004 identified the higher grade nickel sulphide breccia, which is semi-continuous over approximately 800m of strike, in the south-east of the Munali Intrusive. This resource has been called the “Enterprise Zone”. A new geological interpretation and resource estimate was completed in 2005 and the Indicated Resource was 4.5Mt at a grade of 1.4%Ni and an Inferred Resource of 2.5Mt at a similar grade.

Nickel sulphide mineralisation is developed irregularly within a 70 to 100m wide zone of variably brecciated, serpentinised and carbonate altered ultramafic and gabbro which is concordant with and constrained by the marble unit as a structural hangingwall and gabbro as the structural footwall. The interpreted resource comprises a semi-continuous 4-7m wide sulphide breccia core, intimately associated with millimetric to metric-scale serpentinite clasts, located toward the base of the ultramafic breccia. This zone locally bifurcates and thickens forming a distinctive WNW trending shoot, which has been targeted for bulk mining. A number of discontinuous mineralised surfaces are located sub-parallel to and mainly within the hangingwall of the principal surface, toward and locally juxtaposed to the marble contact. These surfaces are known as hybrid breccias and comprise decimetric-metric bands of magnetite-carbonate ± sulphide. Mineralisation dips approximately 70^{o} to the SW. Zones of shear are marked by talc schist, and lesser biotite-chlorite schists.

Within the mineralisation, massive sulphide comprises an annealed aggregate of 5-10 mm euhedral pyrrhotite grains with 1-2 mm pentlandite coatings, and 2-10 cm chalcopyrite grains occurring at grain triple junctions. Rounded fragments of carbonate display palimpsest textures after cumulate olivine. These are observable due to a fine dusting of magnetite around the grains. Medium-course grains of apatite, coarse grained secondary magnetite, and rounded serpentine clasts are also common inclusions, although within the true massive sulphide sections the proportion of clasts does not exceed 20%. Late brittle veins of carbonate-pyrite occur locally. Away from the central core, stringer-vein sulphides occur together with carbonate (± serpentine-magnetite) veins often displaying magma streaming textures.

The Munali orebody dips SW at approximately 55-70 degrees with a slight plunge towards the north. Orebody thicknesses vary from centimetres to approximately 30m in the widest zones. The current geological interpretation has a significant portion of the resource between 2 and 8m wide. Strike length is approximately 750m.

In addition to the main orebody, lower grade lodes exist in the hangingwall. These lodes have been assumed to be sub-economic at this stage, except where they join into the main orebody. Future drilling is planned to better understand the potential of these lodes. Geotechnical studies are currently being undertaken as part of the BFS.

Initial studies indicate that the orebody and surrounding rock masses are generally competent and there are no fatal flaws with the proposed mine layouts or methods of extraction.

The resource was estimated with the Surpac software using an inverse distance squared interpolation technique. A high grade mineralised surface has been interpreted which occurs towards the base of a much thicker sulphidic ultramafic breccia zone, at the margin of the Munali intrusive. This surface is interpreted as a more or less continuous sheet, varying in width from less than 4m to greater than 25m. **Figure 2.5** shows an oblique projection of the Munali deposit.

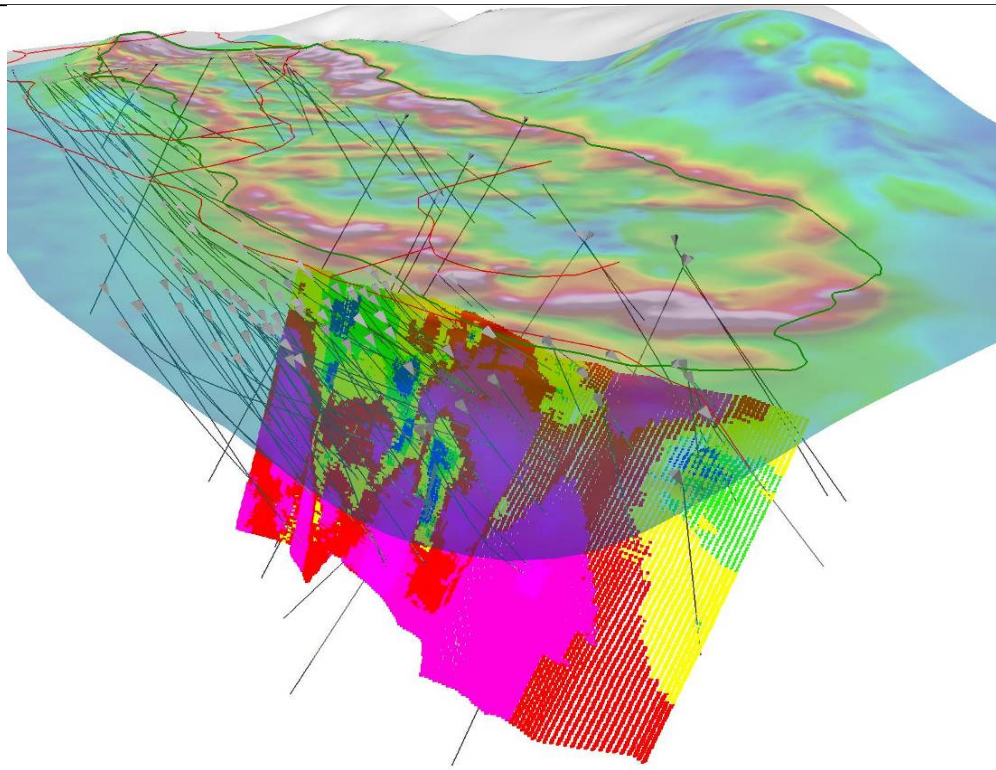


Figure 2.5 Oblique Projection of the Enterprise Resource

2.4 METALLURGY

2.4.1 Historical Work

Over the period 1971 to 1975 the Central Services Division of Nchanga Consolidated Copper Mines in Kitwe, Zambia carried out laboratory test work which generally produced low grade concentrates. Sighter tests appear to be erratic but later testwork was systematic and provides the only rigorous evaluations to date of the grind sensitivity and effect of pH on Munali metal recoveries. The mineralogy which was carried out at the time is considered valuable.

A later programme was carried out at Lakefield Research in Canada. Some flotation work was done with the main aim of producing a high recovery, low grade nickel concentrate although one sample targeted production of a high grade concentrate. This testwork indicated that the reagent regime for the production of a pentlandite concentrate and the flowsheet for the ore was potentially simple.

More recent testwork was done at Independent Metallurgical Laboratories ("IML") on a sample with a 0.63% Ni head grade in 2003. This comprised 23 flotation tests in two phases. The results of this testwork were inconclusive as the progress from one test to another was accompanied by more than one change in conditions. However a flowsheet was developed which produced a saleable concentrate at a moderate recovery.

To enable input of recovery and concentrate quality data into the 2005 Scoping Study, a review of the limited historical metallurgical testwork was carried out with the following objectives:

- Review and discuss historical testwork;

- Assess the probable recoveries of nickel and by-product elements based on historical testwork;
- Estimate capital and operating costs for the processing facilities;
- Benchmark the proposed concentrator operation relative to other nickel flotation concentrators; and
- Recommend a testwork schedule to develop the metallurgy to a suitable level to support a Feasibility Study on the project.

As part of the Scoping Study the testwork results over the range of concentrate results from historical tests were graphed and a grade/recovery curve regressed from these results.

It was assumed that recovery will be limited on the upper side by mineralogy as it was believed that 12-15% of the nickel was to be contained in pyrrhotite. It was also assumed that the presence of talc would reduce the nickel recovery by around 3%, either through losses in the concentrate from talc pre-float or, if this was not used, through the presence of talc during the rougher/scavenger flotation. It was therefore believed that around 15% of the nickel would not be available for recovery to a saleable grade concentrate. If 90% of the available nickel is recovered to a 10% Ni concentrate, then a recovery in the mid to high 70’s is generated.

Improved recoveries over the historical testwork results were expected due to:-

- The head grade from underground production will be higher than the sample tested at IML;
- Optimisation of pyrrhotite cleaning, talc depression and the collector had not been carried out; and
- Addition of lime and other reagents to the grinding stage had not been fully explored.

Subsequent to this work and as part of the BFS a considerable metallurgical testwork programme has been undertaken. This testwork programme involved the following process:-

- Approximately 50kg of diamond core was selected from representative areas throughout the Enterprise deposit;
- This material was crushed to form a “super composite” totalling approximately 50kg of material;
- The super composite was split into 1kg sample sizes;
- Initial scoping flotation testwork, on the 1kg samples, focused on an appropriate grind size for the ore;
- Following this, flotation testwork focused on the most effective reagents to be used in the flotation cells;
- Grindability testwork to determine the optimal crushing and milling circuit required for the concentrator;

- Flotation testwork then focused on an optimal flowsheet for a concentrator;
- Optimisation of the various reagents to be used in the concentrator; and
- Variability testwork throughout the resource to determine the differences in recovery within the resource.

Based on the metallurgical testwork programme to date results indicate that a concentrate averaging approximately 15% delivers nickel recoveries of approximately 78%.

Testwork for the BFS is being completed at both Independent Metallurgical Laboratories (IML) and AMMTEC, in Perth, under the supervision of Albidon.

The completion of the BFS testwork will involve:

- Grindability testwork to provide input numbers into the design and engineering of a concentrator;
- Flotation testwork of composites throughout the deposit to test for variability;
- Reagent optimisation; and
- Design and engineering of the concentrator.

2.4.2 Plant Flowsheet

The process plant will be designed to treat the massive sulphide ores from the underground mine at the Enterprise Resource. An overview of the flow sheet is shown in **Figure 2.6**.

Following underground mining and excavation the ore will be tipped onto the run of mine (“ROM”) stockpile immediately adjacent to the process plant. The present assumption for the comminution circuit is that the ore will be subjected to a single stage of crushing followed by grinding in a SAG mill. However, the BFS will examine two options:-

- Single stage crusher and SAG mill; and
- Three stage crusher followed by a Ball mill.

From the mill the slurry will be pumped through a cyclone cluster to classify the material according to size. A grind size of approximately 80% passing 75µm will be targeted. Overflow material from the cyclone cluster will be passed through a trash screen to remove any detritus from the mining operation that may have been carried with the ore. Underflow from the cyclone cluster will be returned to the mill for additional grinding and reclassification.

The material that is appropriately sized will enter a flotation reagent tank, or conditioning tank, where reagents will be added to suppress talc and aid the flotation of the sulphide material.

The slurry will then pass through a series of rougher, scavenger and cleaner flotation cells to produce a concentrate-slurry. This material will then be put through a thickener, to remove excess water, before it is dried and placed in a concentrate storage shed.

2.4.3 Expected Concentrate Quality

Test work for the BFS has indicated that a concentrate grade of 12% provides an average recovery of 80% nickel. The initial recoveries in the financial model are slightly lower as mining progresses through the transitional zone, immediately below the oxide material of the resource.

2.4.4 Consumables / Reagents

Various consumables are required to operate a nickel concentrator. These include:-

pH modifier	Lime or slaked Quicklime
Activator	Copper sulphate
Collector	Sodium Ethyl Xanthate
Talc Depressant	Guar
Flocculant	Various propriety substances
Frother	IF50
Milling balls	60 to 100mm steel
Crushing consumables	propriety manufactured parts.

These are the anticipated consumables and reagents however, various alternatives will be trialed during the commissioning phase and ongoing operation of the concentrator and therefore these may change in time. As these items are not widely available within Zambia it is expected that these will be imported via the nearest port.

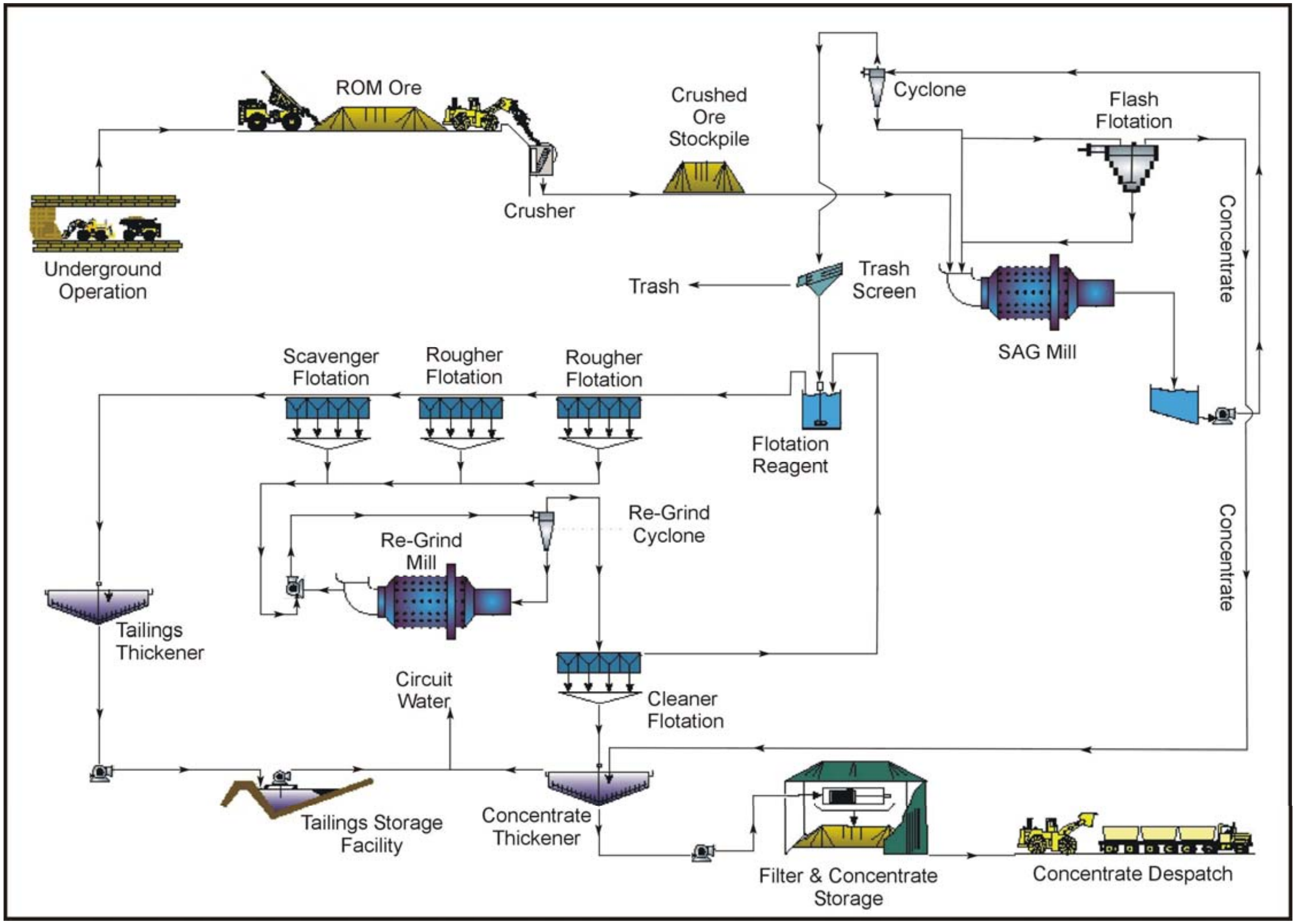


Figure 2.6 Process Flow Sheet for the Munali Concentrator

2.5 MINE SCHEDULE

Mine development is expected to commence in late 2006, which starts with the development of the box-cut.

The decline advance rate will build up to approximately 150m per month (30 to 35m per week). A single jumbo has been scheduled until sufficient multiple headings (more than 3-4 faces) are available. This occurs when the 960m level take-off is commenced, approximately 12 months from commencement of the decline. At this stage a second jumbo is commissioned. Once this is done, the decline advance rate will increase to approximately 400m per month. To maintain a production rate of 500-750ktpa the second jumbo is utilised for a period of 12 months after which the advance rate reduces to 200m per month, again utilising just 1 jumbo. By the time the second jumbo is decommissioned the first primary long-hole stopes will have been developed.

The scheduling has assumed a single jumbo will be used for the majority of the life of the operation but a second jumbo will be available to deal with operational issues, such as additional support, additional stopping, and possibly mechanised cut and fill of some minor areas.

Production from the benching levels has been assumed at a maximum of around 20,000t per month per level for either the north or south end. Production from open stoping has been assumed at a maximum of around 30,000t per month from 1 level. This will be easily achievable given that some levels have up to 3-4 primary stopes.

The long-hole stopes have been scheduled so that the primary and secondary stopes are mined first and the lower grade sill pillars are mined during the final 2 years of the operation.

The general development layout can be viewed in long projection in **Figure 2.7**. Access to the underground levels will be via a 5.5m high and 5.5m wide 1:7 decline. This decline will be capable of supporting 40 to 50tonne underground articulated trucks. Levels will be spaced every 22.5 vertical meters. Capital development comprises of the decline, level access/crosscuts, vertical development (airway and escape way) and any footwall drive development, which is considered long term development and links into the exhaust airways. Footwall drives give greater flexibility through permitting greater production rates and flow-through ventilation. Currently the layout allows for primary air to travel down the decline and enter the levels via the crosscuts. Dirty air will be directed to one of two 3.0m diameter exhaust rises.

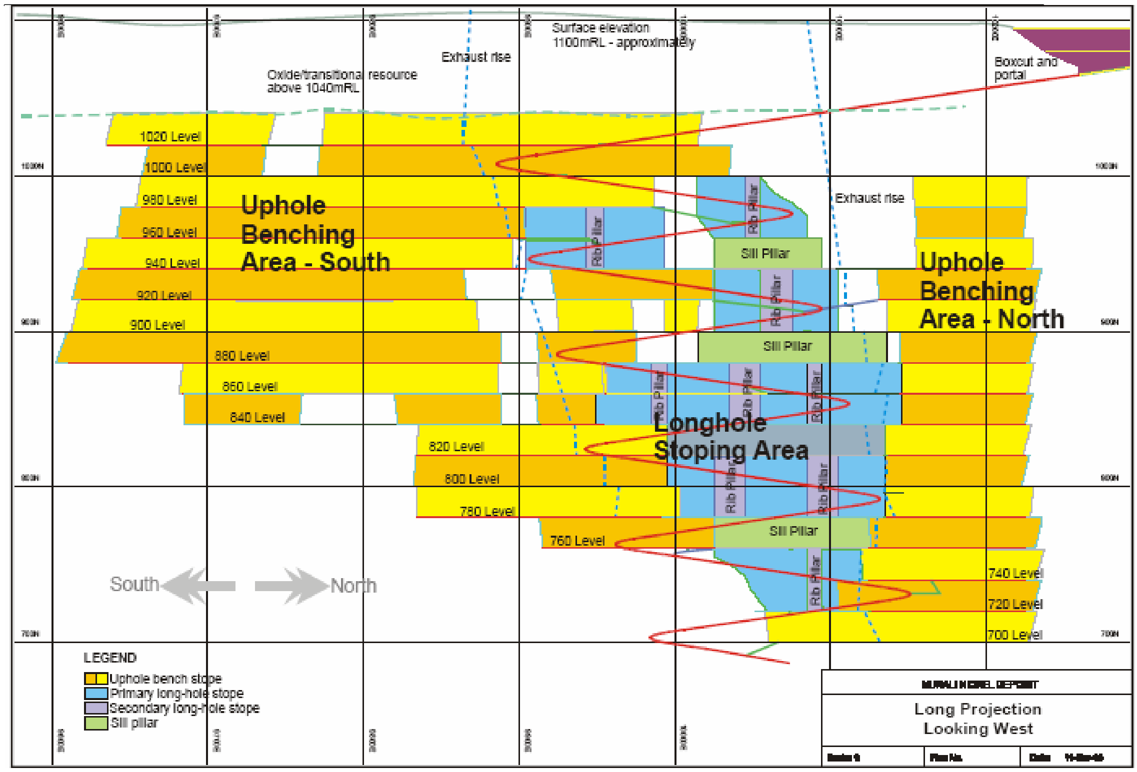


Figure 2.7 Mine Layout - Long Projection

As the Munali decline approaches the ore it turns to the north and parallels the plunge direction. This will provide the opportunity to complete further reserve delineation drilling as required.

The long-hole open stopes will be accessed with the following developments:-

- Draw points on the extraction level (spaced every 15m along strike);
- Drill drives on the upper level;
- Footwall drives to give independent access to each stope; and
- Pillar wrecking drives required for drilling and blasting of the sill/crown pillars.

The primary long-hole stopes are shown in **Figure 2.8**.

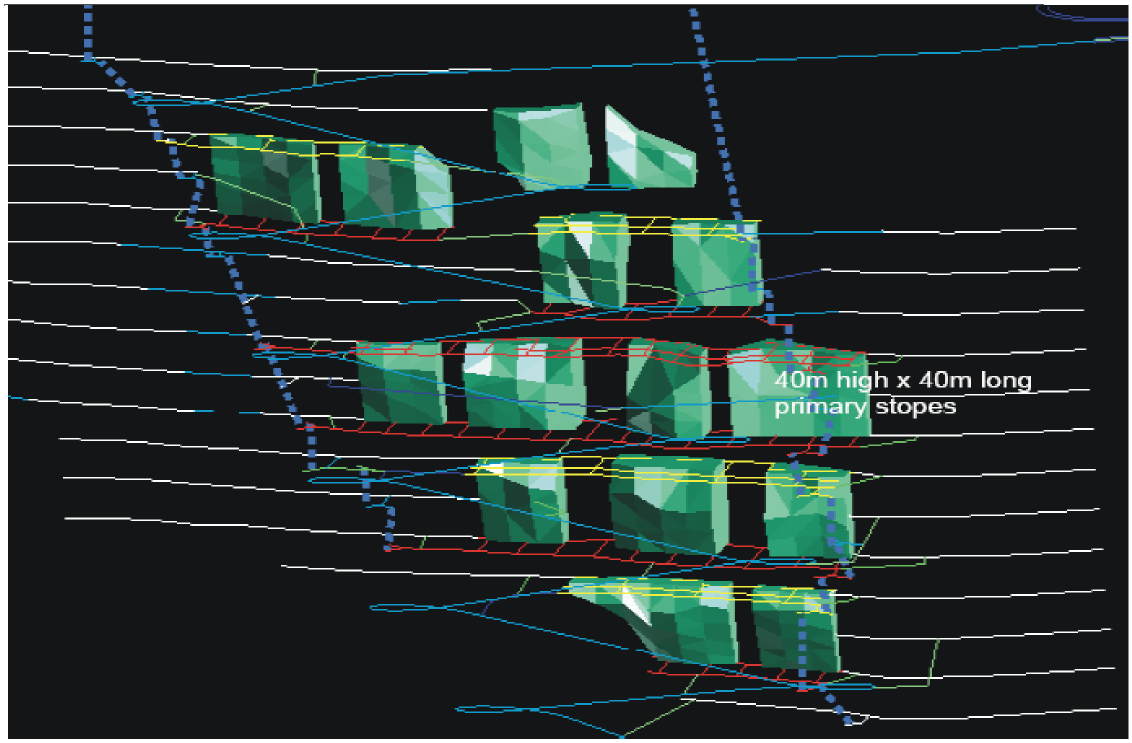


Figure 2.8 3D View of Primary Open Stopes

Uphole benching has been assumed in the narrower Munali orebodies. Ore drives will be developed every 20-25 vertical meters and will be advanced until the ore becomes sub-economic.

On some levels the length of the strike drives can exceed 300m. In order to develop these long ore drives temporary ‘jump up’ rises may need to be developed to intersect the stope above. By not filling the stopes air can be exhausted through the stopes and the ‘jump up’ raises can break into these openings to provide temporary ventilation. Similarly, the long drives will reduce the efficiency of the LHD tramming. To alleviate this problem an ore drive, every 3-4 levels, could be developed large enough to accommodate trucks. The ore from the levels above could then be dropped down short ore-passes onto the trucking level.

A comprehensive physical schedule is shown in **Table 2.1** below. It indicates anticipated quantities for the known life of the operation. At present it is anticipated that the Munali Project will have a mine operating life of 10 years.

Albidon hope to complete the BFS by July 2006. Depending on the final results of this study, and subject to timely approvals of the EIA and EMP by the Zambian Regulatory authorities, project construction could begin in August 2006. Fabrication, erection and commissioning of the project infrastructure will take approximately 12 months. Mine production could commence by mid-2007, with concentrate production in early 2008.

Table 2.1 Mine Development Schedule for Munali Underground Project

MUNALI PROJECT : Physicals Schedule	Unit	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Mining													
Development													
Capital	m	1,580	1,027	1,187	1,187	1,187	1,187	1,187	474	-	-	-	**9,018**
Raises	m	408	173	207	207	207	207	207	128	-	-	-	**1,742**
Operating (waste & ore)	m	1,303	3,226	3,166	3,166	3,166	3,166	3,166	2,842	-	-	-	**23,199**
TOTAL	**m**	**3,291**	**4,427**	**4,559**	**4,559**	**4,559**	**4,559**	**4,559**	**3,444**	-	-	-	**33,958**
Ore Mined	**t**	**122,261**	**615,890**	**687,102**	**687,102**	**687,102**	**687,102**	**687,102**	**688,196**	**678,474**	**523,529**	-	**6,063,860**
Grade - Nickel	%	0.94	1.04	1.09	1.18	1.18	1.18	1.18	1.18	1.06	0.97	-	**1.12**
Grade - Copper	%	0.10	0.12	0.13	0.16	0.16	0.16	0.16	0.16	0.14	0.12	-	**0.15**
Grade - Cobalt	%	0.04	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.05	0.05	-	**0.05**
Grade - Palladium	g/t	0.55	0.60	0.49	0.52	0.52	0.52	0.52	0.52	0.45	0.39	-	**0.51**
Grade - Platinum	g/t	0.23	0.25	0.27	0.24	0.24	0.24	0.24	0.24	0.23	0.17	-	**0.24**
Ctd Metal - Nickel	t	1,279	7,100	8,315	8,997	8,997	8,997	8,997	9,011	8,010	5,620	-	**75,322**
Ctd Metal - Copper	t	130	829	962	1,255	1,255	1,255	1,255	1,257	1,029	719	-	**9,948**
Ctd Metal - Cobalt	t	58	348	373	440	440	440	440	441	401	275	-	**3,656**
Ctd Metal - Palladium	oz	2,403	13,187	12,019	12,806	12,806	12,806	12,806	12,827	10,909	7,344	-	**109,913**
Ctd Metal - Platinum	oz	1,018	5,595	6,511	5,910	5,910	5,910	5,910	5,920	5,492	3,201	-	**51,377**
Waste Mined (all sources)	**t**	**161,908**	**154,870**	**187,173**	**187,173**	**187,173**	**187,173**	**187,173**	**95,191**	-	-	-	**1,347,833**
Processing													
Ore Milled	**t**	-	**565,890**	**675,000**	**675,000**	**675,000**	**675,000**	**675,000**	**675,000**	**675,000**	**675,000**	**110,071**	**6,075,961**
Head Grade - Nickel	%	-	1.03	1.06	1.17	1.18	1.18	1.18	1.18	1.09	1.01	1.01	**1.12**
Concentrate Produced	**t**	-	**39,059**	**49,541**	**54,698**	**55,119**	**55,211**	**55,237**	**55,239**	**51,304**	**47,292**	**7,712**	**470,412**
Grade - Nickel	%	-	10.80	10.80	10.80	10.80	10.80	10.80	10.80	10.80	10.80	10.80	**10.80**

2.6 EMPLOYMENT

It is estimated that between 200 and 400 people will be employed either directly by Albidon or indirectly through contractors during the 12-month mine construction phase. During the mine operational phase, approximately 250-300 Zambian nationals and 20 expatriates will be employed directly by Albidon. Additional jobs will be generated in the service sector in Mazabuka, Kafue and Lusaka.

The approximate distribution of personnel is described in **Table 2.2** below.

Table 2.2 Allocation of employees of the Munali Project by Department

Department	Number of Employees
Mining	160
Processing	90
Administration	35
HS&E	10
Total	295

Whenever possible, appropriately skilled labour from within Zambia will be sourced to fill these positions. It is understood that some appropriately skilled labour, professional and management staff will also be employed from outside of Zambia. The number of expatriate personnel is expected to be 20 when the operation has reached a steady state. All working visas will be acquired for these personnel and their spouses.

During the initial 18 month period of construction and subsequent 6 months of commissioning there will be a requirement for larger numbers of expatriate personnel. The construction crews, in particular, will be sourced external to Zambia due to the specialist skills required. The number of expatriate personnel utilised during these stages will be approximately 150.

2.7 INFRASTRUCTURE

Water

Most of the water required for the operations will be sourced from the area immediately around the project area. In addition, Albidon will require access to the Kafue River for extraction of water, sand and gravel. All extraction licences will be sourced and approval gained prior to mobilisation of these inputs. A hydro-geological survey is underway to determine the volumes of water released from the underground operations to determine the requirement of water from surrounding sources.

Mine site potable water supply will be sourced from either a borehole within the vicinity of the project or from mine dewatering. A water tank/ filtration/chlorine dosing plant will be constructed onsite to treat water and provide a safe drinking water supply to Albidon employees.

Roads

Transport infrastructure at the Munali project area is poor at present, however, the site is situated 2.5 km from the main sealed bitumen road between Lusaka and Livingstone. The Lusaka-Livingstone main trunk road (T1) links Munali to Lusaka and other parts of the country. The road is tarred and is generally in fair condition but also has some potholed stretches. The rainy season impacts on the road, extending pot-holed areas and creating new ones. In the project area all roads except for Lusaka-Livingstone main roads are secondary unsealed roads. Mine equipment, supplies and mine products will be moved via the T1 road. Traffic volumes are high. The GRZ through the Ministry of Works and Supply is committed to upgrading the Highway. Road infrastructure development plans necessary for mining operations are underway.

Albidon will construct and maintain the mine access road from the T1 main road to the mine plant site. Roadbase and aggregate required for the operation will be obtained from quarries located within Albidon's Mining Licence.

Access through the parks and reserve immediately north of the project area will be via the main southern highway for the most part. Some tracks will be required to facilitate exploration and mining activities.

Railways

Munali is situated approximately 20km from the Lusaka-Bulawayo rail line station at Nega Nega siding.

Electricity

The Munali area is not connected to the National Power Grid, though 33kV power lines from both the Kafue Gorge and Kariba hydroelectric schemes pass close by. Project development will require an extension of the power line to Munali. The cost of extending this power line to Munali is included in the initial Munali Capital Cost. Discussions with ZESCO are underway.

2.8 Site Water Management and Plant Site Water Balance

2.8.1 Site Water Management

Albidon will manage water across the mine site in order to prevent any adverse impact on adjacent watercourses and groundwater, and to conserve natural resources. To achieve this, Albidon will develop and implement a Site Water Management Plan, some of the activities of which are discussed in the Environmental Management Plan and Environmental Monitoring Plan in **Chapter 7** below.

The Water Management Plan will focus on the following:-

- Separation of clean and dirty water;
- Treatment of mine effluent and surface runoff prior to discharge to the environment;
- Where practicable, reduce raw water consumption, maximize re-cycling of waste water and reduce the volume of effluent discharged to the environment;
- Regular inspection and maintenance of the mine site drainage system and pollution control facilities;
- Regular monitoring of surface water, effluent streams and flow rates, and groundwater quality;

- Compliance with the Zambian water quality standards and other relevant guidelines for effluent discharge to surface waters;

- Preparation of formal emergency response procedures in the event of a plant spill; and

- Development and regular updating of the site water balance in order to effectively and efficiently manage the water resources across the mine site.

2.8.2 Plant Site Water Balance

A site water balance is being developed as part of the hydrogeological study being carried out for the Feasibility Study. This study will provide information to develop a site water balance with the various inputs, processes and outputs of the project.

There is very little surface water on the project area during the greater part of the year but surface runoff rates are high during and immediately after rainfall events during the rainy season (October to March). At present it is assumed that raw water will be abstracted from the Kafue and pumped via a 450 mm Ø pipeline to raw water storage dams located at the plant site. From the storage dams the water will be pumped to the various plant operations. If necessary, the plant raw water will be supplemented with water pumped from the underground. If the volumes of water pumped from the underground dewatering operations are sufficient enough they will provide the sole feed to the process plant operations.

The total raw water requirement of the nickel plant is approximately **800kt/yr**.

2.9 Employee Accommodation and Transport to the Mine Site

Albidon proposes that all mine employees recruited outside the immediate Munali area be housed in Kafue or Mazabuka and commute to the mine site. Employees will be responsible for finding their own accommodation. Albidon recognises that an increase of up to 1,000 people and their immediate dependents to Kafue/Mazabuka may place a strain on the town infrastructure. Therefore a budget has been allowed for improvements to water supply, sanitation, schools, clinics and recreation facilities in close proximity to the Munali area.

Albidon’s decision that some employees should live in Mazabuka or Kafue will lessen the ecological impact of the project in the Munali area, discourage uncontrolled development adjacent to the mine site, minimise friction between people of the Munali area and outsiders and the erosion of local culture and customs.

Albidon will make appropriate plans to effectively transport personnel to and from the mine site.

3. ENVIRONMENTAL BASELINE STUDY

3.1 INTRODUCTION

The Munali baseline study was conducted over a 6-month period beginning in September 2005 and finishing in March 2006. Data was collected over this period to examine seasonal and temporal changes in site conditions.

The baseline study area chosen for physical and ecological data collection is mainly that area which is in the direct zone of influence of the mine, its process facilities and infrastructure. Physical and ecological data was also collected on the local watercourse downstream of the immediate project area.

Project socio-economic and cultural impacts will affect a greater geographical area than the direct environmental impacts. The baseline study area for the socio-economic and cultural study corresponds to the extent of the rural community in which the project is located. The study area therefore roughly parallels the extent of His Royal Highness Chief Naluama's Chiefdom.

3.2 SCOPE OF WORK

The scope of work for the Munali 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:-
  - Climate
  - Air quality
  - Topography
  - Geology
  - Local hazards
  - Noise and vibration
  - Hydrology
  - Hydrogeology
  - Terrestrial flora and fauna
  - Aquatic flora and fauna
  - Archaeological and Cultural environment
  - Land use and land classification
  - Social-cultural-economics

3.2.1 Baseline Team

The baseline study was undertaken by the following persons:-

- Mr. Mbita Chifunda - study co-ordinator and environmental engineer (AMC);
- Mr Nyundo Armitage - Environmental Consultant (AMC);
- Ms Angela Duerden - Environmental Scientist (AMC);

- Mr Lishomwa Mulongwe - Principal Forestry Research Officer, Forestry Research Department, Ministry of Environment & Natural Resources, Kitwe;

- Dr. Mutilo Silengo, Socio-cultural-economic Specialist (AMC); and

- Mr. Collins Chipote, Archaeologist, National Heritage and Conservation Commission (NHCC), Lusaka.

3.3 CLIMATE

3.3.1 Regional Rainfall, Temperature, Humidity and Sunshine Data

The Southern Province of Zambia lies in a low rainfall zone of the country. Rainfall mainly occurs in heavy thunderstorms producing typical precipitation events of 10 to 40 mm. The region has distinct dry (May to October) and wet (November to April) seasons. Temperatures range from 9.5^0 to 32^0 over the year.

Department of Meteorology 30-year climatic data (1974 - 2004) for Southern Province town of Kafue indicates mean annual rainfall to vary between 502.6 and 1159.2 mm per annum. The average rainfall, maximum and minimum temperatures, wind speed, humidity and sunshine data for Kafue, 1974 - 2004 are presented in Figures 3.1 and 3.2. 30 year meteorological data sets covering rainfall, temperature (minimum and maximum), wind speed, humidity, sunshine and evaporation were collected from the Zambian meteorological department and are summarised below.

Rainfall and Evaporation

Rainfall mainly occurs in heavy thunderstorms producing typical precipitation events of between 10 and 40 mm. Zambia Department of Meteorology rainfall data indicates the mean annual rainfall to be 502.6 - 1,159.2 mm per annum in the Kafue area. Annual rainfall of 1,400 - 1,500mm per annum is likely to be reached or exceeded one year out of five. Extreme weather events such as floods, droughts and high winds do occur from time to time. The 30-year and 100-year maximum 24-hour storm event is calculated as 135 mm and 162 mm respectively.

Evaporation generally exceeds precipitation for most of the year. Potential evaporation is highest in the drier months and during the beginning of the summer (September to November).

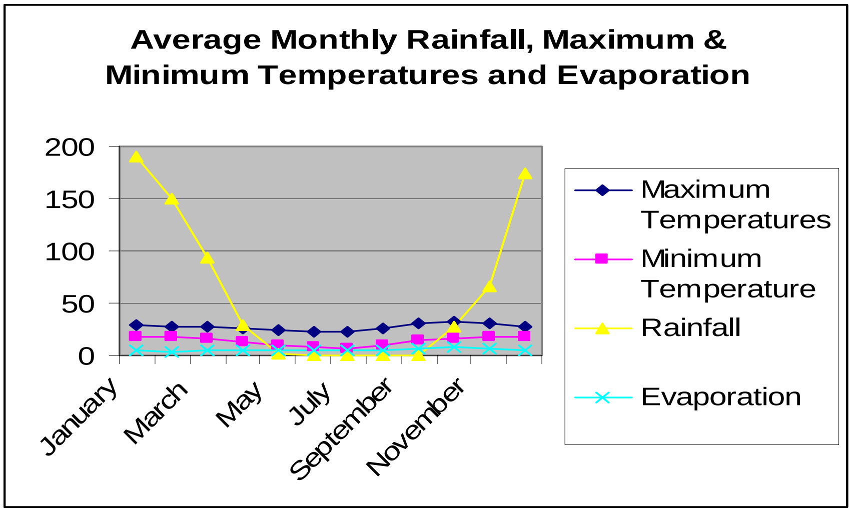


Figure 3.1 Average Monthly Rainfall, Maximum and Minimum Temperatures and Evaporation

Humidity

Zambia Department of Meteorology humidity data indicates mean annual humidity at Kafue to be between 33 and 60%. Mean humidity levels vary from a minimum of 27% in the cool dry season to a maximum of 84% in the wet season.

Temperature

Mean minimum and maximum temperatures vary between 7.1ºC and 18.4ºC in June and between 22.9ºC and 28.2ºC in December. The monthly extreme temperatures are highest in October, at 32ºC, and lowest in June and July, at approximately 6.4ºC.

Sunshine

Mean annual sunshine in Kafue is about 4.4 to 7.8 hours. There is more sunshine during the dry season than during the wet season. In the rainy season the sunshine hours decrease from December to March and then start to increase in April and May.

Wind Speed

The predominant dry season wind direction is from the east-southeast. Mean monthly wind speeds vary from a low of 2.2 m/sec in February to a high of 4.6 m/sec in September. Thunderstorms during the summer are generally associated with west north-westerly winds.

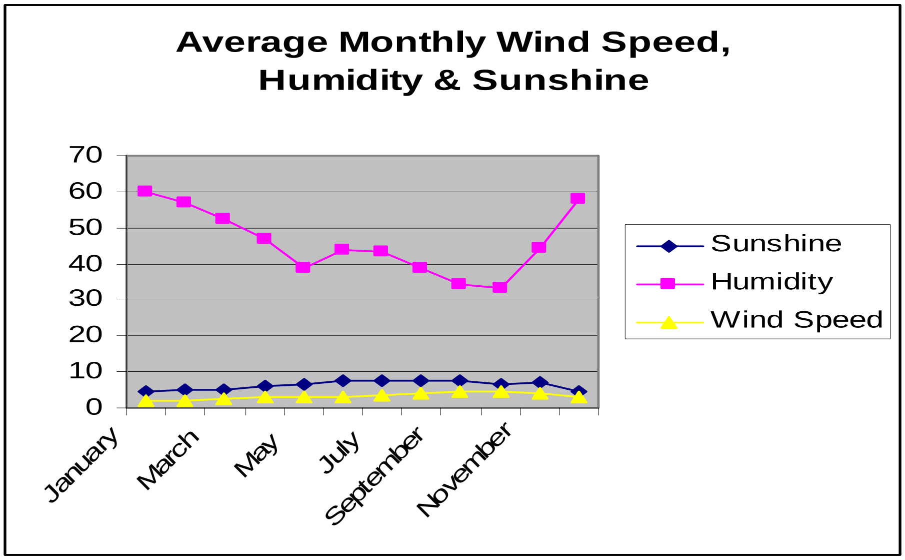


Figure 3.2 Average Monthly Wind Speed, Humidity and Sunshine

3.4 AIR QUALITY

No air quality data is available for the Munali area because of its remoteness and the absence of industry and infrastructure. Field observations indicate that the general air quality in the area is good. However, seasonal variation as well as localised and temporal deterioration in air quality does occur.

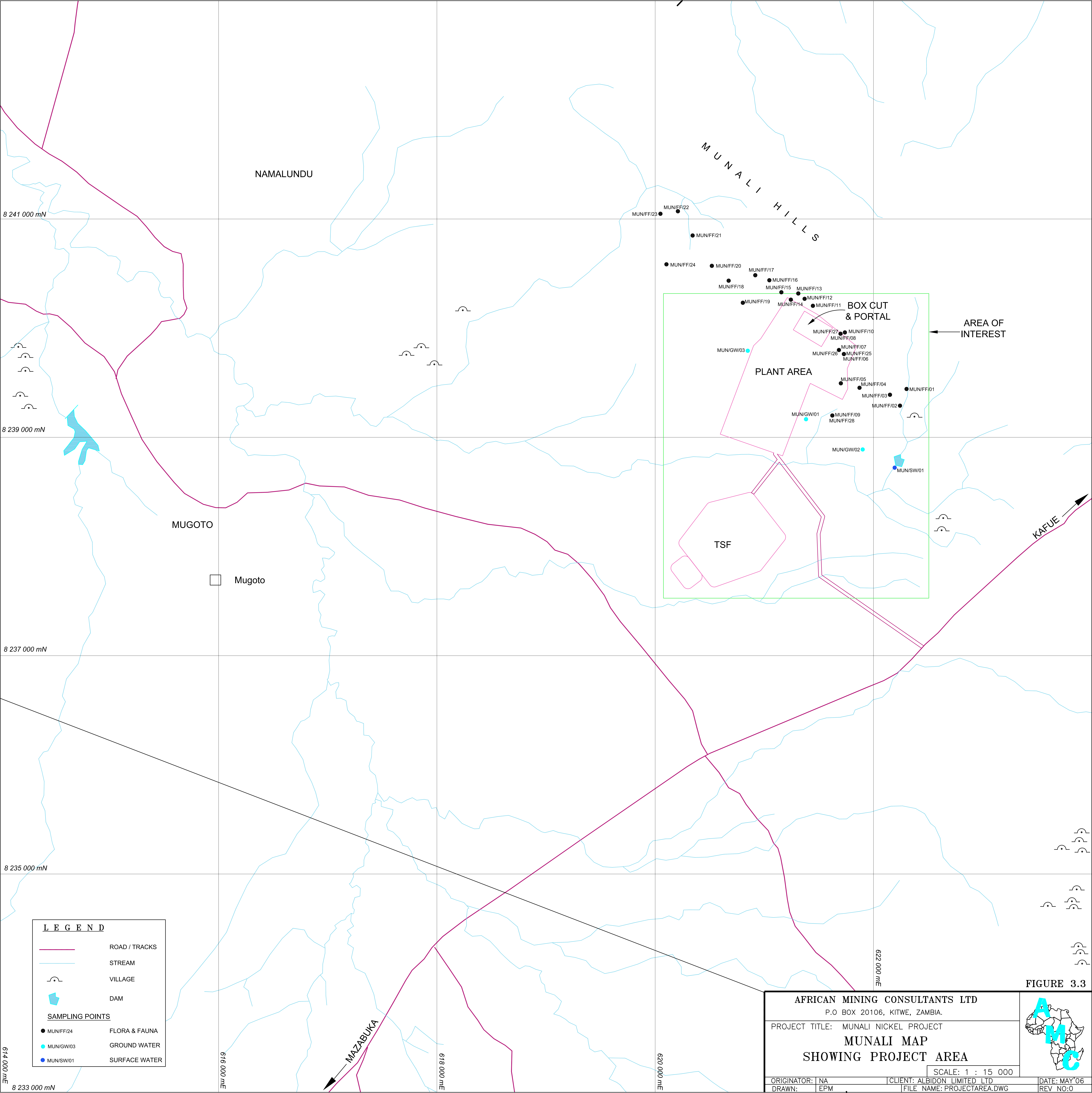
Grassland and forest fires, charcoal burning and traditional *Chitemene* slash and burn agriculture during the dry season generates smoke and dust. This air pollution hangs over the area and forms a distinctive haze. The haze layer is mainly visible from the air and worst during the coolest months (June and July) when temperature inversions tend to trap the smoke near ground level. The haze lasts until the arrival of the rains in November. Localised and temporal air quality deterioration is also associated with village domestic fires.

Field observations indicate that exhaust emissions from vehicles travelling along the T-1 main road disperse rapidly and are localised. Current road traffic volumes are high for most times at 60 pick-up vehicles per hour and 32 trucks/buses per day (Albidon Munali Road Traffic Survey, February 2006).

3.5 TOPOGRAPHY

Field observations together with topographical maps, satellite data and a regional terrain model have been used to define the topography and landscape of the study area. Topography in the project area, shown on **Figure 3.3**, is characterised by flat land that is bound to the north and south by the rolling hills. The area is also incised by some streams, which are generally dry for most part of the year. The predominant vegetation is Miombo woodland. The area is dominantly dry due to the drought frequently experienced in the area.

Surface elevations in the vicinity of the Munali nickel deposit vary between 980 and 1,200m amsl. The highest point in Mvuma Hills Prospecting Licence PPLS 199 is 1,320m amsl which is located on the southeast boundary.



NAMALUNDU
M U N A L I H I L L S
8 241 000 mN
8 239 000 mN
8 237 000 mN
8 235 000 mN
8 233 000 mN
614 000 mE
616 000 mE
618 000 mE
620 000 mE
622 000 mE
MUN/FF/23
MUN/FF/22
MUN/FF/21
MUN/FF/24
MUN/FF/20
MUN/FF/17
MUN/FF/16
MUN/FF/18
MUN/FF/15
MUN/FF/13
MUN/FF/12
MUN/FF/19
MUN/FF/14
MUN/FF/11
BOX CUT & PORTAL
AREA OF INTEREST
MUN/FF/27
MUN/FF/10
MUN/FF/08
MUN/FF/07
MUN/FF/26
MUN/FF/25
MUN/FF/06
MUN/GW/03
PLANT AREA
MUN/FF/05
MUN/FF/04
MUN/FF/01
MUN/FF/03
MUN/FF/02
MUN/GW/01
MUN/FF/09
MUN/FF/28
MUN/GW/02
MUN/SW/01
MUGOTO
Mugoto
TSF
KAFUE
MAZABUKA
L E G E N D
ROAD / TRACKS
STREAM
VILLAGE
DAM
SAMPLING POINTS
MUN/FF/24 FLORA & FAUNA
MUN/GW/03 GROUND WATER
MUN/SW/01 SURFACE WATER
FIGURE 3.3
AFRICAN MINING CONSULTANTS LTD
P.O BOX 20106, KITWE, ZAMBIA.
PROJECT TITLE: MUNALI NICKEL PROJECT
MUNALI MAP
SHOWING PROJECT AREA
SCALE: 1 : 15 000
ORIGINATOR: NA
DRAWN: EPM
CLIENT: ALBIDON LIMITED LTD
FILE NAME: PROJECTAREA.DWG
DATE: MAY'06
REV NO:0
AMC

3.6 GEOLOGY

3.6.1 Local Geology of the Munali Deposit

The Munali nickel deposit is hosted within the Munali intrusion, a largely gabbroic body which forms an elongate rectangular body of about 2.7km length and 0.5km width at surface, concordantly intrusive into Neoproterozoic sediments.

The Munali intrusion is interpreted to be a strata bound sill-like magma conduit hosted within a locally folded re-crystallised Katangan (ca 850Ma) limestone (marble) with local graphitic horizons. The intrusion has stoped into and separated the marble in the middle and therefore a rind of marble can be found on both sides of the intrusion. Immediately outward of the marble, a thin (<5m) calc-silicate horizon is developed possibly representing either a sandy limestone or a contact metasomatic front present up to about 15m adjacent to the mafic-ultramafic sill. Both the marble and calc-silicate horizons are hosted within a banded, weekly haematitic quartzite. Above the haematitic quartzite is a thick package of biotite-andalusite schist, whilst below the quartzite the footwall statigraphy includes scapolite and kyanite schists which overly a basal (west-facing) conglomerate. The conglomerate is in contact with porphyritic granite (Munali Hills granite), which intrudes ca 1,100 Ma granite gneiss basements.

3.6.2 Munali In-situ Mineral Resources

The Munali resource estimates were classified in accordance with the Australian Code for Reporting of Identified Mineral Resources and Ore Reserves. The estimates are based upon data compiled by Albidon.

The undiluted pre-mining Indicated Resource as at December 2005, at a cut-off grade of 0.7% Ni, stood at 4.5 million tonnes at less than 1.4% Ni. In addition, there are estimated to be 1.3Mt or Inferred resources at a grade of approximately 1.4% Ni.

3.7 LAND USE AND LAND CLASS EVALUATION

3.7.1 Land Use

The majority of land cover is degraded disturbed woodland. The project area is affected by shifting cultivation practices, burning, and charcoal burning activities.

Almost all of the fertile land within the project area is cultivated. Cotton or maize fields are commonly between 2 and 3 hectares in size and cultivated for up to five years. There is also large-scale or commercial agriculture in the project area. Commercial farmers also grow coffee.

There is evidence of charcoal burning activities within the vicinity of the project area.

Animal husbandry is limited to the keeping of goats, pigs, chickens, ducks and cattle.

There is no industrial land within the permit area. Nearby urban areas include Mazabuka and Kafue. There is very little in the way of industry at Munali.

3.7.2 Land Classification

Regional land classification based on United States Department of Agriculture (USDA) standards indicates medium to low potential for sustainable development. This classification is mainly based on regional soil classification and the deeply developed, extremely weathered, iron and aluminium rich soils characteristic of the area. These soils are nutrient deficient and have poor water retention abilities, though they are easily worked.

Landsat 7 satellite data has been used to identify and outline the distribution of land cover found in the Munali project area. Based on satellite data interpretation and field observations, the natural land cover in the area can generally be described as predominantly savannah wood.

The satellite data used was a quarter LANDSAT 7 Enhanced Thematic Mapper scene acquired in August 2002 (Landsat-7 ETM+, 171-71). The quarter scene covering 8,100 km^2 was of good quality with little cloud cover. The data has a resolution of 30 metres for 5 spectral bands and 15 metres for a panchromatic band. The classification follows common and well researched classification methods and was verified by thorough ground truthing. The 5 bands in the visible and infrared spectra were used for vegetation classification and identification of agriculture land and settlements.

Seven land cover classes were selected from observations made on the ground. These are water, savannah-woodland, clearings or fields, dense vegetation or forest, savannah grassland, dambo/wetland and built-up or degraded land. Land class, definition and image characteristics are described in **Table 3.1. Figure 3.4** shows the distribution of land classes and proportional land cover within the mine permit area.

Table 3.1 Land Class definition and characteristics

Land Class	Definition	Image character
Water	**Open Bodies of water such as rivers and lakes**	**High Absorbance in all spectral bands.**
Savannah Woodland	**Often typical Miombo woodland. Well distributed.**	**Reflectance in the near infrared spectral band with more signal from soil than in dense vegetation. Large and uniform features.**
Clearing/Field	**Open non-forested land. Vegetated by grass or crops.**	**Strong reflectance from mineral soil and some reflectance in the near-infrared spectrum.**
Dense vegetation/ Forest	**Dense vegetation often along watercourses and sometimes on wetland.**	**Very strong signal in the near-infrared spectrum. As strips along watercourses and as "islands" in wetlands.**
Savannah Grassland	**Heavily degraded Miombo Woodland, dominated by grass and regenerating woody species / very similar to agricultural land**	**High reflectance from mineral soil and some reflectance in the near-infrared spectrum.**
Dambo/Wetland	**Hydromorphic vegetation, characterised by grass and sedge in damp or wet areas**	**High Absorbance in all spectral bands. Some reflectance in the near infra red spectrum.**

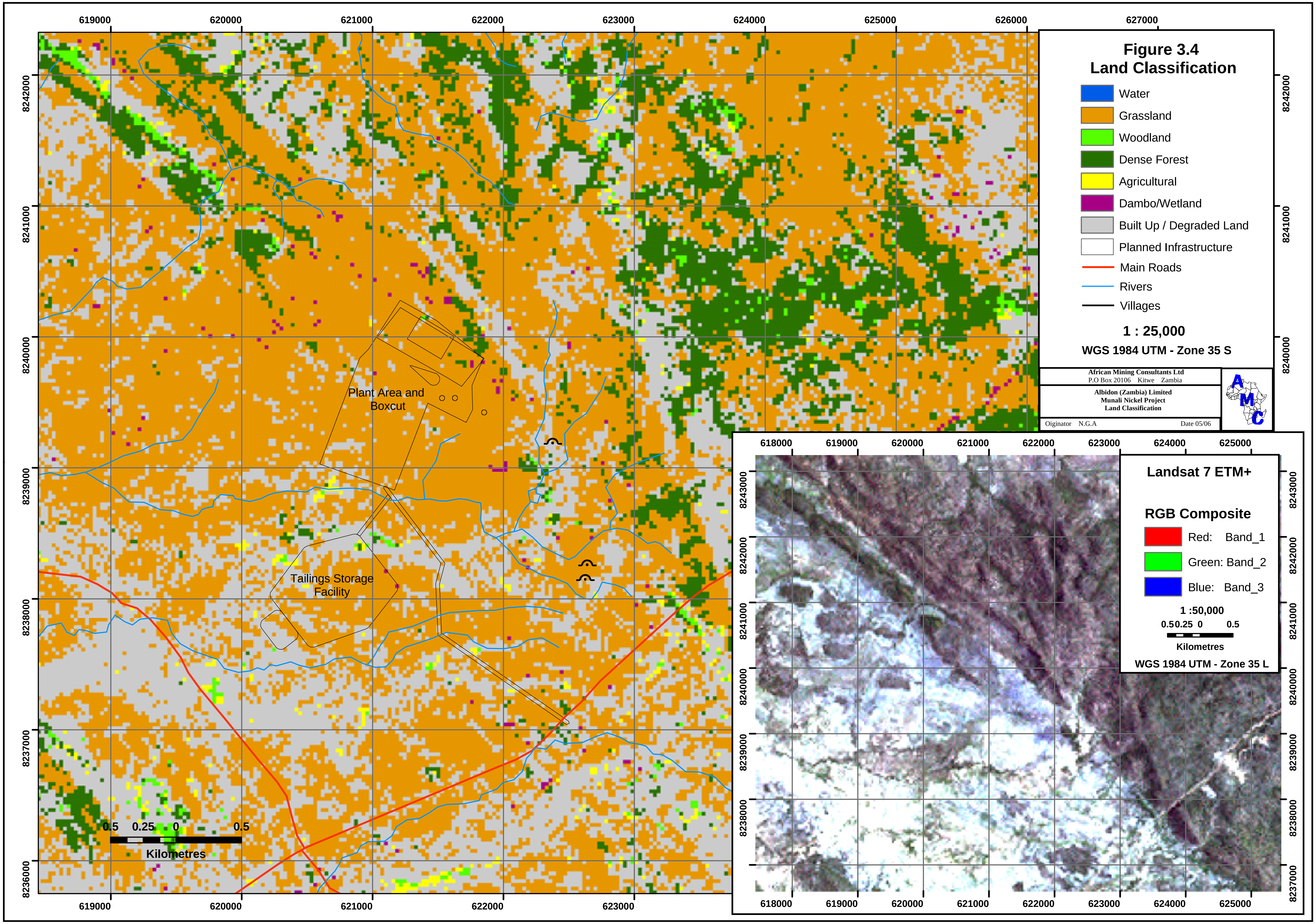


Figure 3.4
Land Classification
Water
Grassland
Woodland
Dense Forest
Agricultural
Dambo/Wetland
Built Up / Degraded Land
Planned Infrastructure
Main Roads
Rivers
Villages
1 : 25,000
WGS 1984 UTM - Zone 35 S
African Mining Consultants Ltd
P.O Box 20106 Kitwe Zambia
Albidon (Zambia) Limited
Munali Nickel Project
Land Classification
Oiginator N.G.A
Date 05/06
Plant Area and Boxcut
Tailings Storage Facility
0.5 0.25 0 0.5
Kilometres
619000
620000
621000
622000
623000
624000
625000
626000
627000
8242000
8241000
8240000
8239000
8238000
8237000
8236000
Landsat 7 ETM+
RGB Composite
Red: Band_1
Green: Band_2
Blue: Band_3
1 :50,000
0.5 0.25 0 0.5
Kilometres
WGS 1984 UTM - Zone 35 L
618000
619000
620000
621000
622000
623000
624000
625000
8243000
8242000
8241000
8240000
8239000
8238000
8237000

Land Class	Definition	Image character
Built-up / degraded land	**Land used for housing, bare agricultural land and mine dumps and pits.**	**High reflection in all bands. Forming patchy features.**

Most of the area can be classified as grassland, being made up of heavily degraded woodland and old clearing and fields. There is some overlap between this land classification and that of the land class ‘agriculture’ as many of the characteristics of the classes are similar.

Built-up or degraded land in this case is seen as the area occupied by Chinkomba and Mugoto villages as well as fields that had been ploughed indicating high reflectance arising from exposed mineral soil similar to that of built up areas. .

Dense vegetation / forest occur along the Munali Hills where human exploitation is minimal and soil conditions are poor. This vegetation type found away from the main drainage network is present as dense woodland.

The clearing / field category includes agriculture land, grassland and to some extent other woodland and forest openings. There is also evidence of extensive charcoal burning.

3.7.3 Soils

Soils occupying high ground have a deeply weathered profile, are well drained, and have low fertility. More fertile, and sometimes hydromorphic soils, with less well-developed profiles are generally found along dry watercourses.

Upland soils are commonly deep red to yellowish grey with a very thin darker upper horizon with some organic matter. These soils are characterised by high iron and aluminium content and by very low content of the major nutrients such as potassium, sodium, calcium and phosphor. Lateritic horizons are common and occur as indurated laterite or disintegrated laterite material.
Cultivation of upland soils is minimal especially on the slopes of the Munali hills themselves. The natural vegetation on upland soils across the project area is Miombo woodland. These woodland areas are experiencing large scale tree-felling for the production of charcoal by the local population.

Lowland soils, found along watercourses are blackish, dark brown to light reddish brown and in contrast to the upland soils, contain more organic matter incorporated in the ‘A’ horizon. These soils are less well drained than upland soils with evidence of water logging and gleying on very low and flat land adjacent to watercourses. Cultivation includes maize, cotton, sunflower, sweet potatoes and a variety of green vegetables. Most of this soil resource within the project area is under cultivation.

3.7.3.1 Soil Sampling and Analysis

An environmental team, consisting of Mbita Chifunda and Angela Duerden, conducted soil sampling. Soil sampling was undertaken in order to classify typical soils found in the permit area as well as to evaluate the current baseline levels of pH, copper and cobalt. Other elements were sampled for, such as mercury (Hg) and lead (Pb), and common elements such as calcium (Ca) and iron (Fe).

A clean trowel was used to sample soil over the selected areas. Samples were obtained from the 0-30cm horizon at all locations. Approximately 250g of soil was extracted and placed in labelled plastic bags. The labelling format was MUN (to indicate the Munali project area), TA (to indicate soil sample is from the tailing dam location, PP to indicate that soil sample is from the processing plant, RAMP to indicate that the sample is from the access ramp; followed by the sample ID number. GPS coordinates and photographs were taken at each sampling point. The samples were transported to AH Knight Laboratories, a BSI 9002 accredited laboratory in Kitwe, Zambia for metal analysis.

Soil sampling points were selected according to the probable location of planned surface facilities such as the tailings storage facility and plant area, all of which are likely to have long-term future impacts on soil quality. Baseline values of important parameters such as pH, copper and sulphur levels are therefore needed to provide a comparison with any future soil study conducted to evaluate soil contamination in the vicinity of the mine and processing facilities.

The analysis results are shown in **Table 3.2.** The results indicate that the magnesium, iron, manganese and aluminium values are high. This could be due to the weathering of the ore body.

Table 3.2 Soil Sampling Analytical Results

Date	Sample ID	GPS coordinates		pH	% Clay	Al µg/g	As µg/g	Ba µg/g
		Easting	Northing					
08/12/05	MUN/TA/01	621076	8238312	-	-	13000	2	<10
08/12/05	MUN/TA/02	620762	8237975	-	-	13900	<1	109
08/12/05	MUN/TA/03	620692	8238149	-	-	15400	1	<10
08/12/05	MUN/PP/01	620940	8238724	-	-	13900	<1	109
08/12/05	MUN/PP/02	621430	8239588	-	-	12000	<1	134
08/12/05	MUN/RAMP/01	621414	8239443	-	-	14900	<1	223
08/12/05	MUN/RAMP/02			-	-	14500	<1	90

Date	Sample ID	Be µg/g	Ca µg/g	Cd µg/g	Co µg/g	Cr µg/g	Cu µg/g	Fe µg/g
08/12/05	MUN/TA/01	<16	<10	10	20	141	30	16500
08/12/05	MUN/TA/02	<10	<10	10	20	157	30	16900
08/12/05	MUN/TA/03	<10	<10	2	20	182	20	19400
08/12/05	MUN/PP/01	<10	<10	2	20	199	20	17900
08/12/05	MUN/PP/02	<10	<10	3	45	122	110	51800
08/12/05	MUN/RAMP/01	<10	<10	5	50	138	70	85200
08/12/05	MUN/RAMP/02	<10	<10	5	70	199	40	89600

Date	Sample ID	Hg µg/g	Mg µg/g	Mn µg/g	Mo µg/g	Ni µg/g	Pb µg/g	Se µg/g
08/12/05	MUN/TA/01	<1	28900	189	<10	30	12	<1
08/12/05	MUN/TA/02	<1	28800	159	<10	30	10	<1
08/12/05	MUN/TA/03	<1	27100	182	<10	15	8	<1
08/12/05	MUN/PP/01	<1	10600	209	<10	20	8	<1
08/12/05	MUN/PP/02	<1	11400	164	<10	55	3	<1
08/12/05	MUN/RAMP/01	<1	11900	198	<10	99	5	<1
08/12/05	MUN/RAMP/02	<1	10600	309	<10	314	5	<1

Date	Sample ID	V µg/g	Zn µg/g	Total S %	SO_4^{2-} %
08/12/05	MUN/TA/01	<10	29	*	*
08/12/05	MUN/TA/02	119	24	*	*
08/12/05	MUN/TA/03	<10	26	*	*
08/12/05	MUN/PP/01	<10	20	*	*
08/12/05	MUN/PP/02	169	4	*	*
08/12/05	MUN/RAMP/01	277	10	*	*
08/12/05	MUN/RAMP/02	229	12	*	*

* Analyses not able to be carried out at the time of sampling

3.8 LOCAL HAZARDS

Local hazards are associated with natural and man-made events.

Thunderstorms

During the rainy season (November to March) strong winds, lightning, heavy rainfall and sometimes hailstones associated with thunderstorms, are normally experienced in the area. The strong winds accompanying rainstorms damage crops, wooden huts and houses. Lightning strikes set off bush fires and cause death in a few rare cases. Heavy rainfall results in flooding of the houses and huts due to poor drainage and the poor state of housing in Chinkomba village.

Fire

Bush fires caused by lightning strikes and shifting cultivation (slash and burn agriculture), can cause property damage and personal injury.

Seismic Activity

According to the Seismic Hazard Map of Africa (G. Grünthal, C. Bosse, Geoforschungs Zentrum, Potsdam, Germany), shown in **Figure 3.5** below, there is a 10% probability of a peak ground acceleration of between 0.4 and 0.8 m/s^2 being exceeded every 50 years in the Southern Province of Zambia. Seismic events of magnitude 4.9 on the Richter scale have been recorded in the Province (Turyamurugyendo - Seismic Hazard Assessment in Eastern and Southern Africa, 1996). Munali is considered to be an area of low to medium seismic activity.

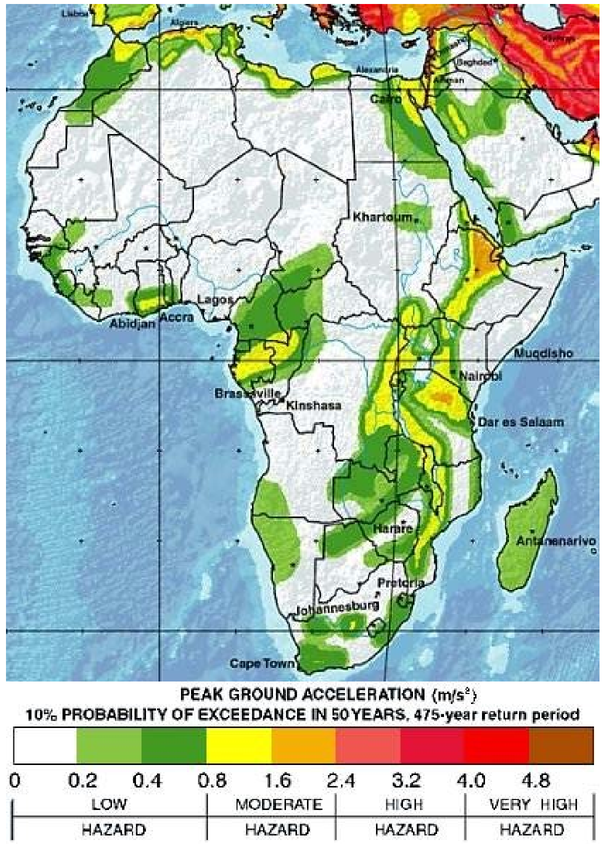


Figure 3.5 Seismic hazard map of Africa (G. Grünthal, C. Bosse, Geoforschungs Zentrum, Potsdam, Germany)

3.9 NOISE AND VIBRATION

There is no historical data for Munali project area. Due to its remote location and the absence of active industry in the area, current noise levels are associated with drilling operations, traffic on the main road, social activities and natural elements i.e. wind, rains and thunderstorms. Daytime noise levels are relatively low.

Due to social activities in the evening at Chinkomba village, noise levels are higher than daytime levels.

Noise from traffic is very low as the project area is about 2.5km from the main road.

There are no significant sources of vibration in the project area apart from traffic using the mine access road and localised exploration drilling activities.

3.10 HYDROLOGY

Hydrologically, the Kafue river system flows to the north of the project area and annually floods the Kafue Flats forming a large wetlands area. There are no perennial rivers within the project area apart from seasonal streams of runoff water that flow during the rainy season. The runoff contains high amounts of suspended solids. These seasonal rivers form part of the catchments areas of the Kafue river system.

3.10.1 Surface Water Drainage

3.10.1.1 Surface Water Drainage

There are a number of small streams located within the permit area. These streams are not perennial and are dry for most of the year. During the time of the baseline study, there were no flowing streams within the permit area. A surface water sample was collected from the dam on the mine permit to identify the characteristics of surface runoff during the rainy season.

There are no dambos (flat and wet channel-less valleys) or other wetland features in the permit area.

3.10.1.2 Surface Water Sampling

A limited surface water sampling programme was carried out due to the lack of water flow in the stream channels. Sampling of surface could be undertaken at the dam which was still full with water at the time of the baseline study. Therefore the data collected from the dam was assumed to be representative of the seasonal surface flow in the area.

3.10.1.3 Analytical Parameters

The main objective of the surface water sampling and analysis was to establish the pre-mining water quality of the project area. The results provide baseline values of water quality against which the significance of any future impacts can be measured. The results also provide the basis for the design of a mine environmental monitoring programme. The description and location of the surface water sampling site is shown in **Table 3.3**.

The physical, chemical and bacteriological parameters tested included:-

pH	Fluoride	Calcium
Conductivity	Chloride	Colour
Total dissolved solids	Nitrogen	Total Coliform
Total suspended solids	Phosphate	Faecal Coliform
Sulphates	Cyanide	

Total and dissolved metals tested for quarterly included:-

Aluminium	Cadmium	Mercury	Lead
Arsenic	Cobalt	Magnesium	Selenium
Boron	Chromium	Manganese	Vanadium
Barium	Copper	Molybdenum	Zinc
Beryllium	Iron	Nickel	Uranium

Table 3.3 Surface Water Monitoring Sites – Co-ordinates and Description of Physical Location

Monitoring site	Site GPS UTM Co-ordinates		Physical Location
	Easting	Northing	
MUN/SW/01	622223	8238562	Chinkomba Village dam water source for the animals downstream of the plant site.

Table 3.4 below shows the sampling results.

Table 3.4 Physical, chemical and bacteriological parameters sampled in surface and groundwater

Site	Date of sampling	**Faecal Coliform (/100mls)**	**pH**	**EC (µS/cm)**	**TDS (mg/l)**	**TSS (mg/l)**
MUN/SW/01	8/12/05	Nil	8.3	30	16	625

Site	Date of sampling	SO_4^{2-} (mg/l)	F^- (mg/l)	NO_3^- (mg/l)	PO_4^{3-} (mg/l)	CN (mg/l)	Colour (hazen)	Turbidity (NTU)
MUN/SW/01	8/12/05	<2.8	0.13	4	4	<0.05	70	750

The results indicate that the surface water in the dam within the project area is generally of good quality. The water contained a high concentration of total suspended solids (TSS) which was also visible through the colouration of the sample when collected. The value for turbidity was also high. The water is not used for domestic purposes but used to feed animals.

Total metal analyses were also carried out on the surface water sample. The results are shown in **Table 3.5.** The total metal concentrations are generally well within the World Health Organisation ("WHO") Water Quality Standards.

Table 3.5 Total metal analyses results carried out on samples of surface water

Site	Date of sampling	**Al mg/l**	**As mg/l**	**Ba mg/l**	**Be mg/l**	**Ca mg/l**	**Cd mg/l**
MUN/SW/01	08/12/05	41	<0.01	0.6	<0.1	0.5	0.03

Site	Date of sampling	**Co mg/l**	**Cr mg/l**	**Cu mg/l**	**Fe mg/l**	**Hg mg/l**	**Mg mg/l**
MUN/SW/01	08/12/05	0.05	0.2	0.2	30	<0.001	23

Site	Date of sampling	**Mn mg/l**	**Mo mg/l**	**Ni mg/l**	**Pb mg/l**	**Se mg/l**	**V mg/l**	**Zn mg/l**
MUN/SW/01	08/12/05	0.2	<0.1	<0.03	<0.04	<0.01	<0.1	0.17

3.10.2 Stream Sediment Sampling and Analysis

M.L. Chifunda and A. Duerden, of AMC, carried out all sediment sampling. Sampling was conducted in accordance with internationally accepted procedures for the collection of river sediment samples.

Stream sediment samples were submitted to A. H. Knight Analytical Services for geo-chemical analysis of sediment solids and dissolved metal analysis on sediment pore water.

The sediment sample was collected after water sample was collected at the same sampling point as the surface water sampling point (SW/01) on the 8th of December

2005. The full results of the geochemical (sediment solids) and dissolved metals (pore water) analysis are presented in **Table 3.6**.

Table 3.6 Geo-chemical analysis results for sediment solids and pore water

Site	Date of sampling	Al µg/g	As µg/g l	Ba µg/g	Be µg/g	Ca µg/g	Cd µg/g
MUN/SS/O1	08/12/05	18900	<1	<10	50	50	8
Pore Water (mg/l)		3	<0.01	<0.2	<0.1	72	0.12

Site	Date of sampling	Co µg/g	Cr µg/g	Cu µg/g	Fe µg/g	Hg µg/g	Mg µg/g
MUN/SS/01	08/12/05	25	143	60	16500	<1	40800
Pore Water (mg/l)		6	<0.03	0	13	<0.001	61

Site	Date of sampling	Mn µg/g	Mo µg/g	Ni µg/g	Pb µg/g	Se µg/g	V µg/g	Zn µg/g
MUN/SS/01	08/12/05	156	<10	25	12	<1	<10	10
Pore Water (mg/l)		0.8	<0.1	<0.03	0.18	<0.01	1	2

The sediment geochemical analysis shows that most of the elements are found in low concentrations except for abundant minerals such as aluminium, calcium, iron and magnesium. These concentrations are likely the result of weathering of the surrounding metal bearing ores.

The sediment pore water for the sample collected in the dambo shows an abundance of calcium, iron and magnesium.

3.10.3 Groundwater Quality

Groundwater is used extensively in the project area for domestic and potable water. Since 1990, the Department of Water Affairs has sunk many wells in the project area to supply villages with clean domestic water. There are three wells close to the Munali deposit near the Chinkomba village. Groundwater is the main source of water in Chinkomba and surrounding villages and discussions with the local population revealed that they believe the underground workings will affect levels of waters in these bore holes. They fear that due to dewatering in underground workings, the main sources of water would dry up. A further source for concern was the likelihood of groundwater degradation due to mining activities and a loss of drinking water quality. Groundwater testing from boreholes in the vicinity of the project currently used for potable water has indicated that lead, nickel, chromium and suspended solids exceed WHO drinking water quality guidelines.

The environmental team took these comments onboard and designed a hydro-census of the main sources of water in Chinkomba. Mbita Chifunda and Mitulo Silengo, aided by Albidon, carried out the hydro-census on the 24th of September 2005. There are three boreholes adjacent to the Chinkomba village near to the workings i.e. MUN/GW/01, MUN/GW/02 and MUN/GW/03 (refer to **Table 3.7**).

Table 3.7 Ground Water Monitoring Sites – Co-ordinates and Description of Physical Location

Monitoring site	Site GPS UTM Co-ordinates		Physical Location
	Easting	Northing	
MUN/GW/01	621382	8239166	Borehole used by the villagers (Chinkomba) as a source of drinking water
MUN/GW/02	621901	8238889	Borehole used by the villagers (Chinkomba) as a source of drinking water
MUN/GW/03	620848	8239793	Borehole used as a source of water for the Albidon camp

Samples were collected at these three sources of water on the 24th of September 2005 and 8th of December 2005 and were submitted to Alfred H. Knight for analysis. The results of physical, chemical and bacteriological analysis are shown in **Table 3.8** below.

3.10.3.1 Analytical Parameters

Groundwater sampling and subsequent analysis provides the basis on which to design the environmental monitoring programme for the mine.

During AMC's initial (September 2005) and second sampling exercises, the physical, chemical and bacteriological parameters that were tested included: -

pH
Conductivity
Total dissolved Solids (TDS)
Total Suspended Solids (TSS)
Sulphates
Fluoride
Chloride
Nitrogen
Phosphate
Cyanide
Calcium
Colour
Total Coliform
Faecal Coliform

Total and dissolved metals tested included: -

Aluminium
Arsenic
Boron
Barium
Beryllium
Cadmium
Cobalt
Chromium
Copper
Iron
Mercury
Magnesium
Manganese
Molybdenum
Nickel
Lead
Selenium
Vanadium
Zinc

3.10.3.2 Sampling Personnel and Procedures

M. Chifunda, N.G Armitage and A. Duerden (AMC) conducted the groundwater sampling. Sampling was completed in accordance with internationally accepted procedures for the collection of groundwater samples for physical, chemical and bacteriological analysis. Samples were analysed at Alfred H. Knight Laboratories, a BSI 9002 accredited laboratory in Kitwe, Zambia. Analytical results of groundwater analysis are detailed in **Tables 3.8 and 3.9**.

The results presented in **Table 3.8** indicate that groundwater quality is generally good, with a pH of 6.8. However, nickel, iron, chromium and total suspended solids concentrations exceed WHO Drinking Water Quality Standards in all the three bore holes sampled. This is most probably due to the weathering of the geology. Turbidity concentrations are high in boreholes GW01 and GW02. This could be attributed to the fact there are a lot of people using the boreholes at all times. Concentrations of calcium are high in GW02. Albidon are currently investigating options for the long tern, reliable supply of drinking water for the workforce at the project site.

Table 3.8 Physical, Bacteriological, Chemical and Total Metal Analysis (24th September 2005)

Parameters	MUN/GW/01	MUN/GW/02	MUN/GW/03	WHO/Zambian Drinking water
A. Physical				
Turbidity (NTU)	10^	9^	2	5/
Conductivity (µS/cm)	935	893	1170	1500/1500
Total Dissolved Solids (mg/L)	7	<3.5	<3.5	1000/500
Colour (Hazen units)	5	<5	<5	/15
Total suspended solids (mg/L)	522^	548^	688^	100/
B. Bacteriological				
Total Coliform (#/100ml)	nil	nil	Nil	nil/nil
Faecal Coliform (#/100ml)	nil	nil	Nil	nil/nil
C. Chemical				
PH	6.8	6.8	6.8	6.5-8.5/6.5 -8.5
Nitrate NO_3^-(mg/l)	4	7	10	10/10
Sulphates SO_4^{2-} (mg/l)	44	51	56	250/500
Phosphates PO_4^{2-} (mg/L)	<0.3	<0.3	<0.3	5/5
Fluorides F^- (mg/l)	0.28	0.21	0.16	1.5/1.5
Chlorides CL- (mg/l)	79	87	52	250/250
Cyanide (CN)	<0.05	<0.05	<0.05	0.07/0.2
D. Metals				
Zinc Zn (mg/l)	0.2	0.05	<0.01	3/
Lead Pb (mg/L)	<0.04	<0.04	0.07^*	0.01/0.05
Nickel Ni (mg/L)	0.10^	0.13^	0.08^	0.02/
Manganese Mn (mg/l)	<0.03	0.2^*	<0.03	0.4/0.05
Magnesium Mg (mg/l)	30	28	48	200/150
Iron Fe (mg/l)	2.0^*	1.8^*	1.4^*	0.3/1
Copper Cu (mg/l)	1	0.07	0.7	1.0/1.0
Chromium Cr (mg/l)	0.3^*	0.5^*	0.6^*	0.05/0.05
Cadmium Cd (mg/l)	<0.01	<0.01	<0.01	0.003/0.005
Calcium Ca (mg/l)	70	82^	62	75/200
Sodium Na (mg/l)	44	40	50	200/270
Cobalt Co (mg/l)	<0.03	<0.03	<0.03	N/A/1
Arsenic As (mg/l)	<0.01	<0.01	<0.01	0.01/0.05
Selenium Se (mg/l)	<0.01	<0.01	<0.01	0.01/0.01
Mercury Hg (mg/l)	<0.001	<0.001	<0.001	0.001/0.001

^ Exceeding WHO Guidelines for Drinking Water Quality (3rd Current Edition)
*Exceeding Zambian Drinking Water Quality Standard

Table 3.9 below shows the sampling results for the samples collected on the 8th of December 2005.

Table 3.9 Physical, Bacteriological, Chemical and Total Metal Analysis For the samples collected on 8th December 2005

Parameters	MUN/GW/01	MUN/GW/02	MUN/GW/03
A. Physical			
Turbidity (NTU)	14	9	2
Conductivity (uS/cm)	-	-	-
Total Dissolved Solids (mg/L)	-	-	-
Colour (Hazen units)	-	-	-
Total suspended solids (mg/L)	<3.5	<3.5	<3.5
B. Bacteriological			
Total Coliform (#/100ml)	Nil	Nil	nil
Faecal Coliform (#/100ml)	Nil	Nil	nil
C. Chemical			
PH	-	-	-
Nitrate NO_3^-(mg/l)	-	-	-
Sulphates SO_4^{2-} (mg/l)	-	-	-
Phosphates PO_4^{2-} (mg/L)	-	-	-
Fluorides F^- (mg/l)	-	-	-
Chlorides CL- (mg/l)	-	-	-
Cyanide (CN)	-	-	-
D. Metals			
Zinc Zn (mg/l)	-	-	-
Lead Pb (mg/L)	0.05	<0.04	0.08
Nickel Ni (mg/L)	<0.03	<0.03	<0.03
Manganese Mn (mg/l)	0.1	0.2	<0.03
Magnesium Mg (mg/l)	-	-	-
Iron Fe (mg/l)	3	3	2
Copper Cu (mg/l)	0.2	<0.02	0.2
Chromium Cr (mg/l)	0.06	0.2	0.1
Cadmium Cd (mg/l)	0.03	0.01	0.06
Calcium Ca (mg/l)	-	-	-
Sodium Na (mg/l)	-	-	-
Cobalt Co (mg/l)	0.1	0.1	0.1
Arsenic As (mg/l)	-	-	-
Selenium Se (mg/l)	-	-	-
Mercury Hg (mg/l)	-	-	-

3.11 HYDROGEOLOGY

A site investigation is being undertaken by Golder Associates and a hydrogeological report will be completed as part of the BFS.

3.12 TERRESTRIAL FLORA AND FAUNA

3.12.1 Introduction

The baseline terrestrial flora and fauna study of the project area was undertaken by environmental consultant Mr Lishomwa Mulongwe, Principal Forestry Research Officer at the Forestry Research Department of the Ministry of Environment and Natural Resources in Kitwe, Zambia. Mr. Mbita Chifunda of AMC assisted Mr Mulongwe. The field component of the study was conducted between 14th and 18th November 2005.

The district, climatically, lies in a semi arid area known as agro-ecological zone number II, basically receiving approximately between 750mm and 1,000mm of rainfall every year. The rainfall is concentrated between November and March, with the odd shower before and after that. Average minimum and maximum temperatures range between 15^{o}C from May to June and 38^{o}C in October annually. Frosts are rare and the prevailing wind is from the south-east.

The soils of the district are classified as follows:-

a. Red clays forming the extensive farming soils of the district;
b. Sandy soils that are mainly used for pasture and have a low nutrient content;
c. Marginal flat soils used for sugar cane production; and
d. The hydromorphic clays of the Kafue flats.

The vegetation of the district is associated with these soil types. The red clays are found on the plateau and were once covered with Munga or Acacia woodlands hence their preference for cultivation. The sandy soils carried the Miombo woodlands and these can still be seen on the escarpment and isolated high areas. Small gallery and riparian woodlands follow the old and dried stream and river-beds. Termitaria are rare and restricted in occurrence and may be found in the form of transitional types of vegetation between different vegetation types and on the margins of the Kafue flats.

The total woody flora of Mazabuka is estimated around 750 species, of which 670 have been recorded with specimens in the Forest Herbarium, Kitwe. The vegetation is generally classified as follows:-

- Closed Forest
  Riparian woodland

- Open Forest

  Miombo woodland
  - Pemba thickets
  - Escarpment Miombo

  Munga woodland

  - *Faidherbia albida* woodland
  - Dry dambo woodland

  Vegetation of Termitaria

  - Miombo Termitaria
  - Munga Termitaria

- Grasslands
  - Dambo grassland
  - Flood plain grassland.

The area historically was once populated by large numbers of wildlife species especially the escarpment and the Kafue Flats. The Kafue Flats are still very important for the red Lechwe and numerous bird species. Before the development of the area larger wildlife and birds used to migrate from the Kafue Flats to the Lower Zambezi. Even today isolated small herds of elephants and buffalo still wander between the two sites. On the escarpment vervet monkeys, baboons and the occasional kudu are still seen.

The vegetation of the Munali hills was mainly escarpment Miombo and Munga woodlands, with a few isolated Riparian woodlands along drainage lines. These vegetation types are described as follows:-

- **Riparian woodland** – the original vegetation was a mixture of *Khaya-Trichilia-Syzygium guineense* species along a narrow belt on both banks of the major rivers and streams of the district. This type of vegetation has since disappeared and has been replaced by *Bridelia-Homalium-Syzygium cordatum* species mix. The genera *Khaya* and *Trichilia* are now found as planted ornamental trees in most districts of Southern Province.
  Presently, the dominants in the existing riparian woodlands are *Bridelia micrantha, Ficus capensis, Homalium abdessamadii, Syzygium cordatum, S. guineense* ssp *barotsense, Trichilia emetica* and pure stands of the invasive *Acacia polycantha*.

- **Miombo woodland** – the Miombo originally occurred on the plateau and on the escarpment. The escarpment Miombo still occurs in more or less its original form although highly disturbed by charcoal production. The plateau Miombo has largely disappeared and has been replaced by agricultural fields and Munga/Acacia woodlands. The canopy species are largely *Brachystegia boehmii,* and *Julbernardia globiflora* with *Brachystegia glaucescens* on rock outcrops. These trees grow up to 15m on good soil and up to 6m on stony shallow soils.
  Canopy associates are mainly *Albizia antunesiana*, *Brachystegia speciformis, Br taxifolia, Burkea africana, Combretum collinum* and *Parinari curatellifolia*. Fire and grazing have also contributed to the destruction of the Miombo in the district.

- **Munga woodland** – characteristically an open Savannah type woodland dominated by species of *Acacia, Faidherbia, Combretum* and *Terminalia*. It occurs on the red clay soils of the plateau that are also the premier agricultural soils, there is very little of this type of woodland left in the area.
  Common canopy species include *Acacia sieberana, Albizia harveyi, Burkea africana, Combretum imberbe, Ficus sycomorus* (the woodland type species where the woodland still exists), *Lonchocarpus capassa, Parinari curatellifolia, Pericopsis angolensis, Piliostigma thonningii, Sclerocarya birrea, Terminalia spp. Xeroderris stuhlmanni, Ziziphus abyssinica* and in isolated groups the palm *Borassus aethiopum*.

The study carried out in the mining license area was based on these three woodland types as they represented the major vegetation types encountered in the area. The purpose of the study was to collect data and information on existing vegetation (flora) and associated wildlife (fauna), and analysing these to give trends in patterns of vegetation growth, utilization, management and conservation.

3.12.2 Study Methods and Approaches

Vegetation Survey

a. The vegetation in the area was initially assessed using strata located in all areas considered densely covered with vegetation or disturbed by agricultural activities. Random sample plots were placed in each stratum. The number of plots located in each stratum was based on the species assemblage, topography, the size of vegetation isolated by fields, accessibility and time allocated for the assessment. The sample plots used for assessments were 20m in diameter or 0.0314 of a hectare. Twenty-four (24) sample plots were sampled (**Table 3.10**). The following data were collected from the sample plots:-

- Species densities using counts of individual species in each sampling plot;
- Diameter measured in centimetres at breast height using a diameter tape;
- Height distribution in meters measured using a hypsometer; and
- Lists of species encountered in the study area.

Table 3.10 Locality of sampling plots and description of vegetation within strata

SITE	Easting	Northing	STRATA	Vegetation description
MUN/FF/01 MUN/FF/02 MUN/FF/03 MUN/FF/04 MUN/FF/05	622303 622243 622151 621872 621701	8239443 8239290 8239390 8239454 8239495	1	Mugoto, Riverine and rock-out crop type of vegetation with *Bauhinia, Euphorbia, Croton, Diospyros* and *Sterculia* as dominants
MUN/FF/06 MUN/FF/07 MUN/FF/08 MUN/FF/09	621729 621682 621698 621623	8239763 8239800 8239949 8239200	2	Old fields and grazing areas formerly Munga woodland, with *Acacia, Combretum, Albizia* and *Cassia* as dominants
MUN/FF/10 MUN/FF/11 MUN/FF/12 MUN/FF/13 MUN/FF/14 MUN/FF/15 MUN/FF/16 MUN/FF/17	621738 621445 621369 621311 621243 621156 621046 620917	8239961 8240205 8240269 8240318 8240261 8240329 8240439 8240485	3	Degraded thickets with *Combretum, Pericopsis, Annona, Dicrostachys* and *Diospyros* as dominants
MUN/FF/18 MUN/FF/19 MUN/FF/20 MUN/FF/21 MUN/FF/22 MUN/FF/23 MUN/FF/24	620673 620803 620519 620343 620208 620048 620103	8240435 8240233 8240571 8240849 8241071 8241048 8240585	4	Rock-outcrop or hill with *Kirkia, Schrebra, Acacia, Cussonia, Terminalia, Albizia, Hymenocardia* and *Diplorhynchus* as dominants

b. Individual tree species assessment

   An individual tree species assessment was made for *Adansonia digitata* (Baobab) and *Kirkia acuminata* (Musanta in Tonga). The two species were selected because of their apparent economic and ecological value to the inhabitants of Mugoto. The information collected was similar to (a) above but in addition, propagation and growth of the two species was assessed.

c. Observations on vegetation formation

   A descriptive analysis of the vegetation in the area was done using structural and spatial assemblages of individual or groups of species. This is important for classification purposes and to determine changes to existing historical records of vegetation of the area.

Anthropological influences on vegetation

Anthropological influences were assessed based on observations made on the following:-

a. Local land use patterns;
b. Local utilization of vegetation;
c. Tree harvesting patterns; and
d. Tree planting by local people and conservation practices.

Wildlife Survey

The information gathered was based on oral traditions, sightings and presence of droppings or hoof prints in areas where animals are still suspected to occur. The fauna of Mugoto/Chinkomba assessed were large animals, birds and reptiles; their habitats and feeding habits.

3.12.3 Survey Results

3.12.3.1 Classification of vegetation

Classification was based on information collected on the composition and structure of existing vegetation in the assessment area. The importance of vegetation classification was that it allowed for delineation of the study area into strata as given in **Table 3.10** above. It was also useful for determining management practices appropriate to each area based on current land-use type and intensity of human activity.

The original vegetation of the area was determined by collecting growth data of tree species greater than 15cm and at least 6m in height. The assumption being that management practices of leaving shade, fruit and boundary trees allowed the survival of big trees over time. **Figure 3.6** shows the numbers of three tree species that have been left as a result of this method. Large specimens encountered included: *Albizia amara; A. harveyi; Cassia abbreviata; Acacia karroo; Azanza gackeana; Sclerocarya birrea; Adansonia digitata;* and *Bauhania petersiana*. Regenerating vegetation in cultivated areas exhibited species composition similar to these species as dominants or co-dominants. The only difference being where exotic species have been introduced, i.e. around settlements.

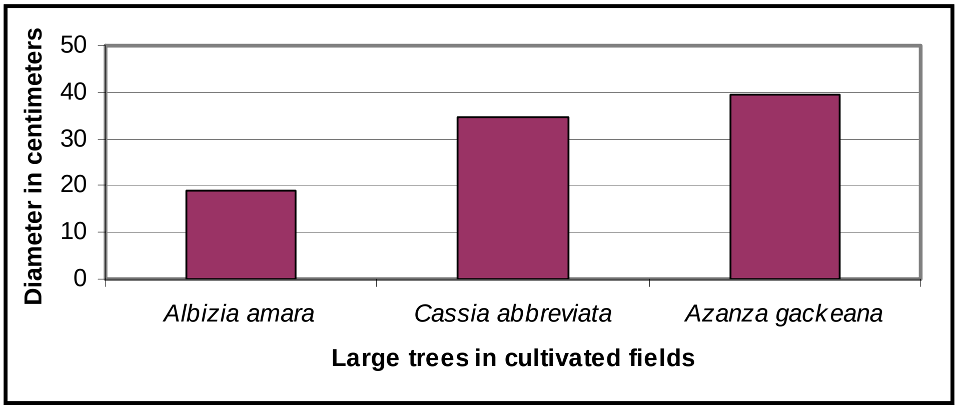


Figure 3.6 Large trees left behind for shade, fruits or boundary demarcation.

Rock outcrops or hills on the other hand exhibited a species mix widely different from that on the plateau. Notable species included large specimens of *Sterculia quinqueloba, Kirkia acuminata, Euphorbia candelabrum, Diospyros kirkii* and *Entada nanas.* These tree species in their undisturbed form have attained the best growth at a slightly higher altitude than on the plateau.

3.12.3.2 Vegetation formations of rock outcrops and hills

The two hills surveyed were located at the south-eastern and north-western ends end of the property. These two hills represent vegetation assemblages very different from the cultivated area or that covered with thickets. Even a comparison of the vegetation of the two hills presented a species assemblage that is different in composition and structure. The two hills have been damaged through clearance of vegetation for agricultural land. Although the soils found on the hills occur in small pockets, they are highly fertile due to an accumulation of organic matter and absence of wild fire over a long period of time.

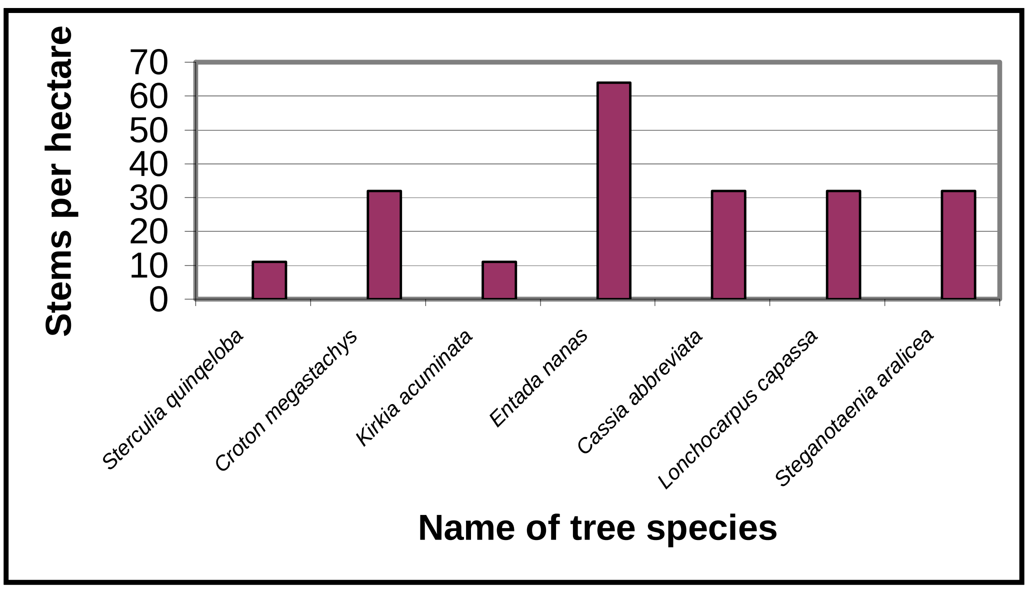


Figure 3.7 Frequency of dominant and co-dominant tree species on the south-eastern rock outcrop

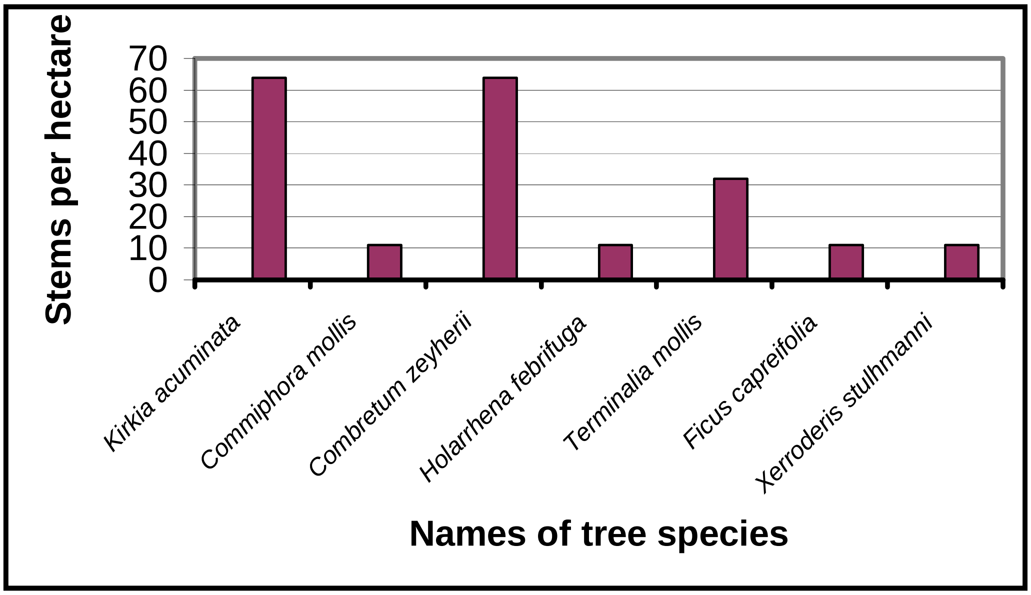


Figure 3.8 Frequency of dominant and co-dominant tree species on the north-western rock outcrop or hill.

From **Figures 3.7 and 3.8** above, it can be seen that the two hills or rock outcrops have a different range of species. For example *Holarrhena febrifuga* and *Xerroderis stulhmanni* are only found on the north-western rock outcrop. *Kirkia acuminata* is more abundant on the north-western rock outcrop than the south-eastern one.

3.12.3.3 Dynamics of old field vegetation regeneration

Agricultural productivity especially for maize in the area has reduced drastically over the last few years mainly because of reduced rainfall. One of the major effects of this is a change in the land use type. Even though persistent drought was considered the biggest land use change factor, other influencing factors included:-

- Male owner of the field dies and there are no male children to continue with current land use type;
- Livestock (oxen) die from disease and tillage of land becomes difficult;
- High cost of inputs (fertilizer and labour);
- Family head decides to relocate to some other town, village or province; and
- An agricultural field is left to fallow.

The above factors of field abandonment in turn lead to vegetation naturally re-establishing itself. The sequence and pattern of regeneration may not be fully explained here but an indication of processes assumed by the regenerating vegetation on the re-colonization of abandoned fields is illustrated.

The results of an assessment of a field 1.5 limas in extent using two plots of 10m x 10m had on average 39 sprouting stumps of *Albizia harveyi, Cassia abbreviata, Lonchocarpus capassa* and some *Acacia* species. The percentage sprouting representation of each species is given in **Table 3.11** below.

Table 3.11 Average sprouting ability of each species as a percentage of the total number of sprouting stumps

Species name	Percentage of plants sprouting	Average number of sprouts/plant	Source of regeneration
Albizia harveyi	60	4	Coppice
Cassia abbreviata	25	2	Coppice
Lonchocarpus capassa	9	2	Coppice
Acacia species	6	3	Coppice/seed

The general management practice adopted by local people in actively cultivated fields is to have vegetation re-growth from the previous cropping season cut back before ploughing. Sometimes when rainfall is abundant cutting back of vegetation re-growth in a field has to be done twice in a cropping season. According to the owner of the field assessed, re-growth in the field had been cut back in September/October 2005. At the time of assessment in November 2005 the stumps had sprouted and grown to an average height of 30cm. The ability of stumps to sprout so quickly may be related to their size and the length of time they have survived in the fields. This factor was not assessed in this study.

Older fields abandoned for two years or more exhibited a higher degree of woody species growth and species composition. Sampling plots 6, 7 and 9 represent fields lastly cultivated 2-4 years ago. Sampling plot 8 adjacent to the old fields had never been cultivated before because it generally has shallow soils with a lot of rocks scattered all over the area. It was included in **Table 3.12** for comparative purposes.

Table 3.12 Status of regenerating vegetation in selected sampling areas including old fields

Plot number	GPS reading	Source of regeneration	Approximate age of field	Management Practices
MUN/FF/25	0621729 8239763	Seed/coppice	4 years	Browsing & fuel - Wood collection
MUN/FF/26	0621681 8239800	Seed/coppice	4 years	Browsing & fuel - Wood collection
MUN/FF/27	0621698 8239949	Seed/coppice	Unknown	Grazing/browsing
MUN/FF/28	0621623 8239200	Seed/coppice	2 years	Browsing & fuel - Wood collection

Most of the woody species growing in these areas were in form of regeneration. These exhibited a high percentage of multiple stemming. Multiple stemming is an important indication of stress tolerance in regenerating vegetation. In this case this phenomenon could be attributed to the following:-

- Low soil moisture levels due to drought;
- Frequent grassland fires;
- Frequent harvesting of vegetation;
- Browsing effect of goats and cattle; and
- Pathogens and pest attack on stressed plant.

These factors could lead to a high incidence of die-back hence inducing multiple stemming as a response to induced stress.

Figure 3.9 Multiple stemming behaviour for all species in the four sample plots

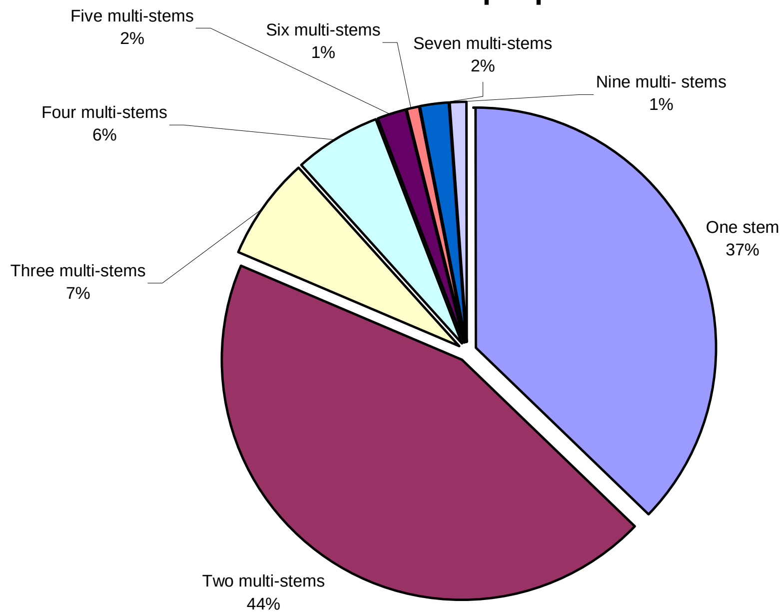
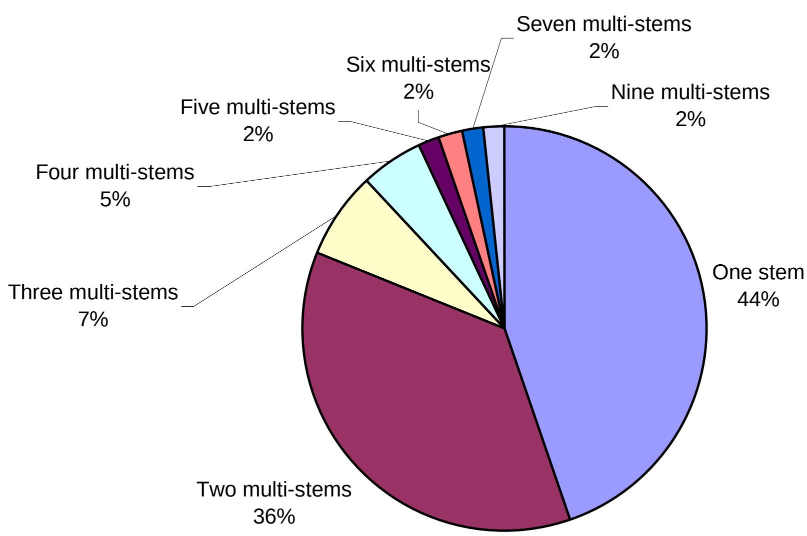


Figure 3.10 Multi-stemming in *Albizia harveyi* and *Albizia amara*



Multiple stemming was evident in 67% of regenerating species and these had between 2-9 stems on each stool or stump (**Figure 3.9 and 3.10**). Two tree species, namely *Albizia amara* and *Albizia harveyii,* accounted for 40% of all species that exhibited multiple stemming. The two species are at the same time not well favoured by goats or cattle as browse species. This factor may mean that multiple stemming in the two species may be due to some other factor other than browsing.

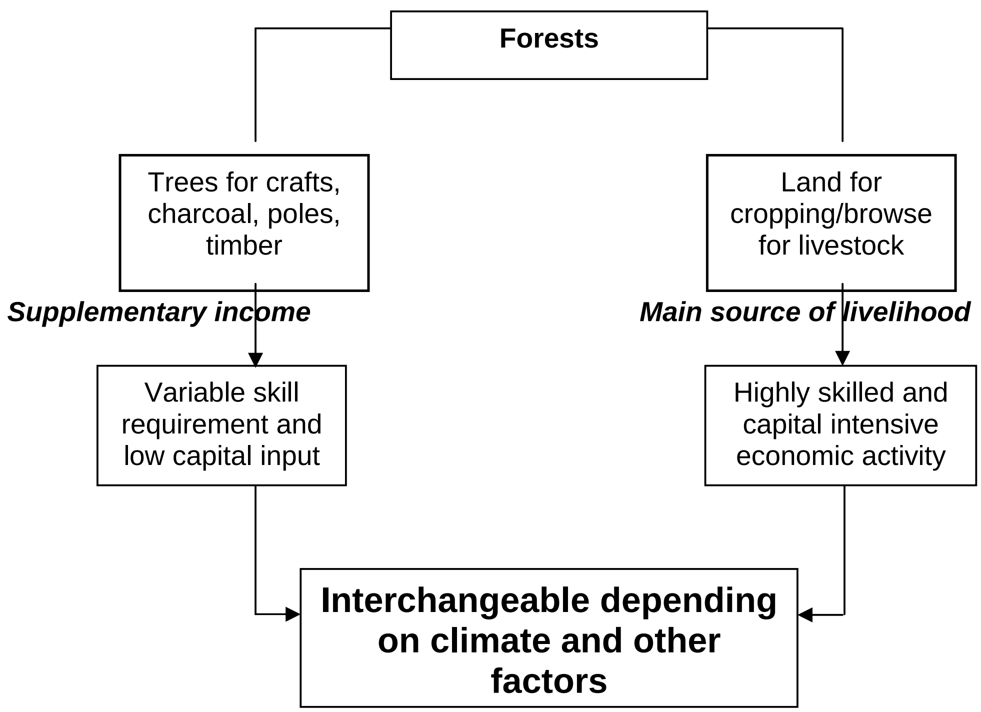
3.12.3.4 Forestry and livelihood support strategies: the role of charcoal production

In the study area charcoal production is a major forestry activity that contributes significantly to household incomes. The activity is conducted mainly on the escarpment where the preferred species of *Brachystegia* and *Julbernardia* are found. Where these species are absent genera such as *Terminalia, Bauhania, Schrebra, Acacia* and *Diplorhynchus* have been harvested. Factors contributing to a high dependency on charcoal production as a livelihood strategy are:-

- Frequent droughts and low agricultural productivity;
- Low employment opportunities in the area;
- High demand for charcoal in urban areas;
- Poor regulatory framework for forestry resource management; and
- Production of charcoal does not require skill or complex equipment.

The interactions that occur between the forests or woodlands and the people that live in or near to them are illustrated in **Figure 3.11**.

Figure 3.11 Interactions between forests and land-use types



Common charcoal species include all the *Brachystegia* species, *Julbernardia, Diplorhynchus, Acacia*, and *Schrebra* species.

3.12.3.5 Local vegetation management strategies

a. Propagation of fruit and timber species.

The local people in the survey area have over the years promoted the cultivation of indigenous fruit and timber species on a small scale. The two species grown are *Adansonia digitata* (Baobab) for its fruits and *Kirkia acuminata* (Musanta in Tonga) for its timber. *Adansonia digitata* was grown from seed while *Kirkia acuminata* from truncheons. In order to get an idea of productivity in the two species all the planted trees found in the settled area were assessed for diameter and height. In *Adansonia digitata* diameter growth seems to be a very important indicator of reproductive capacity. For example, all the trees that had a diameter greater than 70cm had fruit on them **(Figure 3.12 below).**

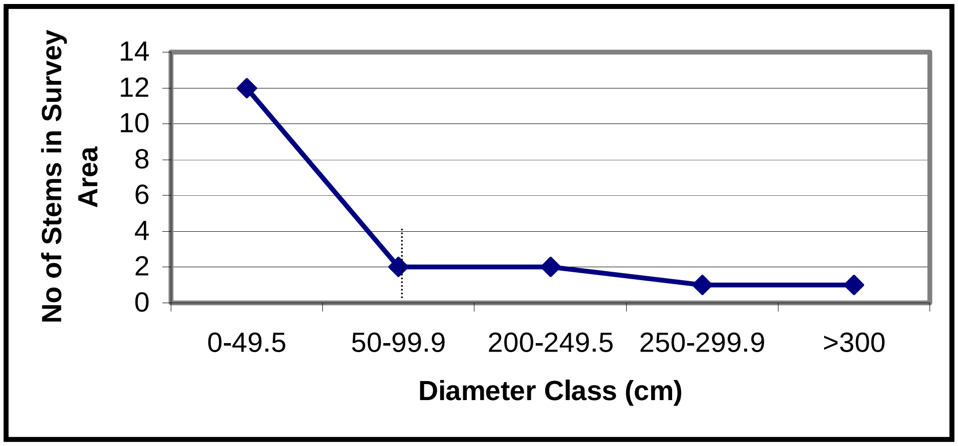


Figure 3.12 Diameter distribution of Adansonia digitata found in the survey area

On the other hand volume production was a more important measure of timber production in *Kirkia acuminata*. At an estimated age of 28 years volume production is as shown in **Figure 3.13**.

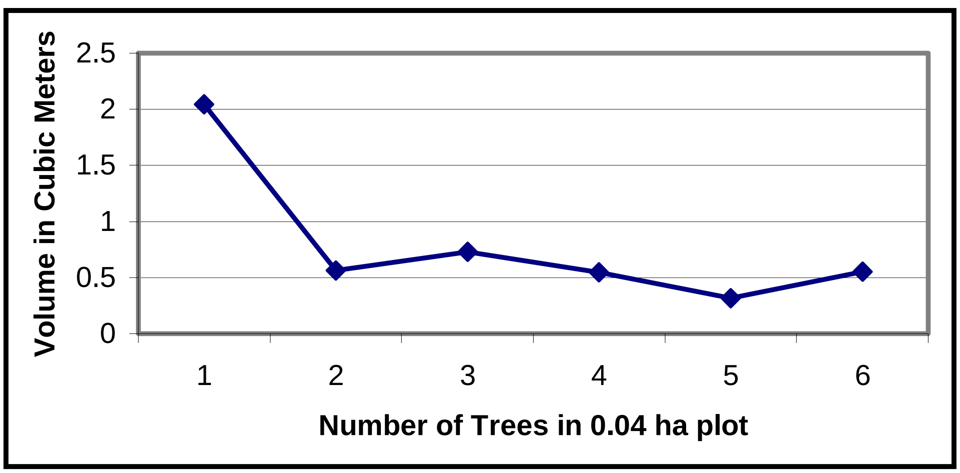


Figure 3.13 Volume production in *Kirkia acuminata* grown from truncheons

b. Management of browse species

The people of Mugoto keep an appreciable number of livestock, mainly goats and cattle. During the rainy season these animals depend on grass while during the dry season tree and shrub species become very important sources of browse. Common browse species include: *Piliostigma thonningi, Acacia* species*, Lonchocarpus capassa* and *Bauhinia petersiana*. Browse species grow actively during the wet season when grass is abundant.

c. Wood harvesting for fire-wood

A common practice in the area is to harvest regenerating tree species for firewood and agricultural purposes. For firewood harvesting, this is done by cutting larger coppice and leaving small ones, a forestry practice termed 'singling'. The result is vegetation that is constantly in a regenerative state, especially where fires are prevalent.

3.12.4 Fauna around Munali Area

This account of fauna is based more on oral tradition or local knowledge than actual sightings because the large mammals have more or less been exterminated from the area. According to the local people, the following factors have led to the existing scenario:-

- High poaching levels and destruction of animal habitats;
- Creation of human settlements along wildlife corridors impending movement of larger mammals such as elephants and buffalo;
- Introduction of livestock in areas once populated by wildlife;
- Lack of environmental awareness campaigns to encourage local people to conserve natural resources such as wildlife; and
- Viewing primates as pests during cropping season, a factor that leads to their being hunted down and killed.

The list of birds sighted in the study area is shown below in **Table 3.13**. For the list of animals (**Table 3.14**), there were no actual sightings from consultants. The local people gave names of animals that were once abundant or are sighted occasionally. The only exception was that droppings of a jackal were found on the south-eastern hill. Commonality as indicated below was based on past and not current local knowledge of the populations of the animals listed.

Table 3.13 Commonly sighted birds in Mugoto area

Name of bird	Scientific Name	Habitat	Comments on sightings
Spotted Eagle Owl	*Bubo africana africana*	Wooded places	Widely distributed
Ground Hornbill	*Bucorvus leadbeateri*	Woodland	Generally distributed
Jackal Buzzard	*Buteo rufofuscus augur*	Hilly country	Frequent
Nightjar	*Caprimulgus sp*	Non specific	Generally distributed
Cisticola	*Cisticola sp.*	Woodlands	Common
Crow	*Corvus sp*	Partial to village	Common
Falcon /	*Falco*	Non specific	Frequent

Name of bird	Scientific Name	Habitat	Comments on sightings
Kestrel			
Swallows	*Hirundo sp.*	Non specific	Common
Kite	*Milvus sp.*	Non specific	Generally distributed
Gunieafowl	*Numida sp*	Non specific	Common
Honey Guides	*Pternistus sp.*	Tall grassland	Frequent
Bulbul	*Pycnonotus barbatus*	Woodland	Common
Common Stonechat	*Saxicola torquata robusta*	Open places	Common
Hornbills	*Tockus sp*	Woodland	Frequent

Table 3.14 List of animals once found in study area

Animal name	Scientific name	Habitat	Comments
Side striped Jackal	*Canis adustus*	Woodland/open areas	Reasonably common
Vervet Monkey	*Cercopithecus aethiops*	Woodland/forest	Common/pest to crops
Rock Hyrax	*Dendrohyrax brucei*	Rocky outcrops	Common
Greater Galago	*Galago crassicaudatus*	Woodland in tree holes	Common
Porcupine	*Hystrix africae-australis*	Non specific	Common
Bush Hare	*Lepus capensis*	Open ground/dambo	Common on plateau
Ant Eater	*Orycteropus afer*	Woodland/open areas	Common
Temmincki's Pangolin	*Manis temmincki*	Anthills in open areas	Less common
Honey Badger	*Mellivora capensis*	Non specific	Common
Chacma Baboon	*Papio ursinus*	Woodland/rocky areas	Common
Tree Squirrel	*Paraxerus cepapi*	Woodland/rocks	Reasonably common
Sharpe’s Grysbok	*Raphicerus sharpei*	Thick grass & scrub	Reasonably common
Common Duiker	*Sylvicapra grimmia*	Woodland/dambo edge	Common

3.12.5 Conclusions

a. The vegetation of Mugoto in Munali Hills is highly disturbed especially on the plateau.

b. The local people have an aversion to *Sclerocarya birrea* (Marula) rather than *Adansonia digitata* (Baobab) as a fruit tree even though elsewhere in the sub-region it is more important economically than Baobab. If processed, the abundant fruit could contribute to poverty alleviation in the area.

c. Although charcoal production is still rife in the area, employment of the local people by the mining company has led to reduced charcoal production activities. This may be indicative of the fact that land-use type is related more to a people’s culture and prevailing circumstances than other factors.

d. It is only possible to propagate and manage tree species on a large scale if their cultural and economic value is appreciated by the local people.

e. Wildlife conservation, though important for the maintenance of biodiversity, is not an important livelihood issue among the people of Mugoto. Livestock is more important in this regard.

f. There is no further necessity to investigate multiple stemming in indigenous trees as a natural response to stress.

g. Vegetation disturbances during the actual mining of the minerals is not tackled here due to a general lack of information on proposed mining related developments in the area. At the moment road-works are the major source of disturbances.

3.13 AQUATIC FLORA AND FAUNA

The natural water composition presents no impediment to aquatic flora and fauna. Small fish and insects were observed in the water in the dambo. Interviews with the local population revealed that there are none or very small catches of fish in the dam and the watercourses are not considered a source for fish.

M. Chifunda completed a biological habitat assessment of the Chinkomba dam at surface water sampling point SW/01 in January 2006.The United States Environmental Protection Agency ("USEPA") Rapid Bio-assessment Protocol ("RBP") was used to assess the aquatic environment. The completed field data collection sheet is included in **Appendix IV**.

The Habitat Assessment Score is out of a total of 200. The score in this case indicates the ability of the dam to support aquatic life . Habitat Assessment Scores are described in **Table 3.15.** The results of the bio-assessment exercise are summarised in **Table 3.16.**

This approach provided a comprehensive description of the aquatic conditions and aquatic flora found at the sampling site. The bio-assessment sheets provide a detailed description of the sampling site and the surrounding area, as well as a habitat assessment score that indicates the condition of the sampling point. This is based on 10 factors that influence the quality of habitat available for aquatic and surrounding aquatic flora and fauna. The RBP's are useful in defining the potential for a water body to support aquatic life.

The results of the USEPA Rapid Bio-Assessment exercise indicate that habitat quality of the watercourses within the permit area have optimal habitat scores, with little current human impact at the locations evaluated using this method.

Table 3.15 Description of Habitat Assessment Score

Habitat Assessment Score	Habitat Description (level of human impact)
0 – 50 **51 – 100** **101 – 150** **151 – 200**	**Poor Habitat (habitat which is will support a severely limited amount of aquatic life)** **Marginal Habitat (habitat which may support a small diversity of aquatic life)** **Sub Optimum Habitat (habitat which may support fairly large diversity of aquatic but most probably non of the sensitive aquatic species)**

Habitat Assessment Score	Habitat Description (level of human impact)
	Optimum Habitat (Optimal habitat for all aquatic species endemic to the area)

Table 3.16 USEPA Rapid Bio assessment of Aquatic Flora and Fauna

Aquatic Site	Location	Habitat Score (Max 200)	Aquatic Habitat Description
MUN/SW/01	Chinkomba dam, 2km from the Albidon campsite. Potential future monitoring point for surface runoff.	116	Sub Optimum Habitat (habitat which may support fairly large diversity of aquatic but most probably non of the sensitive aquatic species)

3.13 ARCHAEOLOGICAL AND CULTRUAL ENVIRONMENT

Mr. Collins Chipote (archaeologist) of the National Heritage Conservation Commission (“NHCC”) Lusaka office undertook the baseline cultural and natural resources study of the project area. The NHCC is a Statutory Body established under Chapter 173 of the Laws of Zambia. Section 48 and 49 of CAP 173 entrusts the commission with the responsibility of protecting all ancient heritage and National Monuments from any unauthorised exploitation, excavation or damage. Mr. Chipote carried out the field component of the study between 7th and 9th December 2005.

3.13.1 Objectives

The objectives of the study included the following:-

- Identify and prepare an inventory of cultural and natural heritage resources that are found within the project area;
- Describe and evaluate the heritage resources identified and assess their significance;
- Assess the likely impacts of the project development on the heritage resources; and
- Recommend the appropriate preservation/conservation measures that would foster the integrity of the heritage resources in the context of the proposed mining project area.

3.13.2 Survey Methodology

The survey was conducted over a period of two days in the month of December 2005. Mr Chipote surveyed the area with the help of two members from AMC, Miss A. Duerden and Mr. M. Chifunda, and the second day a third person from Albidon joined the survey. The survey was essentially a fast but conscientious search of selected likely localities for all classes of sites, finds or other features. The term “site” is used in this survey to refer to any locality with associated artefacts/relics, isolated surface finds, cave, rock shelter and overhang, area of unique, distinctive or beautiful flora or fauna or land formation.

From a base point reached by vehicle, the team would walk to a selected area. Some of the areas were just below 2km away from the base point. Once on the selected area, the team would spread out and explore the area by methodical transects, keeping a distance of about 15 to 20m in between the members of the team. In cases where ground visibility was excellent, the space between members was extended. As for the possibility of locating rock art sites, the team targeted only hills with rock surfaces that could be ideal for rock paintings or art.

3.13.3 Survey Results

The survey revealed the existence of one cultural resource the Munali Pass Monument, which is located several kilometres from the Project site, and a sink hole. No archaeological resources were located but this cannot rule out their presence in the soil substratum especially during the project implementation stage. Any change of the use of the land from subsistence farming to industrial can lead to the revelation of the artefacts when much earth is disturbed. There were few rock surfaces/substrates ideal for rock art but even then, no rock art sites were found in the project area.

There were reports also of a cave located within the project area. The team surveyed the area and found sinkholes but no cave(s).

3.13.3.1 Historical Heritage

The Munali Pass Monument lies at UTM 06 23 444E, 82 38 963N and is located on the summit of the second hill. The Standard Monument of stone type is erected on the immediate west of the Lusaka-Livingstone main road and lies at UTM 06 24 565E, 82 39 025, is 1.7km from the road junction to the Project area and hence is several kilometres distant from the project site The hill summit and the Standard Monument are separated by a distance of about 1.3km.

<u>*Site Setting*</u>

The site is set on a hill summit overlooking the Kafue River to the north, the main road to the east and the project area to the south. It is located within the Miombo woodland area with *Julbernardia* and *Brachystegia* as dominant tree species. At the summit, the trees are very spaced and the environment is no longer pristine. The dominating trees are young as the older ones appear to have been cut down for charcoal and other uses. At the time of the survey, female charcoal burners were found gathering charcoal from a kiln less than 100m from the site’s cairn. This has affected the site’s scenic beauty. Grass was just beginning to sprout. At the centre of the site, is a small cairn with 7.4m stone lines spreading out in four different directions. The core site covers the entire hill summit and has an area approximately 47.5m by 22.9m

<u>*Site Significance*</u>

According to traditions, it is stated that it was from the summit of this hill on the west of the Lusaka-Livingstone Road (where the standard monument lies) that the great legend, explorer, medical doctor, missionary and anti-slavery activist Dr David Livingstone obtained his first view of the Kafue River on the 14th December 1855. He crossed these hills during his great trans-Africa journey from Angola to Mozambique. The pass “*Munali*” meaning the “*Red One*” is named after him.

The site marks one of the most important stages during David Livingstone's great historical journeys. From this summit, Livingstone's first location of the Kafue River was later to be made known to the outside world and put on the world map.

<u>*Sinkholes*</u>

The alleged site is found about 1.3km west of the Munali Camp and has a solution hole-like feature which is a result of reaction between meta-carbonate rocks and acid/rain water. Carbonate rocks easily dissolve in water to produce cavities as caves and solution holes. The geology of the study area is mainly that of granites, meta-quartzite and carbonates of which the latter is less resistant to the effect of solution weathering. It is for this reason that there is selective weathering of the rocks. In the project area, the study revealed no caves while the holes are not worth protecting. From a heritage point of view what was found was not significant and therefore requires no protection.

3.13.3.3 Conclusion and Recommendations

Mining activities are expected to have some negative impacts on the environment, however there are no heritage resources located within the Project area and hence there will be no impact. Much of the (natural) environment in the project area has already been altered mainly by human activities which have caused significant disturbance due to uncontrolled exploitation of natural resources, principally vegetation. The Munali Pass Monument area has been disturbed primarily by deforestation. On the other hand, the envisaged mining activities at the Munali Nickel Project by Albidon should not impact negatively on the monument:-

- The site disturbances would not arise since the mine will essentially involve underground operations. Construction activities would cause destruction (near or total) of the natural or cultural resources where the major infrastructure will be located. In the case of this project, no heritage resources, at least on the land surface, were found within the core mining area; and

- The heritage site is about 2km east of the core mining area and is set on a hill summit. Other mining activity areas such as the tailing storage facility location are far from the core heritage site area.

The increase in population would give rise to a range of indirect effects upon the site since it is a source of some natural resources such as Miombo trees and building stone aggregate.

Some heritage resources especially archaeological ones are difficult to locate as they could be buried underground and could be disturbed, dislocated or simply destroyed when the project commences. They can only be revealed when they are unearthed. The fact that archaeological remains or antiquities are finite, non-renewable resources and are highly fragile and vulnerable to damage cannot be over-emphasized. No archaeological remains were located during the survey but that does not rule out their presence underground and hence susceptible to damage once the project is implemented.

Once any heritage resource or relic is unearthed during project implementation or operation, the relevant authority responsible for the preservation of the heritage would be contacted.

4. SOCIO-CULTURAL AND ECONOMIC STUDY

4.1. INTRODUCTION

Environmental consultant Dr. Mutilo Silengo, who is also Academic Coordinator, Leadership for Environment and Development ("LEAD"), Southern Africa, Lusaka, undertook the baseline socio-cultural-economic study of the project area. Mr. M Chifunda, AMC environmental engineer assisted Dr Silengo. The field component of the study was conducted between 12th October and 11th November 2005.

4.2. APPROACH AND METHODOLOGY

The approach to the socio-economic baseline study was participatory, in line with World Bank and International Finance Corporation ("IFC") guidelines. The first phase of the study was to review available secondary information. In the next phase, the participatory rural appraisal ("PRA") methodology was employed to collect socio-cultural and economic field data.

The following research process was adopted:-

- Review available secondary documentation;
- Site visits to Mazabuka Town and Munali areas;
- Conduct the PRA in the local community;
- Meetings with community leaders; and
- Conduct interviews with key informants and stakeholders.

Tools and techniques used to engage the community and gather information are listed in **Table 4.1**.

Table 4.1 Tools and Techniques Used to Engage the Community and Gather Information

Tools Used	Technique Used
• Resource mapping	• Group discussions
• Seasonal calendar	• Group discussions
• Semi-structured interviews	• Discussion with key informants
• Livelihood analysis	• Group discussions
• Venn diagram	• Group discussions
• Daily activity done	• Discussion with people

4.3 COMMUNITY MEETING

A community meeting was held to:-

- Share basic information concerning the project;
- Identify issues and outline the concerns of the affected communities;
- Invite the local communities input to the project; and

- Build support for the project.

4.4 COUNTRY OVERVIEW

The Republic of Zambia government system is a multi-party democracy. The 150-member National Assembly, elected by universal suffrage, represents the national legislature. The President is the Head of State governing the nation via his appointed Cabinet. The legal system is based on English common law and customary law. The country is divided into 9 political subdivisions referred to as Provinces.

The Zambian economy has always been dependent on foreign exchange revenue from its extractive industry. Copper accounts for over 75% of export earnings. The decade immediately after political independence saw a collapse in copper prices. State controlled economic policies introduced in the early 1970s had a devastating effect on the Zambian economy. Since then, the country has experienced a steady decline in its economic performance, with per capita income falling, almost 5% annually from 1974 through the 1990s.

Zambia has also suffered economically because of its ‘land locked’ location and proximity to southern Africa's recent hotspots - the Democratic Republic of Congo, Zimbabwe and Angola. The constant arrival of new refugees and ex-combatants is a cause for concern because of the country’s weak economy and poverty rating.

Zambia has however, made significant progress in implementing ambitious economic reforms, including privatisation, deregulation and exchange and trade liberalisation. Indications are that hyperinflation has been contained and economic management has improved. These steps have yet to be reflected in sustained economic growth and Zambia remains one of the poorest countries in the world. Social indicators remain persistently low and a high incidence of HIV-AIDS presents further challenges to Zambia's poverty reduction efforts. It is estimated that 73% of the population live below the national poverty line. The government has undertaken a number of institutional reforms in social sectors and has put forward a broad strategy for growth and poverty reduction in its Poverty Reduction and Strategy Paper presented to the IMF in 2002, including implementation of HIV-AIDS programmes. The Human Development Index (HDI, 2005) is 0.394. Life expectancy at birth is 37.5 years. Adult literacy rates stand at 67.9%.

4.5 PROVINCIAL GOVERNMENT AND ADMINISTRATION

The Southern Province of Zambia covers an area of 85,283km^2, representing 11.8% of the total area of Zambia. It forms boundaries with Western Province on the western side, Central Province in the north and Lusaka Province to the north-east. It shares borders with Zimbabwe, Botswana and Namibia in the south.

Administratively, the province is divided into 11 districts, namely: Choma; Gwembe; Itezhi-Itezhi; Kalomo; Kazungula; Livingstone; Mazabuka; Monze; Siavonga; Namwala and Sinazongwe. Livingstone is the administrative capital of the province.

Southern Province boasts many tourist attractions, the major one being the Victoria Falls. There are four main rivers: the Zambezi; Kafue; Kalomo and Ngwezi and the two man-made lakes: Kariba and Itezhi-tezhi. Other attractions include wildlife and bird viewing in Musi-oTunya, Kafue and Lochnivar National Parks; Maramba Cultural Centre; Livingstone Museum; rafting and boating; micro-light flights; bungi jumping; motorboat rides; helicopter flights; and Sichifulo and Mulobezi Game Management areas.

Southern Province has a number of industries though some were closed down after their privatisation. The Province, endowed with good soil, has been experiencing drought for some years now. The province is remote from the more industrialised Copperbelt and there is an abundance of large-scale commercial farming activities. The Province has fair road infrastructure but has not attracted many major investments in recent decades.

Other large towns in the province include Choma, which is situated in the NW corner of the province, 175km from Livingstone; Monze, located 245km northeast of Livingstone; Kalomo, which is 110km northeast of Livingstone and Mazabuka, which is 300km northeast of Livingstone.

4.6 TRADITIONAL GOVERNMENT ADMINISTRATION

The traditional system of governance is an important part of the way of life in the rural areas. The Chief administers his area using group tribal leaders, village headmen and a system of deputies. They address typical issues of local importance, for example, issues relating to land or witchcraft.

Chief Naluama, whose area covers Munali, has 9 Group Leaders (3 of these are in the immediate vicinity of the project area from Chinkomba east to the Albidon base camp) and 21 sub deputies. A legal structure is also present in the traditional communities. There are Local Courts with Court Assessors who are appointed on the recommendation of the Chief and district government.

4.7 POPULATION: SOUTHERN PROVINCE

Southern Province accounts for 12% of the Zambia's population. The province had an estimated population of 1,212,124 people in 2000, mainly comprised of small-scale farmers. This is a rise from 496,041 in 1969, 671,923 in 1980 and 965,591 in 1990. However, the population growth rate has declined from 2.8% during the 1969-1980 and 3.0% during the 1980-1990 periods to 2.3% between 1990-2000.

The provincial population density has increased from 5.8 in 1969, 7.9 in 1980, and 11.3 in 1990 to 14.4 persons per km^2 in 2000. Population distribution in the Southern Province is summarised in **Table 4.2** below.

Table 4.2 Population Distribution in the Southern Province of Zambia, 2000

District	Households	Males	Females	Population
Livingstone	18,856	51,828	51,460	103,288
Kalomo	26,921	83,175	86,328	169,503
Itezhi-Itezhi	7,998	22,170	20,941	43,111
Choma	33,655	100,791	104,107	204,898
Kazungula	12,601	34,178	34,087	68,265
Monze	26,398	80,697	82,881	163,578
Mazabuka	86,210	102,585	100,634	203,219
Gwembe	5,604	16,862	17,271	34.133
Namwala	12,075	40,486	42,324	82,810
Siavonga	10,504	29,171	29,693	58,864
Sinazongwe	13,576	39,497	40,958	80,455
Southern Province	204,398	601,440	610,684	1,212,124

4.8 SOCIAL FABRIC AND STRUCTURE

Ethnic-Tribal Groupings

Southern Province has a diverse mix of ethnic or tribal groupings with their corresponding Bantoid languages. The most predominant spoken language of communication in Southern Province is Tonga with 68.9% of the population using it. Other languages spoken in the province are: Nyanja (5.5%), Lozi (5%), Ila (3.8%), Toka-Leya (3.6%), Bemba (3%) and English (0.8%).

The main tribe in Chief Naluama's area is Tonga. The Tonga language is officially taught in schools. It is also used in literacy campaigns, agricultural extension services, newspapers and radio programes. Intermarriages across tribal lines are common and people usually live together in harmony. The Lwiindi Ceremony is the main annual ceremonial event observed in mid-May to thank God and ancestors for the land and harvest. The ceremony is conducted at traditional sites.

Kinship and Culture

The village, among the Tonga people, is a family based unit. The personal identity of the family unit is very important in defining the village entity. Village houses are often built of adobe brick with thatch roof. Some houses are constructed using poles and plastered mud. The number of houses in the village set-up is normally arranged according to the number of elderly people in that family. The parents will occupy a single dwelling, usually the largest in the homestead. In the case of a polygamous family, both the senior and junior wives will have their own houses. Older male and female members of the family will occupy different quarters. The *Chota* (meeting/eating place) is centrally located and is usually used by males as an eating-place and for discussions. Female members of the family sit in this area by invitation only. The *Munsaka* is the domain of women and is used for cooking.

Chief Naluama oversees traditional governance in his chiefdom, which covers the project area. He is assisted by village headmen. These leaders and headmen preside over matters affecting people in his chiefdom.

Religious Practices and Beliefs

From a general survey of the area, it is estimated that over 80% of local people embrace the Christian faith. A number of churches have been established, sometimes located less than 1km apart along the main Lusaka-Livingstone road. It is quite evident that religion is an important aspect of peoples' lives and therefore the Church is a very important institution in these communities. Christian religions and traditional philosophies co-exist, and witchcraft is a common belief. A survey of churches in the project area revealed five denominations. These included:-

1. Roman Catholic Church;
2. New Apostolic Church;
3. Seventh Day Adventist Church;
4. Jehovah's Witnesses; and
5. Pentecostal Assemblies of God.

Livelihoods

An indication of the livelihoods of people living in the project area is given by the rural seasonal calendar. The calendar is dominated by farming activities highlighting the fact that local peoples' lives are strongly influenced by agriculture and agricultural-related activities (see **Table 4.3**).

Table 4.3 Rural Calendar in the Project Area (Agricultural Cycle)

Month	Farming Activities
January - March (Wet Season)	Plant pumpkins and sweet potatoes. Picking of various types of mushroom found in the area. Weeding of fields. Sweet potato harvesting, Jimbo, Ntamba, and beans harvesting and first green maize cobs.
April - July (Cool, Dry Season)	'Scaring' Birds. Harvesting of maize. Women cut thatch grass. Houses are built or repaired.
October - December (Hot, Wet Season)	Clearing bush and lopping trees for the Chitemene farming system. Ploughing fields. Maize, Sorghum, Millet and Groundnuts are planted. Picking of mushrooms and wild fruits like Masuku and Fungo.

The major economic activities in Munali include subsistence farming and other, non-farming activities. Accordingly, livelihood strategies can be grouped into:-

1. Natural resource based; and
2. Non-natural resource based.

The different livelihood strategies are presented in **Table 4.4**.

Table 4.4 Livelihood Strategies in Munali

Livelihood Strategies (economic activities)	
Natural Resource Based	**Non-Natural Resource Based**
• Subsistence agriculture • Market gardening • Charcoal production • Fishing (from Kafue river) • Mushroom collection / selling (during the rain season) • Traditional healing	• Market or roadside vending • Beer brewing • *Munkoyo* brewing (maize or sorghum • based beverage) • Petty trading in *Tuntemba* (roadside kiosks) • Blacksmithing / tinsmith • Livestock rearing

4.9 AGRICULTURE, COMMERCE AND INDUSTRY

Agriculture is practiced on both commercial and subsistence levels. For subsistence level, the traditional slash-and-burn method is used. This is the main source of livelihood. Crops grown include maize, millet, sorghum, sweet potatoes, beans and cotton. Commercial crops gown include maize and coffee. Livestock rearing is also done with the main animals being cattle, goats, pigs, and chickens. Goats are reared in large numbers, primarily for market in Lusaka and Copperbelt. Being traditional rural communities the land usage reflects the dominant occupation of the people.

There are no major industries in the local area. Consequently, commerce is mainly related to trade in agricultural produce and petty trading in household consumer goods. The major markets for produce are Mazabuka , Kafue and Lusaka.

4.10 POPULATION IN THE VICINITY OF THE PROJECT

Albidon carried out a detailed census of houses / huts and population in the immediate project area Chinkomba in November 2005. The census results are presented in Appendix V. There are a total of 73 households or huts in the area. The total population is 739. It was determined through the census and discussions with the local population that there will be approximately 20 households affected by the mining project through loss of farmland or houses. A Resettlement Action Plan has been developed by AMC to determine the affected parties and to discuss the compensation measures to be carried out. The relocation will be carried out in two phases. Six households will be relocated in

Phase 1 and twelve households will be relocated in Phase 2. There will be an additional two households affected through farmland loss alone.

4.10.1 Social Infrastructure

Education and Schools

The Southern Province has a total of 880 institutions, which include 36 secondary schools, 121 basic schools, 516 primary schools, 204 community schools and 3 colleges.

Chief Naluama's area has 2 basic schools, namely, Naluama School and Mugoto Basic School. These are both classified as Grade 3 schools. Naluama School has 406 enrolled pupils (**Plate 1**), whereas Mugoto Basic School has 924 pupils. Both schools are characterised by lack of basic teaching materials, over-enrolments, low staffing levels and inadequate infrastructure to support the burgeoning school enrolment figures. For example, during our field visits we found a Grade 4 class learning under the tree for lack of classroom space (**Plate 2**).

Plate 1 Naluama Primary School

Plate 2 Grade 4 Class under a Tree

Teachers spoken to at community meetings indicated that there is a high drop-out rate at Grade 5-6 mainly due to early marriages, long distances travelled to school on foot and lack of money to pay school fees. The drop-out rates tend to be higher among girls.

4.10.2 Medical Facilities: Rural Health Centres

The existing policy on the location of rural health centres (RHC's) is that they should be established at 15km intervals. There are three RHC's in the project area, operated by the government. The RHC's provide primary health care services, including antenatal, maternity and under-five services. The three RHC's are Naluama Rural Health Centre (**Plate 3**), Nasenga Rural Health Centre and Mugoto Rural Health Centre. The latter has a catchment population of 5,362. Plan International, an international Non-Governmental Organization ("NGO") operating in the area, constructed the health centre in 1998.

Most common ailments are diarrhoea among children, especially during the hotter months of August to November and malaria in the wetter months of November to March. The surrounding communities are sensitised with the realities on HIV/AIDS through outreach programmes, training of peer educators in psychosocial counselling and provision of condoms. In the schools, the Community supporting Health HIV/AIDS, Nutrition, Gender Equality and Education in Schools ("CHANGES") programme is used to develop HIV/AIDS awareness on Mondays and Fridays.

The main challenges facing the provision of effective health care services in the area are poor roads and long distances making attendance difficult for many people. For example, it is not uncommon in some instances for patients to travel on foot for up to 12km to the nearest health centre. The centres have poor staffing levels, inadequate funding and unreliable transport.

Plate 3 Naluama Rural Health Centre

Plate 4 Mugoto Rural Health Centre

4.10.3 Road, Transport Infrastructure and Communication

The road and transport infrastructure in the area is poorly developed. The Lusaka-Livingstone T-X main trunk road links Munali to Lusaka and other parts of the country (**Plate 5**). This important artery is tarred and is generally in fair condition but also has some potholed stretches. The rainy season adversely impacts the road, extending pot-holed areas and creating new ones. The future state of the road will depend upon the policy of the Ministry of Transport on road repair for the area. In the project area all roads except for T-X main road are secondary unsealed roads.

Light trucks, bicycles and ox-drawn carts (**Plate 6**) are used to convey people and farm produce.

Plate 5 Lusaka-Livingstone Highway

Plate 6 Transport by Ox-drawn Carts

A mobile phone company CELTEL provides phone communication in the area.

4.10.4 Water Supply and Waste Disposal

Wells provide portable water for the communities in the area. Sanitation is by way of pit latrines. Domestic wells have been sunk with the assistance of the Water Affairs Department and organisations such as Plan International. There are 4 operational Indian Mark 2 hand Pumps in Chinkomba Village used for drawing potable water and watering livestock. A number of other such water points are scattered in the surrounding villages. There are also 3 dams in the area, namely Chakola, Mugoto and Zingu dams. These are mainly used for watering livestock.

4.10.5 Institutions

Apart from government institutions in the area there are the traditional structures, the Church, political parties and the local courts. The advent of plural politics in the country since 1991 has encouraged the local people to participate in various political activities. During the 2001 tripartite elections all parties were represented. The main political parties are United Party for National Development (“UPND”) and the Movement for Multiparty Democracy (“MMD”). Chief Naluama’s area falls under the Mazabuka Constituency, which has 2 Wards represented by UPND Councillors.

Other institutions that have been active in the area include the Plan International and the Zambia Social Investment Fund (“ZAMSIF”). These have been involved in several projects including the construction and extension of school infrastructure in the region. The Department of Water Affairs has been responsible for sinking wells and boreholes in the district.

4.10.6 Chinkomba Village

Household surveys for Chinkomba Village and the surrounding settlements conducted by Albidon (Appendices 2 and 3) indicate that:-

- Some residents have lived in the village since 1969;
- On average most residents have lived in the village for over 20 years;
- The village has approximately 73 households;
- The vast majority of the residents are subsistence farmers, with generally low education standards and a few formal business skills;

- Maize and cotton are grown, the former for subsistence and the latter crop for sale;
- Other crops grown include sunflower, sorghum, cassava, groundnuts and vegetables;
- Livestock reared include cattle, goats, pigs, chickens, guinea fowls, pigeons, and ducks;
- Farm implements owned and utilized include ox-cart (wagons), ploughs, disc harrows, cultivators; and
- Land holdings range from 2ha to more than 25ha.

4.10.7 Livelihoods Patterns

The mainstay of the local economy is subsistence farming. Maize is the main crop grown. Other minor crops include groundnuts and sunflower. Cotton is grown for sale as part of the out-grower scheme run by Dunavant Zambia. It is estimated that 250ha is under cotton cultivation every year. An average of 1.5 –2ha is cultivated per household. Some households have landholding of up to 25ha.

Livestock rearing is also important in the area. Cattle and goats are in significant numbers in and around the village. A government programme of restocking has commenced in the area. Some of the villagers have been beneficiaries receiving a heifer each.

4.10.8 Energy Sources

Wood and charcoal are the main sources of heating and cooking. Charcoal is normally produced for sale. This is often sold along the main road.

4.10.9 Commercial Activities

There is no defined commercial area in the vicinity of the Chinkomba Village. Grocery stores, bars and taverns are located on the main Lusaka-Livingstone highway. Petty trading is practiced in various household goods, foodstuffs and wares.

4.11 MONUMENTS OF CULTURAL HISTORIC SIGNIFICANCE

The Munali Pass Monument (**Plate 7**) is a site of cultural and historic significance that is located several kilometres from the project. It is told that it was from the summit of the hill that the Scottish explorer Dr. David Livingstone obtained his first view of Kafue River. He crossed these hills on his trans-Africa journey from Angola to Mozambique. This will not be affected by the project activities. More significantly, however, are the burial grounds that are found within the mine site. Since the mining operations will be underground, there may be no need to disturb these areas.

Plate 7 Munali Pass Monument

4.12 SOCIAL INSTITUTIONS

A number of social institutions exist in the area including traditional, religious, government and non-government organizations ("NGO's").

4.12.1 Traditional Authority

The proposed mining project is located in Chief Naluama's locality. The chief has a number of headmen who assist him in the running the affairs in his jurisdiction.

4.12.2 Local Courts

There is a local court in Naluama presided over by the Local Court Justice, a resident of Chinkomba Village. The local court is responsible for resolving all civil matters in the area.

4.12.3 Non-governmental Organizations

At the moment, the only NGO operating in the area is Plan International. This is a child-centred community development organization working with children, their families and communities to make lasting improvements in the lives of children. Plan is implementing four programmes related to:

1. Basic Health, Water and Sanitation
2. Food Security and Income Generation
3. Children's and Community Empowerment and:
4. Early Childhood Care and Development and Basic Education.

In the project area Plan has been implementing a number of health related projects including the construction of the Mugoto Rural Health Centre in 1998 and the training traditional birth attendants (TBA's).

5. ENVIRONMENTAL, SOCIO-CULTURAL AND ECONOMIC IMPACTS

Identification of potential project environmental and social impacts is based on the detailed mine design as described in the Munali Nickel Project BFS, Project Description (Section 2 of this Environmental Report), the Environmental Baseline Study (Section 3 of this Environmental Report) and industry experience. Management actions proposed to mitigate project impacts are based on best industry practice but adapted where appropriate to satisfy Zambian environmental and social conditions.

5.1 PROJECT ENVIRONMENTAL IMPACTS

Environmental impacts are addressed by mine component. These are:-

1. Munali underground mine;

2. Munali waste rock dumps;

3. Plant area, ROM pad and processing facilities; including
   - Ore crushing and transfer;
   - Concentrator;

4. Tailings storage facility ("TSF");

5. Plant area workshop;

6. Transport infrastructure;

7. Waste management; including
   - Industrial waste;
   - Hazardous waste; and
   - Medical waste.

8. Materials handling and storage; including
   - Mine stores; and
   - Fuel.

9. Construction activities (contractors); including
   - Materials handling and storage;
   - Site preparation; and
   - Construction.

10. Possible resettlement of part of Chinkomba Village; and

11. Socio-economic and cultural impacts.

The key environmental aspects/issues and associated impacts relate to each mine component and the pre-mining, operational and post closure phase where appropriate. They have been characterised using both qualitative assessment and quantitative evaluation where relevant data is available. The criterion used to characterise the environmental impacts is explained in Table 5.1.

Table 5.1 Criterion and Terms used to Describe Potential Environmental Impacts

Item No.	Impact Criterion	Description	Criterion Classification	
			Term	**Description**
1.	Positive or Negative Impact	Will the impact have a positive or negative effect on the environment?	Positive	A positive impact.
			Negative	A negative impact.
2.	Intensity or Amplitude of Impact?	What is the likely level of impact with regard to physical disturbance; sensitivity; vulnerability; uniqueness or rarity of component?	Very High	Very high level of impact.
			High	High level of impact.
			Moderate	Moderate level of impact.
			Low	Low level of impact.
3.	Extent of Impact?	What is the geographical extent of the impact?	Project Area	Impact will affect the immediate mine area.
			Regional	Impact will affect areas outside the mine area.
4.	Duration of Impact?	What is the likely duration or time over which the impact will occur / be felt?	Short-term	Impact will cease once activity stops.
			Medium-term	Impact will continue for the lifetime of the power line.
			Long-term	Impact will continue beyond decommissioning of power line.
			Permanent	Impact will be permanent and irreversible.
5.	Timing of Impact?	At what point in time will the impact occur / be felt?	Construction	Impact will occur at the start of construction phase.
			During Operations	Impact will occur within the lifetime of the power line.
			Post Closure	Impact will occur after the decommissioning of the power line.
6.	Frequency of Impact?	What is the likely frequency of occurrence?	Continuous	Impact will be continuous.
			Frequent	Impact will occur frequently.
			Infrequent	Impact will occur infrequently.
			Occasional	Impact will occur occasionally.
7.	Likelihood of Impact occurring?	What are the likelihood / certainty associated with a potential impact?	Unlikely	Impact is unlikely to occur.
			Possible	Impact may possibly occur.
			Probable	Impact is likely to occur.
			Certain	Impact is certain to occur.
8.	Value of Affected Component?	What are the value / importance of the affected component to the people potentially affected?	High	Value / importance of affected component are high.
			Moderate	Value / importance of affected component are moderate.
			Low	Value / importance of affected component are low.
9.	Risk to Human Population	What is the likely level of risk for the safety and well being of the affected people?	High	High risk to human population from impact.
			Moderate	Moderate risk to human population from impact.
			Low	Low risk to human population from impact.
10.	Cumulative 'Knock On' Effect of Impact?	(a) What other environmental physical / biological components are affected by the impact?	Surface Water	Surface water is also likely to be affected.
			Groundwater	Groundwater is also likely to be affected.
			Air	Air is also likely to be affected.
			Soils	Soil is also likely to be affected.
			Flora & Fauna	Vegetation is also likely to be affected.

Item No.	Impact Criterion	Description	Criterion Classification	
			Term	Description
			None	None of the above is likely to be affected.
		(b) What other key social / economic components are affected by the impact?	Economy (R)	Regional (including local) economy is also likely to be affected .
			Economy (L)	Local economy is also likely to be affected.
			Culture	Culture is also likely to be affected.
			Health	Long-term health is also likely to be affected.
			None	None of the above is likely to be affected.

A breakdown of the most important environmental impacts with mitigation measures is shown in Table 5.2. Project environmental aspects/issues, potential environmental impacts and impact characterisation is presented in Table 5.3 in Appendix VII. A total of 282 environmental impacts have been identified. Of these, 262 are classified as negative and 20 are classified as positive. It should be noted that a classification of negative does not necessarily imply a long-term adverse effect on the environment. It may well indicate an irreversible change to the physical environment from original conditions. In some cases, these irreversible changes can result in favourable long-term effects (for example the creation of a sailing or boating club on a tailings dam, such as the Rokana Boating and Sailing Club in Kitwe).

Potential positive impacts relate to social aspects, such as the diversification of jobs in the nearby villages, use of a local workforce and contractors, expansion of the local economy through diversification, supply of clean water to surrounding villages, improvement in electricity supplies due to mine requirements from ZESCO and improvement of health for the workforce and local population.

Negative impacts generally relate to the possible physical disturbance of the land, surface and groundwater contamination, air pollution, soil contamination, noise, public and worker safety, plant spills and accidental releases, handling spills and issues related to waste management and sewage treatment/disposal. These potential environmental impacts, with the exception of permanent changes to the physical landscape resulting from underground mine excavation, tailings storage facility, water dam, and waste rock dump construction, can be prevented or successfully mitigated against by implementation of a sound environmental management plan.

Table 5.2 Summary of the Main Environmental Impacts and the Management Measures to Minimise Impacts

Impact	Sub-Impact	Mitigation Measure	Management Cost
Resettlement of population from Chinkomba Village	Loss of housing.	All affected people in Chinkomba Village will be included in the census and new housing will be constructed for them.	1,000,000 US$
	Loss of churches.	New places of worship will be constructed as part of the RAP.	
	Disruption to	There will be 2 phases of	

Impact	Sub-Impact	Mitigation Measure	Management Cost
	livelihoods.	resettlement at present and all villagers will be notified in advance of relocation. Adequate compensation will be provided for all affected people.	
	Friction between villagers in relocation site and the relocated villagers of Chinkomba Village.	A relocation site will be chosen with the best conditions available. The Chief, headman and villagers of Chinkomba Village will have input in choice of relocation site and final agreement.	As Above
Loss of farm plots	Disruption/loss of income.	Fields and all contents will be measured and valued and compensation will be allocated on an individual basis. Owners of fields that live in Chinkomba will have fields when relocated. Owners outside of Chinkomba Village will be dealt with as discussed in the RAP.	As Above
Subsidence in areas of underground workings	Danger to public living or farming within 100m of all caving areas.	Caving areas will be cordoned off from access. Access to the mine site will be restricted to authorised personnel only.	10,000 US$
	Danger to surface infrastructure over underground workings.	All mine infrastructure will be built away from any potential impact from the underground workings.	
Potential for Acid Rock Drainage	Contamination of surface and groundwater through the discharge of acidic water from the waste rock dump, tailings dam, stockpiles and underground areas (post closure)	All surface runoff from the Tailings dam will be collected in drains and settled in sedimentation ponds. This water will be monitored regularly and treated if necessary to ensure compliance with ECZ regulations. Tails will be dosed with lime prior to discharge into the TSF to neutralise tails prior to placement. Waste rock dump runoff, stockpiles runoff, underground dewatering water and site groundwater will be monitored on a regular basis and measures implemented if contamination is evident.	1,300,000 US$
Lowering of	Reduction in available	Groundwater levels will be	50,000 US$

Impact	Sub-Impact	Mitigation Measure	Management Cost
Groundwater level during mine dewatering	groundwater for use. Drying up of groundwater fed watercourses	monitored during the course of operations. Actions to supplement water supply where necessary will be investigated.	
Noise and Vibration	Risk of loss of hearing (mine employees working in noisy areas) Vibrations affecting surface infrastructure. Disturbance to local community and animals.	Noise and vibration levels (during blasting) will be monitored in and around the project area. Noisy areas (above 75dbA) will require the use of hearing protection. All machinery, equipment and vehicles will be regularly maintained and noise attenuation devices fitted where feasible.	25,000 US$
Dust	Possible risk of respiratory diseases (employees working in dusty areas). Dust contamination around project facilities	Dust levels will be monitored in and around the plant. Workers in dusty areas will be made to wear protective dust masks. Dust levels will be managed onsite by spraying water on road surface, rehabilitating closed areas of the tailings dam and waste rock dump and by maximising the wetted surface of the tailings dam as much as feasible.	25,000 US$
Accidents / Risk to underground miners		A full underground safety manual will be developed detailing all safety aspects relevant to underground mining operations. Training will be provided to personnel for the type of work they are required to perform.	30,000 US$
Soil contamination from spills of chemicals	Degradation of the surrounding soil, affecting flora and fauna and restricting future Land Use.	A soil monitoring programme will be implemented to evaluate the levels of contamination onsite. Materials handling and storage areas will be constructed and plans have been developed to ensure the proper handling and storage of all onsite materials to minimise the risk to the environment.	20,000 US$
Removal of vegetation	Loss of habitats and timber resources. Possible increase in soil erosion.	Removed topsoil and vegetation will be stockpiled and re-used to concurrently re-vegetate and rehabilitate	50,000 US$

Impact	Sub-Impact	Mitigation Measure	Management Cost
		the area during operations and post closure.	
Loss of Archaeological artefacts during construction		In the event of any find, the area will be cordoned off and the local authority consulted.	10,000 US$
Public risk	Injury / fatality due to inadvertent access to the mine	The mine will be sectioned off to the public and only authorised personnel allowed on site. Dangerous areas (such as caving areas and tailings dams) will be sign posted and the public made aware of the dangers through public consultation.	20,000 US$
Increased employment	Increases in disposable income, economic multiplier effects.	Albidon will implement a strategy to employ local people where possible.	10,000 US$
Improved Community Services	Better health and education levels for the local community	Albidon will enhance local health and education through the development of community health and education projects	50,000 US$

5.2 UNDERGROUND MINE

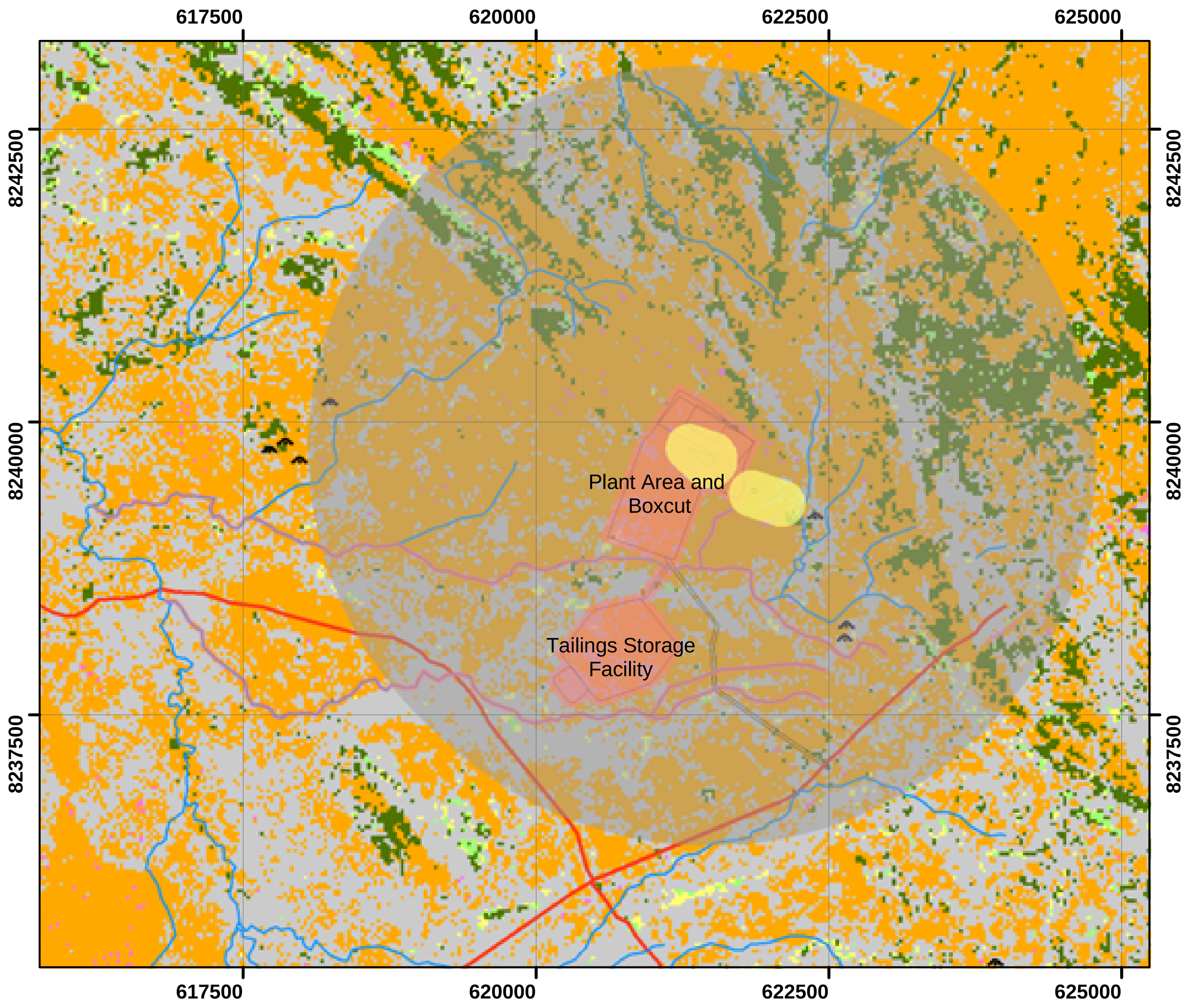
The general development layout can be viewed in long projection in Figure 2.5. Access to the underground levels will be via a 5.5m high x 5.5.m wide 1:7 decline. The underground mine will cover a surface area of approximately 231,000m^2. Approximately 1.5ha of land with some vegetation will be cleared and 30m^3 of soil removed from the portal area.

5.2.1 Construction Phase

The activities to be carried out during the construction phase of the underground mine mainly include site clearance (removal of vegetation and topsoil) around the access portal and along access roads. Construction work will be undertaken using front-end loaders, graders and haulage trucks. The soil removed from development works will be stockpiled for future re-vegetation use. All timber removed from the area will be used for mine construction and any excess will be made available to the public for collection from site. The associated impacts of the construction phase of the underground mine are detailed in the Environmental Impact Assessment Table (Table 5.2) and summarised below.

Landscape and Visual Character

Landscape and visual character of the area will be affected by the removal of vegetation (1.5ha). This impact will be noticeable from the air but will be effectively screened by remaining woodland and the local topography. This is a permanent impact.



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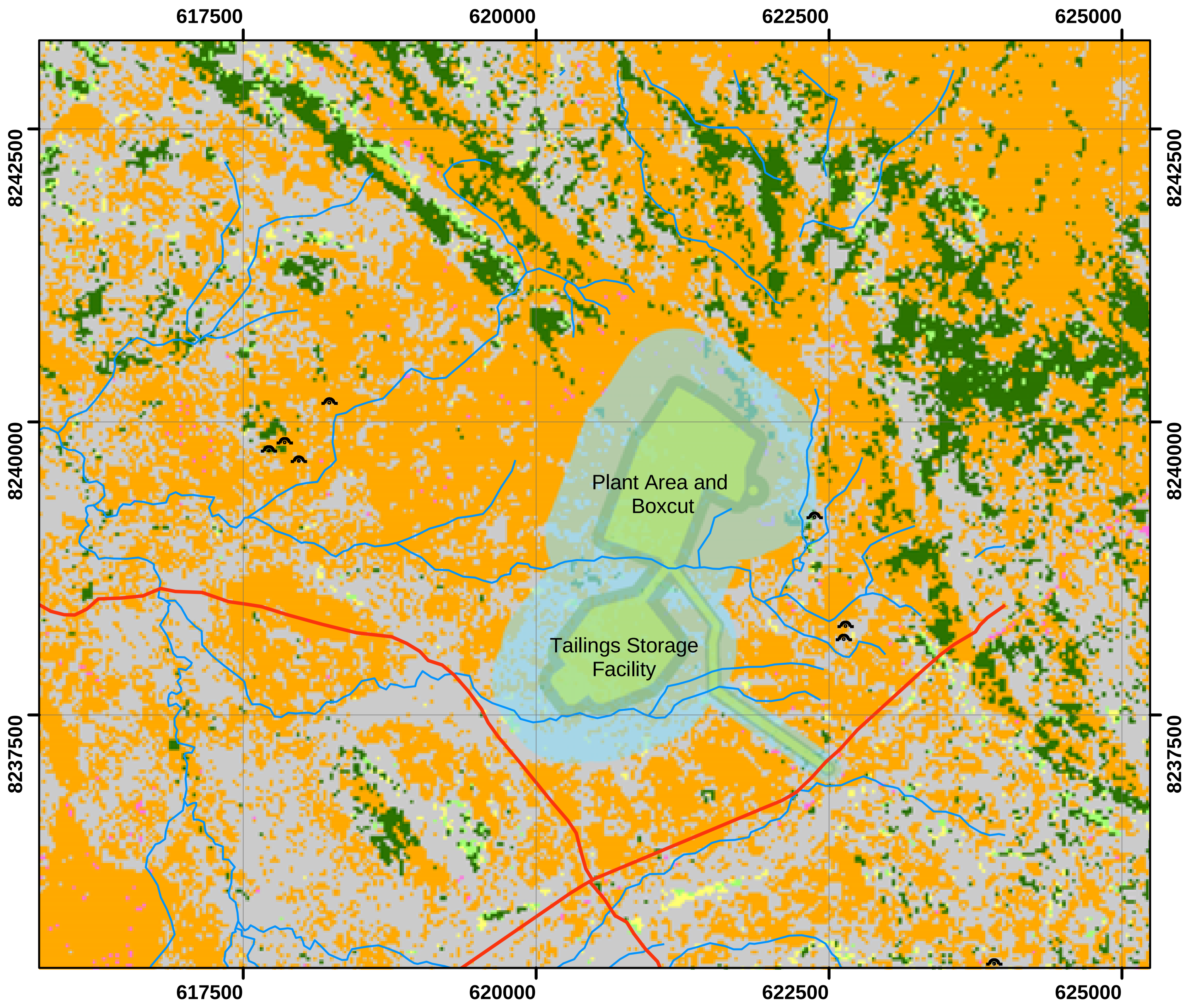
Kilometres

1 :50,000
ARC 1950 UTM Zone 35L
Impact Zones 4 and 5



1 0.5 0 1
Kilometres

1 : 50,000
ARC 1950 UTM Zone 35L
Impact Zones - 1, 2 and 3

Figure 5.1 - Environmental Impact Map

Topography

- Main Roads
- Rivers
- Villages

Land Classification

- Water
- Grassland
- Woodland
- Dense Forest
- Agricultural
- Dambo / Wetland
- Built up Area

Impact Zone

- Zone 1 - Soil, Flora and Fauna and Archeaological
- Zone 2 - Air Quality
- Zone 3 - Noise and Vibration
- Zone 4 - Surface Water
- Zone 5 - Groundwater
- Ressetlement Areas

AMC

08/05/06
Originator - N.G.A

Soil

There will be removal of approximately 1.5ha of vegetation and topsoil from the locations of the access portal and along necessary access roads. The removal of the soils affects future land uses post closure of the mine. The topsoil will be stockpiled and used in future re-vegetation schemes on the mine. Contamination of soil may occur from the spillage of oils and lubricants during construction activities.

Land use

The existing land use such as agriculture and settlement will be lost when site clearance of the underground mine areas occurs. This will affect the income of the local population in Chinkomba village and other surrounding villages.

Air Quality, Noise and Vibration

Construction equipment will impact on local air quality (vehicle exhaust emissions and dust generation) and cause local noise and vibration disturbances. This impact will be screened by remaining vegetation and the local topography. However, the construction workers will be directly affected.

Surface and Ground Water

Surface water may be impacted by the removal of vegetation during site clearance, by exposure of soils to the erosive potential of surface runoff. Siltation may occur in the streams. Any accidental spillage of hydraulic fluid, oils and fuel from construction equipment and vehicles could contaminate surface runoff, which flows into the local watercourses. This may have effects downstream of the mine site. Groundwater may be contaminated from the residue of any spilled oil, fuel and hydraulic fluids through infiltration of surface runoff.

Flora and Fauna

Very little vegetation will be removed during site clearance in the construction of the access portal. However, clearance will result in the permanent loss of habitats. The Miombo woodland offers a source of income and some plants may be used for medicinal purposes. Some of these species will be lost during site clearance. The construction vehicles and equipment will frighten away animals and birds. The movement of construction equipment and vehicles along access roads and the access portal will lead to dust deposition on plants which may cause a small reduction in biological productivity. No rare or endangered species were identified in the project area.

Archaeology

Any archaeological artefacts or existing cultural sites may be destroyed during construction; however the baseline study did not identify any sites of interest during site visits making this impact unlikely.

5.2.2 Operational Phase

The operational phase at the Munali underground mine will involve the removal of nearly 1.4Mt of waste rock and 6.0Mt of ore over a mine life of approximately 9 years. The associated environmental impacts of underground mine operations are outlined below.

Local Geology

The mining in the underground mine will remove 6.0Mt of ore and 1.4Mt of waste rock. The removal of this material results in the depletion of the geological resource of the area and has potential impacts on the hydro-geological regime. This may be a permanent impact.

Soil

Metals and dust will contaminate surface soils in the vicinity of the access portal through transport of ore and wind and water erosion. The contamination in the soils may also impact on flora and fauna due to biological uptake routes starting with the plant root system.

Air Quality, Noise and Vibration

Blasting of the rock during traditional mining methods will cause localised vibration disturbances. Haul truck and heavy plant equipment movement across the mine, and ore handling will generate air borne dust. These activities will also result in increased noise levels and vibrations. The resulting air pollution, noise and vibration may affect people living or farming close to the mine and the fauna of the Miombo woodland surrounding the mine site.

Subsidence / Caving

Underground mining activities may result in the possibility of caving or subsidence on surface due to rock caving underground. The scale of subsidence is considered to be quite low in mining terms with little or no significant caving or subsidence expected. However these areas may still pose a danger to potential land users such as infrastructure developers as small amounts of subsidence can potentially affect buildings or infrastructure causing cracking or buckling of supports and in extreme cases failure.

Surface Water

Impacts to surface water will arise from the mine dewatering programme discharging excess mine dewatering water into the nearby seasonal streams. Water pumped from the underground mine may contain elevated quantities of suspended solids and metals (Ni, Cu, Co, Pb, Zn, Mn, Al). Where possible, it is planned to use the mine water in the process plant, thus minimising the need for discharge of the water to the environment as well as minimising the need for fresh raw water. Any discharged mine water may impact on the surface water quality possibly affecting downstream water users and aquatic flora and fauna. The effect of lowering the water table in the area immediately around the mine may dry up surrounding boreholes currently used for domestic purposes by the villagers. Any spillages of oil, fuel and hydraulic fluids may contaminate surface water and impact on the aquatic flora and fauna and downstream water users.

Groundwater

Underground dewatering is expected to lower the water table in the vicinity of the mine site. The lowering of the water table is likely to affect the amount of water arising in the boreholes used for domestic purposes. This impact will occur throughout the mining operations but should be reversed upon closure of the mine. Any accidental spillages of oils, fuels, lubricants and hydraulic fluids could contaminate surface runoff, which may contaminate groundwater through infiltration through soils.

Flora and Fauna

Blasting, ore handling and transport activities in the underground may scare away small animals and birds. The dewatering of the local area for underground mining operations may remove water from surrounding streams and boreholes.

Incident/Public Safety

The underground mine and related activities (ore movement by haul trucks and front-end loaders) are potentially dangerous to the local public, for this reason the mine will be allowing access only to approved personnel.

5.2.3 Post-closure Phase

At closure, all underground mine equipment will be removed, mine dewatering will cease and the underground mine will be allowed to flood. The impacts associated with the closure and post closure of the underground mine are summarised below.

Land Use

The groundwater levels in and around the underground mine will gradually revert to the pre mining condition once pumping form the mine ceases. The boxcut and vent rises will be backfilled and made safe at closure.

Subsidence / Caving

Subsidence, should it occur, may continue for a period of time after mining ceases up until a point that the ground stabilises. As outlined above land use will be restricted within identified caving areas for a significant period of time up until the ground is certified safe by the Mines Safety Department.

Surface Water and Groundwater

The flooding of the underground mine will result in the hydrological regime rebounding to baseline levels, and re-emergence of local groundwater fed watercourses. The quality of the groundwater in the flooded underground mine will depend on the level of exposure of sulphide rocks to air (oxygen) and any left over waste/contamination from underground operations. Oxidation and hydrolysis of sulphide minerals can lead to the formation of acid rock drainage, which may impact adversely on the local underground water quality in the direct vicinity of the mine. This is unlikely because the presence of sulphide minerals that are potentially acid generating is low and the neutralization capacity of the geology is fairly high. A worst case scenario is that surface water and groundwater become acidic and this affects aquatic flora and fauna, downstream water users and the resultant lakes being unusable for other economic activities, without prior treatment. These are potentially long-term or permanent impacts.

Incidents/Public Safety

All access to the underground workings will be permanently sealed by Albidon upon closure of the mine. Any areas at risk of long term subsidence will be made safe and cordoned off to the public.

5.3 TAILINGS STORAGE FACILITY

5.3.1 Construction Phase

The activities to be carried out during the construction phase of the tailings storage facility ("TSF") mainly include site clearance (removal of vegetation and topsoil) around the TSF and along access roads and the re-profiling of the dam basin. The dam will be constructed directly on the cleared area. Construction work will be undertaken using front end loaders, graders and haulage trucks.

The soil will be removed from the site and will be stockpiled for future re-vegetation use. All timber removed from the area will be used for mine construction, and any excess will be made available to the public for collection from site. The associated impacts of the TSF are detailed in the Environmental Impact Assessment Table (Table 5.2 Item 2) and are summarised below.

Landscape and Visual Character

Landscape and visual character of the area will be affected by the removal of vegetation and the construction of the earth-fill starter wall. This impact will be noticeable from the air but will be effectively screened by any remaining woodland and the local topography.

Soils

Impacts on the soil will occur due to removal of the topsoil during construction activities. This will impact on the future land use of the TSF site. Soil contamination may occur due to accidental spillages of oil and fuel from heavy equipment used during the construction phase.

Land Use

The existing land use such as agriculture and settlement will be lost when site clearance of the TSF occurs. This will affect the income of local population in Chinkomba Village.

Air Quality, Noise and Vibrations

Construction equipment will impact on local air quality (vehicle exhaust emissions and dust generation) and cause local noise and vibration disturbances. This impact will be screened by remaining vegetation and the local topography.

Surface and Groundwater

Surface water may be impacted on by the removal of vegetation during site clearance by exposure of soils to the erosive potential of surface runoff. Siltation may occur in the rivers and streams. Any accidental spillage of hydraulic fluid, oils and fuel from construction equipment and vehicles could contaminate surface runoff which flows into the local watercourses. This could have effects downstream of the mine site.

Groundwater may be contaminated from the residue of any spilled oil, fuel and hydraulic fluids through infiltration of surface runoff.

Flora and Fauna

Vegetation will be removed during site clearance in the construction of the TSF. This will result in the permanent loss of habitats. The construction vehicles and equipment may temporarily frighten away animals and birds. The movement of construction equipment and vehicles along access roads and the TSF will lead to dust deposition on plants which may cause a small reduction in biological productivity. No rare or endangered species were identified in the project area.

Archaeology

Any archaeological artefacts or existing cultural sites may be destroyed during construction; however the baseline study did not identify any sites of interest making this impact unlikely.

5.3.2 Operational Phase

Tailings (filter cake) mixed with water at the flotation plant will be pumped to the TSF. Resultant impacts of the operational phase include contamination of surface water and groundwater, soil contamination, air pollution, site aesthetics impacts and public safety impacts. The impacts will be of varying duration i.e. short-term, long-term and permanent. The impacts will generally be confined to the project area except in the extreme case of TSF failure, which could impact on regional watercourses.

Soil

Soil contamination will occur if there is any breach of the TSF delivery pipeline resulting in the spillage of tailings. This will likely have a cumulative impact on the water quality and flora in the vicinity of the spill. Contamination of soils may occur from dust blown off the TSF.

Air Quality

Air pollution may occur during the dry season due to dust generation from exposed tailings surfaces. The dust arising from the facility may be deposited around the vicinity of the TSF impacting on flora and fauna and the surrounding soil (depending on wind direction).

Surface Water

Surface runoff may be contaminated through erosion of the dam wall. The TSF decant water and contaminated surface runoff may contain elevated levels of suspended solids and element concentrations, including but not limited to Ni, Al, Co, Cu, Fe and Mg. Contamination of the surface water will have cumulative effects on the soil quality close to the streams, downstream users and the aquatic environment. The release of solids to the seasonal streams could also affect the flow and cause local flooding. Dam failure may release tailings and supernatant into surface water environments and have large impacts on aquatic flora and fauna, structure of surface watercourses and downstream water users. Failure of the TSF is considered to be extremely unlikely to occur with good construction management and regular operation inspections.

Groundwater

Acid rock drainage test work (Net Acid Production Potential, NAPP and Net Acid Generation, NAG) carried out by ALS Environmental laboratories from Perth Australia, on two tailings samples (see Appendix VI) delivered by Albidon have indicated that although one tailings sample has a low NAPP (-15.6 kg/H_2SO_4/t) and a neutral NAG (7.5pH(OX)), the other has a high NAPP (139 kg/H_2SO_4/t) and very acidic NAG (2.2pH(OX)). Further testwork was carried out on other samples by Albidon and the tailings were identified as potentially acid forming ("PAF"). When applicable the tailings will be dosed with lime before they are pumped to the tailings storage facility to control the pH and prevent contamination of the groundwater due to seepage of the acidic water through the base of the TSF.

Leachate analysis carried out by ALS Environmental laboratories from Perth Australia, on the two tailings samples indicated that total leachable metals are very low (see Appendix VI)**.** Therefore the contamination arising from the tailings dam is likely to be restricted to acidification only. Albidon are incorporating in the tailings dam design the ability to dose tails with lime, the nett affect of which will be to neutralise the tails. The lime will be mixed with the tailings slurry in the tailings pipe prior to discharge into the TSF. By implementing this lime dosage system, no acid is expected to be generated by the TSF.

Flora and Fauna

The dust blown from exposed tailings surfaces will deposit on surrounding vegetation and soils. This will lead to decreased biological production and may impact on surface water.

Incident/Public Safety

Dam failure of the TSF due to overtopping or breaching of the dam wall, erosion, liquefaction or inadequate drainage would, if it occurred, present a safety impact on the local populations downstream of the TSF. Supernatant and tailings would be washed downstream and flood watercourses. This would impact on the groundwater, soils and flora and fauna of the project area. Drowning may occur if inadvertent access to the TSF is allowed.

Aesthetics

The TSF will protrude above the natural surface topography and surrounding Miombo woodland. This will detract from the natural scenic beauty of the area.

5.3.3 Post-closure Phase

The TSF will be stabilised and re-vegetated with tolerant and hardy species, such as *Acacia polycantha, Acacia sieberana, Albizia adianthifolia, Peltophorum africanum,* and *Dichrostachys cinere*. The potential post closure impacts of the TSF are surface and groundwater contamination, air pollution, aesthetic impacts and public safety. These impacts will be confined to the project area.

Air Quality

Liberated tailings from wind erosion will cause temporary air quality deteriorations. This will be the result of sparse or non-vegetated surfaces on the TSF. The dust could impact on the surrounding vegetation and local population downwind of the TSF (dominant wind direction is towards the west).

Surface Water

Continued erosion of the dam wall may result in contamination of surface watercourses with solids and metals. Contamination of the surface water could have cumulative effects on the soil quality close to the streams and the aquatic environment. The release of solids to the streams could also affect the river flow and cause local flooding.

Groundwater

The oxidation of sulphide minerals that may result in ARD generation will be halted by the neutralising capacity of the lime dosage system. The seepage of water from the TSF containing dissolved metals is considered to be a extremely low risk due to the tailings being neutralised upon placement.

5.4 WASTE ROCK DUMP

5.4.1 Construction Phase

The activities to be carried out during the construction phase of the waste rock dump mainly include site clearance (removal of vegetation and topsoil on 6ha) around the waste rock dump and along access roads. Construction work will be undertaken using front end loaders, graders and haulage trucks. The soil will be removed from the site and will be stockpiled for future re-vegetation use. All timber (if any) removed from the area will be used for mine construction and any excess will be made available to the public for collection from site. The associated impacts of the waste rock dump are detailed in the Environmental Impact Assessment Table (Table 4.2 Item 3) and are summarised below.

Landscape and Visual Character

Landscape and visual character of the area will be affected by the removal of vegetation. This impact will be noticeable from the air but will be effectively screened by remaining woodland and the local topography. This impact is permanent.

Soil

Impacts on the soil will occur due to removal of the topsoil during construction activities. This will impact on the future land use of the waste rock dump site. Soil contamination may occur due to accidental spillages of oil and fuel from heavy equipment used during the construction phase.

Land use

The land use such as agriculture and settlement will be lost permanently during construction. This will impact on the income of the local population (Chinkomba and surrounding Villages).

Air Quality, Noise and Vibration

Construction equipment will impact on local air quality (vehicle exhaust emissions and dust generation) and cause local noise and vibration disturbances. This impact will be screened by remaining vegetation and the local topography.

Surface and Groundwater

Surface water may be impacted on by the removal of vegetation during site clearance through exposure of soils to the erosive potential of surface runoff. Siltation may occur in the rivers and streams. Clearance of the watershed vegetation will affect the evaporative and transmissive routes of water through the catchment areas of local watercourses eventually affecting flow discharges in watercourses. Any accidental spillage of hydraulic fluid, oils and fuel from construction equipment and vehicles could contaminate surface runoff which flows into the local watercourses. This may have affects downstream of the mine site.

Groundwater may be contaminated from the residue of spilled oil, fuel and hydraulic fluids through infiltration of surface runoff.

Flora and Fauna

Vegetation will be removed during site clearance. This will result in the permanent loss of habitats. The Miombo woodland offers a source of income and traditional medicines. Some of these species may be lost during site clearance. The construction vehicles and equipment will frighten away animals and birds. The movement of construction equipment and vehicles along access roads and the waste rock dump will lead to dust deposition on plants which may cause a small reduction in biological productivity. No rare or endangered species were identified in the project area.

Archaeology

Any archaeological artefacts or existing cultural sites, which include cemeteries, relic sites and rock engravings, may be destroyed during construction; however the baseline study did not identify any sites of interest in the location of the waste rock dump making this impact unlikely.

5.4.2 Operational Phase

Activities during the operational phase in the waste rock area will involve the movement and dumping of waste rock by haul trucks and dump trucks. Potential impacts related to the operational phase of the waste rock dump are the contamination of soil, surface water and groundwater, air pollution, noise and vibration, visual disturbance and public safety. These impacts will be confined to the project area.

Soil

Dust blown off the waste rock dump will contaminate the surrounding soils. This may have an impact on surface water quality and flora.

Air Quality, Noise and Vibration

Noise and vibrations from the movement of haul trucks along access roads and around the waste rock dumps will impact on the fauna and local inhabitants of the area. Dust will be generated by movement of vehicles and liberation by the wind which will cause localised deteriorations in air quality. Localised air pollution will occur from vehicles working in and around the waste rock dumps. These impacts will affect the local population, flora and fauna, soils and the mine workers in the area.

Surface Water

Surface run-off may cause erosion of the upper surface and sidewalls of the dump and lead to elevated levels of suspended solids and metals in surface watercourses. This could change the character of surface water channels through solids deposition, and negatively impact on the water quality and the aquatic environment.

Groundwater

Acid rock drainage test work (Nett Acid Production Potential, NAPP and Net Acid Generation, NAG) carried out by ALS Environmental laboratories from Perth Australia, on three waste rock samples **(See Appendix VI)** shows that the waste rock is generally alkaline and the total leachable metals are low. Therefore impacts to groundwater are considered to be negligible.

Flora and Fauna

Deposition of dust from the waste rock dumps on surrounding vegetation will decrease biological productivity. Cumulative impacts could occur on the soils and surface water.

Aesthetics

The waste rock dump will protrude above the natural surface topography and Miombo woodland. This will detract from the natural scenic beauty of the area. This impact will be permanent.

Incident/Public Safety

There are safety risks associated with the operation of the waste dump. These risks will be mitigated by the implementation of site safety and training policies and procedures.

5.4.3 Post-closure Phase

Post closure will cause the cessation of activities on the waste rock dump. Impacts that are associated with this phase are air pollution, surface and groundwater pollution, aesthetics and public safety.

Air Quality

Erosion of exposed surfaces on the waste rock dump walls, by wind, may lead to localised and temporary deteriorations in air quality. This may impact on soils and local population downwind of the waste rock dump.

Surface and Groundwater Quality

Surface and groundwater contamination may occur from erosion of the waste rock dump walls. Surface runoff and infiltrating water could contain elevated concentrations of metals and suspended solids which would have negative effects on the aquatic flora and fauna.

Aesthetics

The waste rock dump will protrude above the natural surface topography and Miombo woodland. This will detract away from the natural scenic beauty of the area. This impact will be permanent however the waste dump will be profiled to blend in with the surrounding topography.

Incident/Public Safety

Access by local people onto the waste dump area after mine closure is not considered to result in any potential harm to the public.

5.5 ROM PAD AND PROCESSING FACILITY

5.5.1 Construction Phase

The activities to be carried out during the construction phase of the ROM Pad and processing facility mainly include site clearance (removal of vegetation and topsoil on 93ha, comprising the whole process plant) around the ROM Pad and along access roads and re-profiling. Construction work will be undertaken using front end loaders, graders and haulage trucks. The soil will be removed from the site and will be stockpiled for future re-vegetation use. All timber (if any) removed from the area will be used for mine construction, and any excess will be made available to the public for collection from site. The associated impacts of the construction phase of the ROM Pad and processing facility are detailed in the Environmental Impact Assessment Table (Table 5.2 Item 4) and are summarised below.

Landscape and Visual Character

Landscape and visual character of the area will be affected by the removal of vegetation and levelling of the site. This impact will be noticeable from the air but will be effectively screened by remaining woodland and the local topography. This impact is permanent.

Soil

Impacts on the soil will occur due to removal of the topsoil during construction activities. This will impact on the future land use of the ROM Pad and processing facility. Soil contamination may occur due to accidental spillages of oil and fuel from heavy equipment used during the construction phase.

Land use

The existing land uses such as agriculture and settlement will be permanently lost during construction activities. This will affect the income of the local population in Chinkomba Village.

Air Quality, Noise and Vibration

Construction equipment will impact on local air quality (vehicle exhaust emissions and dust generation) and cause local noise and vibration disturbances. This impact will be screened by remaining vegetation and the local topography.

Surface and Groundwater

Exposure of the surface soils during construction may lead to erosion of soils by water and this would lead to surface water contamination and siltation may occur in the streams. The accidental spillage of hydraulic fluid, oils and fuel from construction equipment and vehicles could contaminate surface runoff which flows into the local watercourses. This will have affects downstream of the mine site.

Groundwater may be contaminated from the residue of spilled oil, fuel and hydraulic fluids through infiltration of surface runoff.

Flora and Fauna

Vegetation will be removed during site clearance resulting in the permanent loss of habitats. The Miombo woodland offers a source of income and traditional medicines, which may be lost during site clearance. The construction vehicles and equipment will frighten away small animals and birds. The movement of construction equipment and vehicles along access roads and the ROM Pad and processing facility will lead to dust deposition on plants which may cause a small reduction in biological productivity. No rare or endangered species were identified in the project area.

Archaeology

The loss or damage of archaeological artefacts and cultural sites may occur during construction activities. The graves behind each household were identified in Chinkomba Village during baseline investigations. These graves might be affected.

5.5.2 Operational Phase

During the operational phase, activities will include the crushing and milling of ores, movement of ore around the process plant on conveyors, flash flotation, and flotation and tailings removal from the process solution. The impacts that may occur are soil contamination, noise and vibrations, air contamination, surface and groundwater contamination, general releases and general safety.

Soil

The handling, storage and transport of chemicals and reagents may lead to spillages which may contaminate the soils. Breakdowns of process plant equipment may occur and spillages of oil and lubricants could contaminate soils. Accidental spillages of tailings during separation from the process and in transit to the TSF may contaminate soil. Contamination of soils may occur due to the blowing of dust from the crushing and grinding circuits, ore stockpiles and conveyors. Contaminated soils may affect surface water and flora and fauna.

Air Quality, Noise and Vibration

Noise and vibrations will be persistent in the process plant area which will be operational 24 hours a day. Noise will be generated by dozers, haul trucks and operational equipment in and around the process plant and ROM Pad. Airborne dust will be generated from the crushing and grinding circuits, the conveyors and the ore stockpiles. Airborne dust pollution will also occur from the concentrate stockpiles. These impacts will mostly affect mine workers (noise and vibrations) and soils, flora and fauna (air pollution).

Surface Water

Dust and silt will be present on the ROM Pad and around the process plant due to dust blow; losses through transport etc and they will contaminate surface water with dissolved metals and suspended solids. In the process plant, accidental spillages from process equipment, thickeners, agitators and burst pipes may occur as well as spillages of chemicals and reagents caused by inadequate storage, handling and transport techniques. Equipment failure may lead to spillage of process liquids. These spillages may contaminate surface runoff and lead to contamination of surface watercourses. Wash activities of plant equipment will occur on a regular basis and wash water will be contaminated with suspended solids, oils, lubricants and fuels. Tailings will be removed from the process plant via pipelines and spillages may occur which may become incorporated into surface runoff in the process plant. Excess process water may contaminate surface water if not treated prior to release to surface waters or accidental spillages occur. The impacts on surface water will cumulatively affect aquatic flora and fauna, groundwater, soils and downstream water users.

Groundwater

Groundwater contamination may occur through infiltration of spills of chemicals and reagents through the soil profile. Seepages from process water ponds may contaminate groundwater with dissolved metals such as Ni, Cu, Co, Al, Zn and Mg. Spillages at the waste water treatment plant may contaminate groundwater. These are all long-term impacts but are unlikely to occur.

General Releases

Concentrates will be stockpiled after flotation and will be transported off the site via trucks or railway depending on the destination. The exposure of concentrate to the natural weather conditions (wind, rain etc) may lead to contamination of soils, groundwater and surface water. These are short-term regional impacts.

General Safety

There are safety risks associated with the operation of the ROM Pad and processing facilities. These risks will be mitigated by the implementation of site safety and training policies and procedures.

5.5.3 Post-Closure Phase

The potential impacts that may occur on the site of the ROM Pad and processing facility after decommissioning are contamination of surface water, groundwater, soils and public safety from old buildings.

Soil

Contaminated surface runoff off the old stockpile areas (ore and concentrate) and the ROM Pad and processing facility may infiltrate into soils and cause contamination with heavy metals. This may affect flora and fauna on the site.

Surface and Groundwater

Contaminated runoff from the former ROM Pad and processing facilities, if it occurs, may lead to contamination of surface watercourses and infiltration through soils will contaminate groundwater. These impacts may affect soils, downstream water users and aquatic flora and fauna.

Incident/Public Safety

General public safety could be impacted by inadequate decommissioning of old mining buildings (collapse and falling objects) and removal of process chemicals from site. Albidon are committed to ensuring that the site is decommissioned in a responsible and timely manner.

5.6 ENGINEERING WORKSHOPS

5.6.1 Construction Phase

Construction of the mine workshops will affect part of the 21ha of land to be cleared for the process plant above. The land will be cleared of vegetation and trees will be used in plant construction. Excess wood will be made available to the local population to collect from the site. Potential impacts during the workshop construction phase are disturbance or loss of vegetation and natural habitats, soil contamination, noise and vibration impacts, air contamination, surface and groundwater contamination and disturbance or loss of sites of archaeological or cultural interest. The impacts related to land clearance and archaeology are permanent impacts. The associated impacts of the construction phase of the stockpile areas are detailed in the Environmental Impact Assessment Table (**Table 5.2 Item 6**) and summarised below.

Landscape and Visual Character

Permanent clearing and levelling of the site for the workshops will change the natural landscape.

Soil

The removal of trees and bushes (vegetation) during land clearance will expose topsoil to the elements. The topsoil from the cleared areas will be removed and stored for the use in future rehabilitation schemes during mining and post closure. This will have impacts on the possible future land use of the workshop site. Soil contamination from accidental spillages of fuel, oil and lubricants may occur from construction vehicles and equipment.

Land use

Existing land use such as agriculture or settlement will be permanently lost during construction activities. This will impact on the incomes of the local population.

Air Quality, Noise and Vibration

Localised noise and vibrations will be created by construction equipment and vehicles. The quality of the air will be affected by dust from construction activities and vehicles and by the exhaust fumes that they will release. These impacts are present during all the construction activities but are short-term in each instance.

Surface and Groundwater

Exposure of the surface soils during construction may lead to erosion of soils by water and this may lead to surface water contamination and siltation in the rivers and streams. Any accidental spillage of hydraulic fluid, oils and fuel from construction equipment and vehicles could contaminate surface runoff which flows into the local watercourses. This may have effects downstream of the mine site. Groundwater may be contaminated from the residue of spilled oil, fuel and hydraulic fluids through infiltration of surface runoff.

Flora and Fauna

Removal of vegetation will result in the permanent loss of habitats. The Miombo woodland offers a source of income and traditional medicines, which may be lost during construction. The construction vehicles and equipment will frighten away small animals and birds and dust generated from equipment movements will lead to dust deposition on plants and a potential reduction in biological productivity. No rare or endangered species were identified in the project area.

Archaeology

Previously unknown archaeological or cultural sites including; cemeteries, relics and rock engravings may be disturbed, however, the baseline study did not identify any sites of interest making this impact unlikely.

5.6.2 Operational Phase

The activities that will occur in the engineering workshops during the operational phase include cleaning and maintenance of vehicles and trucks and refuelling of all vehicles and fuel tanks. Potential impacts are contamination of soil, surface water and groundwater and impacts on general safety and aesthetic value of the site. These impacts are of long-term duration i.e. they will occur during the lifetime of the mine but the effects of the impacts will be felt after mine closure as well. The impacts will generally be confined to the project area.

Surface Water

Contamination of surface water may occur as a result of carry over of oil with storm water into the site drainage system. To prevent this, oil traps will be installed in all drains at all oil handling and storage areas to capture and recover all oily residues contained in the site drainage system.

The washing of mobile equipment and machine parts will only be done in designated wash bay areas. Drainage from wash bays will pass through oil traps prior to release into the site drainage system. Oil traps will be regularly inspected, monitored and serviced.

The oil residue will be placed in drums and stored in an approved area awaiting collection by an oil recycling company. Sludge from oil traps will be treated as a hazardous substance and disposed by at an ECZ approved site.

Poor housekeeping and spillage handling may also result in the contamination of surface runoff. To maintain good housekeeping and prevent spillage, the workshop areas will be regularly inspected as part of a preventative maintenance programme. All potential sources of contamination in the workshops will be monitored.

Soils

Soil contamination may occur due to inadequate handling and storage of new and/or used oil. To prevent soil contamination, new and used oil will be stored in accordance with specifications in the Materials Handling Procedure. Key measures include:-

- Oil will only be stored and handled in designated areas;
- Oil handling and storage areas will be equipped with:-
  - impervious surfacing;
  - containment;
  - impact & fire protection; and
  - protection against sun & rain.
- Drains from oil handling and storage areas will be equipped with oil traps; and
- Waste oil will be recycled and quantities of stored waste oil will be kept to a minimum.

Oil handling and storage areas will be subject to regular inspections. The results of these inspections will determine service maintenance and repair requirements.

Workshop personnel (management, engineers, mechanic and operators) will receive training on oil handling and disposal. The training will focus on environmental awareness, safe handling procedures, spill reporting and spillage response/action.

Inadequate handling and storage of new and used batteries may also result in soil contamination. To prevent soil contamination new and used batteries will be stored in accordance with specifications in the Materials Handling Procedure. Key measures include:-

- Batteries will only be stored and handled in designated areas;
- Battery storage areas will be equipped with:-
  - impervious surfacing;
  - containment;
  - impact & fire protection; and
  - protection against sun & rain.
- All spills will be treated as contaminated waste;
- Used batteries will be stored in a dedicated area awaiting collection by the supplier for recycling; and

- Quantities of used batteries in storage will be kept to a minimum.

Accidental Releases/Spills

All spills of oil or battery acid will be handled in accordance with procedures outline in the Emergency Response Plan (ERP). The ERP details the measures to be effected in the event of a spill and includes:-

- Key personnel to be notified;
- Emergency equipment to be used;
- Corrective actions;
- Rehabilitation requirements; and
- Correct handling and disposal of any contaminated waste (soil).

Groundwater

The risk of contamination of groundwater from the engineering workshops area is most likely to occur through the seepage of contaminated water through the overlying soils. This contamination may be through spillages of fuel, oil, lubricants and battery acid due to poor handling and storage practices and through the disposal of wash water onto bare soil surfaces. Underground fuel storage tanks may rupture and this could cause groundwater contamination with hydrocarbons. These are considered to be very low likelihood, long-term impacts.

Aesthetics

The natural aesthetic value of the site will be impacted on during the operational phase but mine decommissioning should remove all buildings and foundations (unless otherwise requested at the disposal of the public).

General Safety

The health and safety of workers involved with oils, lubricants and acids can be affected if workers are not adequately trained to use and store these products. Heavy equipment and machinery that will be used in the engineering workshops may present health and safety issues when workers are inexperienced with the equipment.

5.7.3 Post Closure Phase

The removal of all buildings and foundations will occur during mine decommissioning and essentially the site will be rehabilitated. Any contamination to soils that may have occurred during the life of the mine will impact on the surface water, groundwater and flora after closure.

Aesthetics

Any remaining buildings or foundations will detract from the beauty of the landscape.

General Safety

Safety concerns arise for the public when inadvertent access to old buildings in the workshop area occurs.

5.7 TRANSPORT INFRASTRUCTURE – OPERATIONAL PHASE

Accidental Releases/Spills

The contamination of soil, air and/or water may occur as the result of the accidental release or spill of chemicals, acid, organic solvent, reagents, fuel, oil and concentrate due to accidents or inadequate transport procedures. To minimise the risk of an accidental release or spill, the transport of hazardous materials to and from and in and around the mine site will be done in accordance with laid down procedures. These procedures will include:-

- Documentation and inventory control through chain of custody;
- Emergency response training for all Albidon and contractor's employees;
- Tracking and notification of shipment location and condition;
- Carrying of onboard emergency equipment;
- Vehicle road worthiness checks will be conducted and a preventative maintenance programme implemented; and
- Random and unannounced en route safety inspections will be conducted.

Materials will be moved on designated transport routes only. An escort vehicle will accompany explosives trucks and all vehicles will be flagged.

Tarpaulins will be used to cover open top bulk nickel concentrate transport trucks to prevent spills resulting from the exposure of concentrate to rain and/or wind.

All contracts with road haulage contractors will include clauses on Zambian and relevant regional/international standards relating to the transport of hazardous materials.

Contamination may also occur due to defective or damaged infrastructure. In this regard, Albidon will implement a preventative maintenance programme on all mine roads, bridges, culverts and traffic signs to ensure all are maintained in good condition thereby minimising the probability of road accidents. Transport infrastructure will be inspected regularly.

Air Emissions

Air contamination may occur due to dust emissions from vehicles and trucks operating on unsealed roads. Water will be sprayed on all dirt roads to suppress dust emissions from vehicle movements.

5.8 WASTE MANAGEMENT

Industrial Waste Generation

Mine operations will generate significant quantities of scrap metal and empty containers etc, which should be sold or recycled in order to reduce the quantity of waste at the mine. All industrial waste will be disposed of according to the company's Waste Management Policy and Scrap Sales Procedures (to be developed). Industrial waste will be stored in secure areas. Materials will be sorted to facilitate reuse/recycling. Scrap metal dealers and used equipment dealers will be encouraged to take away waste materials. Reusable materials such as empty drums and timber will be reused by the mine, sold or given away. Used tyres will be used on the mine to mark the edges of roads, bends, operational areas and accident black spots.

Hazardous Waste Generation

The generation of hazardous wastes on the mine such as used oil and grease may result in soil and/or water contamination. To prevent contamination, hazardous waste will be stored in a secure area. The storage area will be covered, equipped with a concrete floor and 110% containment. Non-compatible hazardous wastes will be stored at separate sites. Used oil will be sold to a recycling company and greases returned to the supplier or incinerated according to approved disposal practices.

Medical Waste Generation

Inadequate disposal of medical waste from the mine clinic may result in contamination of soil, surface water or groundwater. All medical waste will be disposed of in accordance with the mine's Waste Management Policy. In practice, all medical waste will be incinerated in an approved incinerator.

5.9 MATERIALS HANDLING AND STORAGE

Soil

Soils may become contaminated with regards to handling and storage errors by the accidental spills of greases, oils and/or chemicals around the mine site. This may affect surface water. There is considered to be a very low risk of the rupturing of below-ground fuel storage tanks which could contaminate soils and affect the groundwater.

Surface Water

There is a risk that surface water may become contaminated by the incorporation of fuel spills into surface runoff which ends up in local watercourses. Spillages of fuel may occur from handling spills or leaks/ruptures of the fuel tanker in transit to the engineering workshops. Surface runoff from the storage areas of chemicals and reagents may incorporate the chemicals and reagents and if released untreated into the mine drainage system then watercourses will be affected. These impacts have the potential to impact soils, aquatic flora and fauna and downstream water users.

5.11 RESETTLEMENT OF A PART OF CHINKOMBA VILLAGE

Landscape and Visual Character

The location of the new village will undergo land clearance and levelling to enable the construction of the new village. This will permanently change the new site.

Soil

The movement of the village will increase the intensity of agriculture in the new site and may lead to soil erosion and the loss of soil fertility. The removal of the vegetation exposes the topsoil to the elements (wind and rain).

Land Use and Settlement

The existing land use of agriculture (small fields) will be permanently lost during the construction of the new Village. The new land use will be a village settlement. The relocation of some the population from Chinkomba Village is a necessity for the safety of the local population.

Flora and Fauna

The clearance of vegetation will cause the loss of sustainable woodland and permanent loss of habitats. The Miombo woodland generates income and provides local people with local remedies for everyday ailments and these will be lost during construction of the new village. The construction equipment used to clear and level the site will generate dust during movement and when it deposits on the surrounding vegetation then a small decrease in biological productivity may occur. The noise and vibrations created during the construction phase will scare away animals and birds.

5.12 SOCIO-ECONOMIC AND CULTURAL IMPACTS

The development of the Munali Nickel Project is likely to engender substantial positive socio-cultural and economic impacts in an area, which has so far received no meaningful investment. Obvious positive impacts are the provision of employment and infrastructure in the local community, and the multiplier effects of regional investment from the project. The following sections highlight the potential social-cultural and economic impacts of the Munali nickel project on the local population.

Local Employment

The development of the Munali Nickel Project will create job opportunities for the local population. There are few job opportunities currently available in Chinkomba village. The use of local labourers and skilled workers will improve the skill resource base in Chinkomba through the implementation of training and development programmes. These are both positive outcomes of the project and for the local population. However, there will be an influx of people to Chinkomba looking for work from around Zambia and further a field and this would put strains on the services in Kafue and Mazabuka (limited and unreliable at present). If not carefully managed, this strain would be a negative impact.

Contractor Employment

The use of local contractors will increase the capability of local contractors to carry out their work competently. There will also be an influx of skilled contractors to Chinkomba related to various fields of the economy. This will help to set up economic diversification.

Employee Housing

As defined in Chapter 2, it is anticipated that senior staff will be housed in Lusaka. Other mine workers will be housed in Mazabuka and Kafue. Some of the mine workers will be supplied with materials and some aid to construct their own houses in Chinkomba. This is a positive impact because it will help to expand the local economy in Chinkomba.

Employee Retrenchment

The mining company will provide retrenchment packages to its employees to promote sustainable livelihoods within Zambia. Counselling will be provided for employees prior to retrenchment. These will benefit the local population.

Water Supply

Some underground water will be supplied to the nearby village via a pipeline from the mine site. The pipe will supply 1meg of water to the village every day and the water will be stored in a water tank. A small network of standpipes will be connected to the tank. Overflow from the tank will go into the local streams in Chinkomba. This water will benefit the population of Chinkomba because at present water supply is obtained from three main boreholes.

Power Supply

The demands for power for the mine will be large and as such Albidon has discussed more permanent supplies with ZESCO. Discussions to provide power supply are being carried out with ZESCO,

The associated impacts of the development and operation of the power supply at the mine site include loss of habitat through the removal of vegetation along new power line routes and at the new transformer and contamination of soil and groundwater in the vicinity of the transformers from leaks.

A significant positive impact of the project will be the availability of electrical power to the Munali area after mine closure. This infrastructure could be available for use by the local community or other interested parties after mine closure.

5.13 LOCAL AND REGIONAL ECONOMIC DEVELOPMENT

Local Business Enhancement

The business environment of Chinkomba will improve as the economy expands and multipliers occur and unemployment is reduced. There will be improved supply and access to electricity through the agreements of supply made with the mining company and ZESCO. This will aid in business development in Chinkomba and nearby villages as well. This is a positive impact.

Economic Diversification

The economic expansion in Chinkomba aided by improved electricity and water supplies will enable alternative businesses and economic activities to develop.

Land Use and Settlement

The mine site will pose certain safety hazards for the local population that may gain access to the site and not know much about mining and its dangers. Therefore the mining company is proposing an exclusion zone around the mine site for the safety of the general public and the protection of mining activities.

The dewatering of the underground mine may cause local boreholes to dry up or drop in water level/yield. The boreholes provide the major source of water to the inhabitants of Chinkomba. Albidon has a detailed plan to mitigate against such an impact should it occur.

The clearance of vegetation around the mine site in order to construct various buildings may act to encourage the local population to fell trees and clear expanses of the scant Miombo woodland.

The use of various types of mine water (supernatant, mine waste water, effluent run-off and various other mine water streams) for the irrigation of crops could lead to chronic side effects should the water prove to be of a poor quality. Potentially some of the water sourced from these areas may contain elevated levels of metals, if this is the case, education programmes and warnings to the public will have to be carried out to ensure that they are informed of the potential dangers of using mine water.

5.14 HEALTH PLAN

Healthcare for Employees

Employees and their immediate families of the Albidon mine will be provided with basic healthcare, sanitation and clean water. This will benefit the overall health of the local population. HIV/AIDS information will be dispersed to employees to prevent the spread of the disease amongst the mine employees and their families. Malaria rollback schemes will be implemented by spraying and dispersal of information on how to prevent malaria. These will all benefit the overall health of the Chinkomba and surrounding community and is a long term positive impact.

Healthcare for Chinkomba

The upgrading of the facilities at the clinic to standards necessary for treatment of mine employees will provide appropriate medicines to be used within the population of Chinkomba and Mugoto. This is a positive impact.

Public Consultation

The liaison between Albidon and the residents of Chinkomba and the surrounding areas is aiding the development of a working relationship between all parties where information and opinions can be expressed. The public consultation meeting brought together the local community and important persons from further a field (Kafue, Mazabuka and

Lusaka) and was an opportunity for the developers to gather information on the views of the people that will be affected by the project.

The process of public consultation initiated by Albidon is an ongoing process and will benefit all stakeholders and project affected people as they have an opportunity for their concerns or issues to be heard and addressed throughout the life of the project.

6 ANALYSIS OF PROJECT ALTERNATIVES

The Munali Feasibility Study (mine plan/design) is the basis of the EIA and EMP. A variety of alternatives were identified for the mining methods, processing methods, water supply, waste rock dumps, tailings storage facility and process plant. Location of the various mine components was limited due to the location of the mineral zone but there was no existing site infrastructure. Therefore design of the mine site was carried out with economic feasibility and physical location in mind. The final mine layout plan is shown in **Figure 2.2**. A brief synopsis of these project alternatives is presented here.

6.1 Mining Methods

The Munali orebody dips SW at approximately 65 - 70 degrees with a slight plunge towards the north. Orebody thicknesses vary from centimetres to approximately 40m in the widest zones. . Strike length is in the order of 800m. In addition to the main orebody, lower grade lodes exist in the hangingwall. These lodes have been assumed to be sub-economic at this stage, except where they join into the main orebody.

The economic extraction of ore from the Munali deposits can be achieved by underground mining methods only. Underground mining has the positive environmental aspect of minimal surface disturbance and also minimal dilution. The orebody geometry i.e. depth and dip, and resulting high stripping ratio is also conducive to underground mining. The decision to opt for an underground mine was based purely on project economics. Open pit mining at Munali is cost prohibitive.

6.2 Waste Rock Dumps

The location of the mine waste rock dumps is primarily a function of the tramming distance from the access portal to the dumps. No alternative sites are available within viable tramming distances and none were considered because the dumps did not pose a nuisance to local communities. The waste rock dump could have potentially been located in the proposed location of the process plant but this area would be more beneficial to locate the process plant and offices with regard to the laying of foundations.

6.3 Metallurgical Processing

Assessments were carried out during the Pre-Feasibility Study on two mining scenarios, one for a 0.5Mt annual throughput plant and another for the annual processing of 0.75Mt. The 0.75Mta process plant proved to be more economically viable when using the flotation process over the project lifetime (10 years) required.

6.4 Tailings Storage Facility

The present location of the tailings storage facility was determined by the location of surrounding seasonal streams and economic considerations relating to the maximum feasible distance the tailings dam can be from the plant without entailing excessive costs due to pumping and piping.

6.5 Resettled Chinkomba Village

An analysis of potential relocation sites for the villagers of Chinkomba Village that will be affected by the development of the Munali Project was carried out during the EIA and further developed in the Resettlement Action Plan ("RAP"). These alternatives are discussed in the RAP.

A total of 18 households will be affected by the mining project and compensation issues are discussed in the RAP.

6.6 No Project Option

Development of the Munali nickel project will result in extensive physical disturbance of the land, which for the most part is permanent. These physical environmental impacts include underground mining operations, construction of waste rock dumps, plant site, and tailings storage facility. However, if well managed and appropriate reclamation measures implemented, these mine components will have minimal public health or safety risks and no long-term effects on adjacent watercourses or groundwater resources.

If the Munali nickel project does not proceed, there will be no disturbance of the environment. However, the no project option must be weighed up against the loss of a multi million dollar long-term investment for the Munali area, the Southern and Lusaka Provinces of Zambia, and the whole Zambian economy. Albidon will employ several thousands of people (directly and indirectly) during the life of the mine. There will be numerous multiplier effects for the local and regional communities. Additional jobs will be created in service industries in the nearby towns of Kafue and Mazabuka where the older industries are in decline. Albidon is committed to local employment, the use of local contractors and the promotion of independent sustainable economic development in the Munali area. The no project option would be a major setback for regional and national economic development.

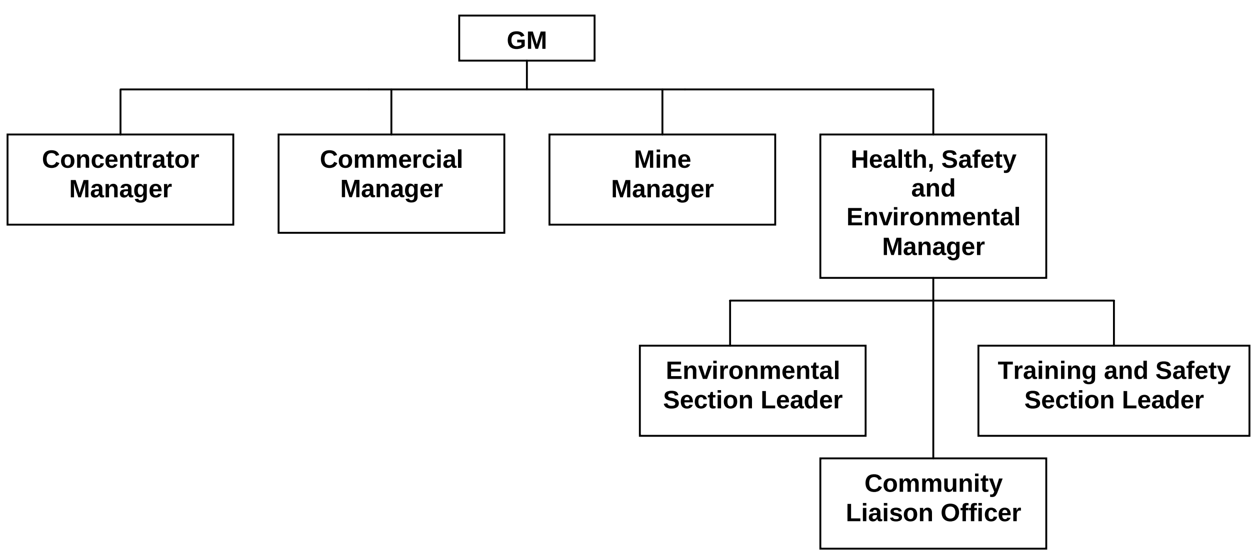
7 MUNALI ENVIRONMENTAL MANAGEMENT PLAN

Albidon's Environmental Management Plan ("EMP") for its proposed Munali Project is structured as follows:-

- Environmental Monitoring;
- Environmental Management;
- Occupational Health and Safety;
- Mine Site Decommissioning and Rehabilitation; and
- Social Management.

Implementation of the EMP will be the responsibility of the Safety Health & Environmental ("SHE") Officer and a Social Liaison Officer. The SHE Officer will also be responsible for accident prevention, mine safety, and environmental awareness and training programmes. He or she will report to the Director of Environment. The Social Liaison Officer will communicate Albidon's environmental policies to the local community through an ongoing public consultation process. He or she will report to the Chief Executive Officer for Albidon. The proposed mine environmental management organisational structure is shown below.

Munali Mine Environmental Management Structure



The HSE Manager will coordinate all safety, health and environmental management activities at the mine. The Community Liaison Officer will coordinate all social matters. The Environmental section will conduct environmental checks and perform environmental monitoring tasks. The Training and Safety section will promote safety awareness, conduct health and safety training, carry out safety inspections, analyse the causes of accidents and implement appropriate corrective action / measures.

Quarterly environmental management meetings will be held between departmental managers to discuss progress with implementation of environmental, social and OHS management plans, environmental performance and compliance with relevant environmental regulations and standards. Quarterly environmental reports will be prepared by the HSE Manager and presented to mine management. At the end of each year an annual environmental report will be issued and a copy made available on the mine for inspection by stakeholders.

Albidon will update the mine EMP annually to include changes to operations, proposed new management actions where the original action is not having the desired effect, changes to the environmental monitoring programme, progress on mine site rehabilitation and updating the environmental protection cost estimate.

An independent audit focusing on performance against the environmental, social and OHS management plans, environmental monitoring and compliance with relevant environmental regulations will be conducted every two years commencing from the start of mine production.

7.1 ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan (EMP) is presented in **Table 7.1 in Appendix VIII**. The plan in **Table 7.1** follows the layout of **Chapter 5** (Environmental Impact Assessment) and is subdivided into construction and operational phases 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)

A total of **175** environmental management actions and **30** social actions were established. Provisional timings for the implementation of the management actions are also given. The EMP is structured to facilitate environmental and social auditing of operations.

The management actions proposed to mitigate the project impacts are based on industry best practice and adapted where appropriate to the Zambian conditions. Reference is made within the plans to the following documents:-

- Emergency Response Plan;
- Waste Management Policy;
- Spillage Response, Prevention, Control and Clean-up Plan; and
- Materials Handling Procedures.

Albidon will develop and begin implementation of these plans before the commencement of the plant operations.

The mine department or manager responsible for each component and for implementation of the environmental management actions to mitigate or prevent potential adverse environmental impacts is shown in **Table 7.2.**

Table 7.2 Implementation of Management Actions - Responsibility by Mine Department

Component Description	Mine Department/ Manager
Underground Mining	Mine Manager
Tailings Dam	Concentrator Manager
Waste Rock Dump	Mine Manager
Run of Mine Pad	Concentrator Manager
Processing Plant	Concentrator Manager
Transport	Commercial Manager
Social Liaison	Social Liaison Officer
Environmental Monitoring	HSE Manager
Health and Safety	HSE Manager

Managers will monitor implementation of management actions in their areas of responsibility and submit progress reports at the quarterly environmental management meetings.

7.2 ENVIRONMENTAL MONITORING PLAN

Albidon will implement an environmental monitoring programme in and around the Munali Project site to ensure that all statutory legislation and best practice guidelines are complied with. Environmental monitoring will be initiated a month prior to the start-up of mining operations.

The constituents of the Environmental Monitoring Plan (EMP) are:-

- Surface Water;
- Groundwater;
- Air Emissions;
- Soils; and
- Noise and Vibrations.

All of the environmental monitoring data will be collected and easily accessed onsite for onsite inspections if necessary and reports submitted to the Environmental Council of Zambia (ECZ) annually for review.

In the event of non-compliance with the statutory legislation on effluent quality and air emissions then Albidon will notify ECZ (in accordance with the Water Pollution Control Regulations, 1993 and the Air Pollution Control Regulations, 1996).

7.2.1 Surface Water Monitoring Plan

Albidon will monitor the surface water quality from 6 sampling sites which are discussed in **Table 7.3**. The monitoring sites are located in **Figure 7.1**. Water sampling methods will be in accordance with international standards and will be supervised by the Environmental Officer.

Table 7.3 Description of Munali Surface Water and Effluent Monitoring Sites

Monitoring Site	Location of Monitoring Sites
SW 1	Tributary of Nakunega stream upstream of mining influence (when flowing)
SW 2	Tributary of Nakunega Stream Downstream of mining (when flowing)

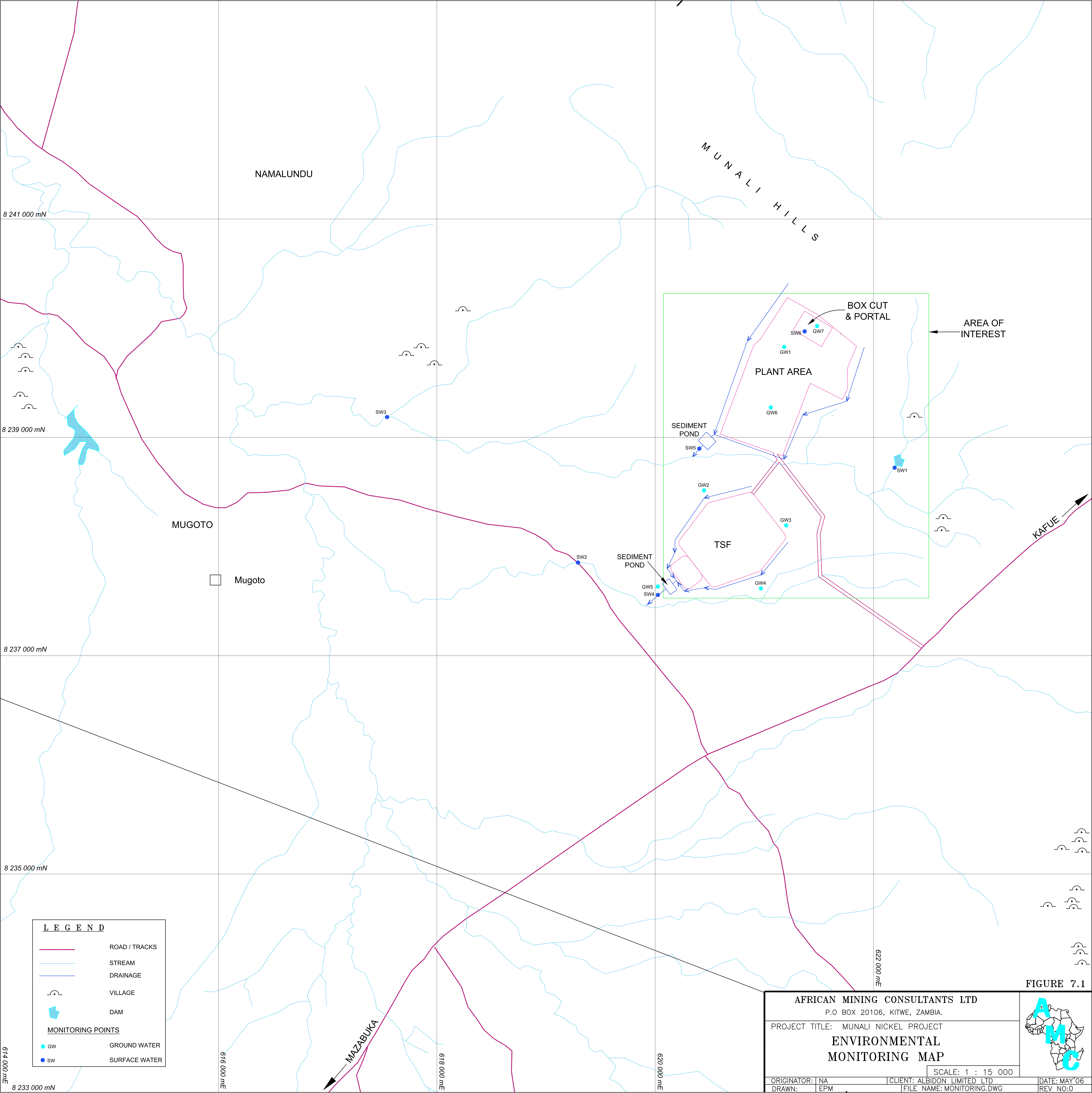


FIGURE 7.1

AFRICAN MINING CONSULTANTS LTD
P.O BOX 20106, KITWE, ZAMBIA.

PROJECT TITLE: MUNALI NICKEL PROJECT

ENVIRONMENTAL MONITORING MAP

SCALE: 1 : 15 000

ORIGINATOR:	NA	CLIENT: ALBIDON LIMITED LTD	DATE: MAY'06
DRAWN:	EPM	FILE NAME: MONITORING.DWG	REV NO:0

Monitoring Site	Location of Monitoring Sites
SW 3	Tributary of Nakunega Stream Downstream of mining (when flowing)
SW 4	Surface run-off from the Tailings Storage Facility
SW 5	Surface run-off from the plant area
SW 6	Discharge from mine dewatering

The parameters that will be monitored along with their frequency are shown in **Table 7.4** below.

Table 7.4 Water & Effluent Monitoring Sites - Sampling Frequency & Analytical Parameters

Monitoring Site	Water Type	Sampling Frequency	Analytical Parameters
SW 1	Surface Water	Weekly	pH, EC, TSS, TDS, SO_4, Ni, Al, Ca
		Quarterly	As, Ca, Cr, Hg, Mg, Mn, Mo, Pb, Se & Zn
SW 2	Surface Water	Weekly	pH, EC, TSS, TDS, Cu, Co & organics
		Quarterly	As, Cr, Fe, Hg, Mn, Ni, Pb & Se
SW 3	Surface Water	Weekly	pH, EC, TSS, TDS, SO_4, Cu, Co & Fe.
		Quarterly	Al, As, Cr, Hg, Mg, Mn, Ni, Pb, Se & Zn
SW 4	Mine Effluent	Weekly	pH, EC, TSS, TDS, SO_4, Cu, Co, Fe, & Na.
		Quarterly	As, Cr, Hg, Mg, Mn, Ni, Pb, Se & Zn
SW 5	Mine Effluent	Weekly	pH, EC, TSS, TDS, SO_4, Cu, Co & Fe.
		Quarterly	As, Cr, Hg, Mg, Mn, Ni, Pb, Se & Zn
SW 6	Mine Effluent	Weekly	pH, EC, TSS, TDS, Cu, Co & Fe.
		Quarterly	As, Cr, Hg, Mg, Mn, Ni, Pb, Se & Zn
		Quarterly	As, Ca, Cr, Hg, Mg, Mn, Na, Ni & Zn

NB. TDS = Total Dissolved Solids, TSS = Total Suspended Solids, EC = Electrical Conductivity

An initial full suite analysis of surface water and effluent stream quality will be conducted following the commissioning of the TSF and process plant to determine the appropriateness of the parameters in **Table 7.4** and whether additional parameters should be included in the final monitoring programme.

Full suite analyses will be conducted on SW1, SW3, SW4 and SW8 monthly to assess fluctuations in composition of effluent discharged from site and ensure that mine effluent is compliant with Zambian statutory limits and other relevant legislation and guidelines.

If monitoring indicates that parameters are non-compliant with Zambian statutory limits then the ECZ will be notified. Actions to address surface water contamination will be undertaken to prevent any risk of contamination to surrounding water users or upon the reasonable instruction of the ECZ. Any accidental spillages and water contamination incidents will be reported to the ECZ. Post closure monitoring will cease after a minimum of 2 years as long as all parameters are compliant with statutory limits and other relevant guidelines.

Analytical Laboratory and Quality Assurance/Quality Control (QA/QC) Analyses

The mine laboratory will be equipped for and be proficient in the analysis of the parameters specified above. The quality assurance / quality control (QA/QC) procedure will be to perform duplicate analyses on 5% of the samples and to carry out additional checks using standard reference materials and spiked samples. QA/QC sample analysis will be performed at an independent accredited laboratory.

Compliance with Statutory Limits and Other Relevant Standards

The Zambian statutory limits for effluent (relevant parameters) to be discharged to surface waters are summarised in **Table 7.5** below. Where the World Bank Guideline for discharge to surface waters is lower than the Zambian statutory limit the World Bank guideline is shown in brackets. For these standards Albidon is committed to complying with the World Bank guideline. The complete list of parameters to be compliant with in effluent discharged to surface waters is provided in Statutory Instrument (SI) No. 72 of 1993, The Water Pollution Control (Effluent and Waste Water) Regulations in the Third Schedule.

Table 7.5 Zambian Effluent Limits and Relevant World Bank Guidelines/USEPA Limits

Parameter	Statutory Limit/Proposed Standard	Parameter	Statutory Limit/Proposed Standard
pH	6.0-9.0	Lead (Pb)	0.5 (0.1)
EC	4,300	Chromium (Cr)	0.1
TSS	100 (50)	Mercury (Hg)	0.002
TDS	3,000	Arsenic (As)	0.05
Magnesium (Mg)	500	Antimony (Sb)	0.5
Chloride (Cl)	800	Selenium (Se)	0.02
Sulphate (SO_4)	1,500	Boron (B)	0.5
Nitrates (NO_3-N)	50	Fluoride (F)	2.0
Ammonium (NH_3-N)	10	Molybdenum (Mo)	5.0
Iron (Fe)	2.0	Silver (Ag)	0.1
Copper (Cu)	1.5 (0.5)	Barium (Ba)	0.5
Zinc (Zn)	10 (2.0)	Thallium (Tl)	0.5
Nickel (Ni)	0.5	Vanadium (V)	1.0
Cobalt (Co)	1.0	Tin (Sn)	2.0
Aluminium (Al)	2.5	Uranium (U)	4.0
Manganese (Mn)	1.0	Radium 226 (Ra)	1.11
Cadmium (Cd)	0.5 (0.1)		

N.B. All values are in mg/l except pH, EC (µS/cm) and Radium (Bq/l)

Albidon will submit a monitoring report to the Mines Safety Department (MSD) and ECZ for its licensed discharge points (SW8) every 6 months from the start of activities (Water Pollution Control Regulations, 1993).

Field Water Quality Measurements

Field water quality measurements of pH and EC will be conducted in conjunction with sampling sessions for comparison with laboratory results. Field water temperatures will also be recorded.

Flow Rate Measurement

Flow rates at the discharge point (SW8) will be monitored using a flow meter or a weir will be constructed. This is all dependent on the site water plan which will be developed during the Feasibility Study.

The flow rate of the dewatering water from the underground operations (SW5) will be measured with a flow meter and flow rates recorded.

Run-off from the process plant will be sent to the TSF and this will be monitored by a weir. Measurements of the return flow from the TSF to the process plant will also be carried out. This can be done either by a flow-meter or a weir.

7.2.2 Groundwater Monitoring

Groundwater Monitoring Boreholes

The highest risk of groundwater contamination is expected to be as a result of seepage and infiltration of process spills and leaks from the process plant, and seepage through the base of the TSF. Albidon proposes to install 6 piezometer boreholes across the mine site to monitor groundwater quality.

Underground dewatering will create a hydraulic gradient towards the underground mine. The cone of depression will draw groundwater flow towards the mine. Monitoring of mine drainage (SW 6) will identify any significant groundwater impact from the process plant or TSF.

Only one piezometer borehole is proposed in the vicinity of the mine workshop and refuelling station because the fuel storage tank is above ground. Groundwater contamination is unlikely to occur if the mitigation measures described in further sections of this report are implemented.

Groundwater samples will be collected monthly from the piezometer boreholes commencing one month prior to process plant commissioning, and analysed in the mine analytical laboratory. The monitoring sites are described in **Table 7.6** and shown on **Figure 7.1**.

Table 7.6 Description of Munali Groundwater Monitoring Sites

Monitoring Site	Location of Groundwater Monitoring Sites
GW 1	At the workshop and fuel depot.
GW 2	North of the tailings storage facility (TSF).
GW 3	East of the tailings storage facility (TSF).
GW 4	South of the tailings storage facility (TSF).
GW 5	West of the tailings storage facility (TSF).
GW 6	At the process plant.
GW 7	Mine Dewatering water

Borehole water levels will also be recorded during groundwater sampling using a dip meter.

Monitoring Frequency and Analytical Parameters

Groundwater sampling around the perimeter of the TSF (GW 2 to 5) will be conducted weekly and quarterly while sampling at the process plant (GW 6) and the refuelling station (GW 1) will be conducted monthly and quarterly. The parameters to be analysed at each monitoring site are given in **Table 7.7**.

Table 7.7 Groundwater Monitoring Sites - Sampling Frequency & Analytical Parameters

Monitoring Site	Sampling Frequency	Analytical Parameters
GW 1	Monthly	pH, EC, Ni, Cu, Co & SO_4
	Quarterly	Ca, Cl, Mg, Na, HCO_3 & K
GW 2	Weekly	pH, EC, Ni, Cu, Co & SO_4
	Quarterly	Ca, Cl, Mg, Na, HCO_3 & K
GW 3	Weekly	pH, EC, Ni, Cu, Co & SO_4
	Quarterly	Ca, Cl, Mg, Na, HCO_3 & K
GW 4	Weekly	pH, EC, Ni, Cu, Co & SO_4
	Quarterly	Ca, Cl, Mg, Na, HCO_3 & K
GW 5	Weekly	pH, EC, Ni, Cu, Co & SO_4
	Quarterly	Ca, Cl, Mg, Na, HCO_3 & K
GW 6	Monthly	pH, EC, Ni, Cu, Co & SO_4
	Quarterly	Ca, Cl, Mg, Na, HCO_3 & K

The quarterly analytical parameters given in **Table 7.7** will be done in addition to the coincident weekly/monthly analytical parameters.

Groundwater monitoring will be conducted on a quarterly basis for a minimum of 5 years post-closure. Sampling will be undertaken at all monitoring points and all weekly and quarterly parameters listed in **Table 7.7** will be analysed and groundwater level measured.

Actions to address groundwater contamination will be undertaken if monitoring indicates a risk of contamination to surrounding water users or upon the reasonable instruction of the ECZ. Post closure monitoring will cease after a minimum of five years and if groundwater quality is within the guideline limits outlined in **Table 7.7**.

Analytical Laboratory and Quality Assurance/Quality Control (QA/QC) Analyses

QA/QC analyses for groundwater samples are the same as that proposed for surface water and effluent streams.

Compliance with Statutory Limits

The Statutory Limits outlined in EPPCA governing groundwater quality (post-closure) limit groundwater contamination to the values listed in **Table 7.5** above. In addition, Albidon proposes that baseline groundwater quality data and the results of initial groundwater analyses in piezometer boreholes (GW 1 to 6) be used as a yardstick to monitor changes in groundwater quality across the mine site.

Albidon will submit annual reports on groundwater quality to the ECZ, as instructed. Any sudden deterioration in groundwater quality will be reported immediately.

7.2.3 Air Emissions Monitoring Programme

Emission Points

Air pollution of significance at Munali could result from dust emissions from the crushing plant and dust blow of from the Tailings Storage Facility, Stockpiles, Waste Rock Dump and vehicle movements.

Dust Emission Monitoring and Standards

Dust levels will be monitored monthly at emission sources (crushing plant, concentrate stockpiles, Tailings Dam and Waste Rock Dump). Zambian statutory dust emission limits are given in Table 7.8.

Table 7.8 Zambian Statutory Dust Emission Limits

Parameter	Emission Limits
Total dust concentration	50 mg/Nm^3
Heavy metal content in dust-	
- Arsenic (As)	0.5 mg/Nm^3
- Cadmium (Cd)	0.05 mg/Nm^3
- Copper (Cu)	1.0 mg/Nm^3
- Lead (Pb)	0.2 mg/Nm^3
- Mercury (Hg)	0.05 mg/Nm^3

Source: Zambia Air Pollution Control Regulations - Third Schedule

In addition, ambient dust concentrations will be monitored across the plant area on a monthly basis to determine total suspended particles in air (statutory guideline is 120 μg/m^3 - averaged over 24 hours) and respirable particulate content - PM <10μm diameter (statutory guideline is 70 μg/m^3 - averaged over 24 hours).

Dust concentrations will be monitored using MSD approved monitoring equipment and personal gravimetric samplers worn by operators in critical areas. Dust samples will be analysed in the mine analytical laboratory to determine the various dust values.

Workplace Air Quality

In addition to the air quality monitoring outlined above, good ventilation will be provided in the workplace. The condition of protective respiratory equipment and air quality monitoring equipment will be routinely checked and maintained.

Protective respiratory equipment will be provided to all employees when the exposure levels for welding fumes, solvents and other substances present in the workplace exceed statutory limits or adopted standards. Respiratory protection will be worn at all times in dusty environments and when air monitoring data, indicates that respiratory protection is required.

Dust masks will be issued to all employees working in areas where particulates (inert or nuisance dusts) may exceed the statutory limit of 50 mg/m^3.

Safety officers will conduct routine inspections to ensure the appropriate respiratory protection equipment is in good working condition and being used correctly.

7.2.4 Noise Monitoring Programme

Continuous and permanent noise will be present in working areas of the process plant (grinding and crushing sections) and in underground areas (vehicle movements, stope drilling and surface ventilation fans). In these areas, workers will be instructed to wear protective ear plugs against the noise and will be allowed to take frequent breaks. Supervisors will monitor the use of ear protection on the mine.

All plant equipment belonging to the mine and contractors will be subject to a routine maintenance programme to ensure it is in good working order and to minimise noise levels.

Where it is practicable and feasible to do so, Albidon will install sound-insulation and control rooms to reduce the average noise level exposure in normal work areas.

An annual noise monitoring programme will be initiated at strategic work areas (areas likely to exceed 85db) when operation begins. All areas that exceed or are within 10db of the limit will be designated as noisy areas. These areas will be sign posted and workers will only be allowed to work in them if they wear appropriate hearing protection. In addition, noise levels at Chinkomba and Mugoto villages will be monitored and the level of noise arising from project operations (including blasting) will be quantified and compared to the limits outlined in the mining regulations.

Vibrations and Noise Levels during blasting

Blasting operations underground will not produce any noise on the surface with the exception of mining activities at the very early stages of the mine life. Vibrations might occur during blasting but blasting sessions will be restricted to the minimum required to effectively operate the site. Notice will be posted on boards at entrance gates to the mine site and other specific areas that will announce the time and location of blasting activities.

Vibration monitoring will be carried out at Chinkomba and Mugoto villages on an annual basis so as to ensure that the people are not affected

7.2.5 Soil Monitoring

To evaluate the level of contamination in and around the vicinity of the project area an annual soil monitoring programme will be implemented. **Table 7.9** below indicates the soil sampling locations. The samples will be collected using recognized international procedures for soil sampling and will be analysed for the following parameters; pH, Ni & SO_4. Any evidence of contamination will be identified and actions implemented to reduce this contamination subject to the advice of the Environmental Council of Zambia.

Table 7.9 Soil Sampling Locations at Munali Mine

Location	Number of Samples
Waste Rock Dump	8 samples around the perimeter (<25m from facility)
Tailings Storage Facility	As above
Stockpiles	As above
Processing Facility	As above

7.2.6 Environmental Monitoring Reports

All environmental monitoring data will be recorded in a database and an annual report produced by the HSE department, commenting on all monitoring carried out including a summary of results, areas of concern and proposed mitigation measures in the case of non-compliance or contamination. This report will be copied to the ECZ for review.

7.3 Waste Rock Dump

Construction Phase

Site Clearance

No rare or endangered species of flora or fauna were identified in the project area during the baseline study (refer to **Section 3.12**). A survey of fauna in the area indicated that only small mammals, reptiles, fish, birds and insects are present. Population pressure and uncontrolled hunting has destroyed or caused the larger mammals that were once present in the area to move away.

Approximately 6ha of Miombo woodland will be cleared in order to construct the mine waste rock dumps. Commercial timber affected by site clearance will be surveyed and valued by the Forestry Department and then removed by a timber merchant. Non-commercial timber will be piled on the site. Local people will be allowed to use it for building material and firewood. This will be at no charge. Where it is feasible and practicable to do so, Albidon will remove and stockpile the remaining vegetation, organic matter and topsoil for later use in mine site rehabilitation.

Albidon will minimise soil erosion from exposed areas by only conducting site clearance three months prior to dumping. Vegetation will only be stripped from designated overburden dumping areas.

Public Safety

Albidon will inform the public concerning the dangers of entering into areas of mining operations through public consultation, liaison with local community leaders and erection of warning signs. Mine security will remove intruders from the mine site.

Archaeology

A ‘walk over’ of the site and discussions with the local community and Albidon employees during the baseline study revealed that no archaeological or cultural sites exist within the area to be cleared for the waste rock dump extension. In the event of an archaeological find, operations will cease and the relevant authorities contacted immediately to undertake a review of the find and advice on further actions.

Operational Phase

Surface Water

Perimeter storm drains will be constructed around the WRD to intercept surface run-off arising from the dump. These drains will connect with the main mine drain and run-off will pass through the two-stage settlement ponds. Clear water will be discharged to the main mine drains discharging to surface watercourses. The drains and sedimentation ponds will be regularly maintained and cleaned out. Solids will be removed and taken to the waste rock dump see **Figure 7.1.**

Dump Stability

To maintain the stability of the waste rock dump and prevent erosion Albidon will incorporate the following procedures: -

- A strategy of dumping weathered waste rock in central dump areas and using more competent waste rock for construction of the outer walls. The more competent waste will also be used to dress dump slopes;

- The waste rock dump has been designed according to best industry practice with an overall final slope angle of 14°;

- The dump construction will be regularly checked to ensure that it is as per design; and

- Perimeter drains and a sedimentation pond will be constructed to control/manage surface run-off. The drains and sedimentation ponds will be regularly inspected and cleared of solids and debris before the start of each wet season.

The waste rock dump will be profiled in such a way as too enable concurrent re-vegetation of the dump walls using stockpiled topsoil. This action will be incorporated into the development of the dump at closed areas. Albidon will investigate additional uses for the waste rock (i.e. for use as road aggregate) and will contact relevant parties to discuss whether an alternative use is feasible.

Dumping Strategy

Inappropriate dumping of non-hazardous waste on the dump will not be allowed. Waste will not be stored on the waste rock dump unless done in accordance with Albidon Management Policy, and then only in designated areas.

Acid Rock Drainage

Geochemical characterisation testwork was conducted on representative samples of waste rock from the Munali mine to assess the Acid Rock Drainage (ARD) risk potential. ALS Environmental laboratories from Perth Australia carried out the test work.

The leach test results indicate that the Munali waste rock is of negligible risk. There is little mobilisation of heavy metals into solution from the three types of waste rock characterised at the mine. One of the rock units is potentially acid forming (PAF) but it is likely due to its small relative abundance that the waste rock with high acid neutralisation capacity (ANC) will prevent any acid formation.

Noise and Vibration

The waste rock dump is located several kilometres away from any settlements. It is unlikely that noise and vibration generated from the operation and movement of heavy equipment will be a nuisance to local people. However, a complaints register will be set up and if necessary, 24-hour noise monitoring will be conducted and the results used to develop appropriate mitigation measures.

Air Quality

The generation of airborne dust from the movement of trucks and other heavy equipment will be suppressed by routine spraying of haul roads with water.

Aesthetics

The waste rock dump is approximately 2km from the Lusaka-Livingstone highway in Zambia. The dump will attain a maximum height of 20 metres. The gently rolling landscape and surrounding vegetation will shield the dumps from view and there will be little visual impact.

Public Safety

Albidon will inform the public concerning the dangers of entering into areas of mining operations through public consultation, liaison with local community leaders and erection of warning signs. Mine security will remove intruders from the mine site.

Post-closure Phase

Concurrent revegetation of the WRD will continue if no alternative use of the waste rock is found. The physical condition of the waste rock dump and the quality of dump surface run-off will be monitored as part of the post-closure environmental monitoring plan. (See Section 7.14.10)

7.4 ROM Pad and Processing Facilities

Construction Phase

During the development of the ROM Pad and Processing Facilities, 95ha will be cleared of some topsoil and of some vegetation. Any large timber resources will be felled and made available to the general public or used during mine development. Topsoil will be stockpiled in an area for use in future concurrent rehabilitation works. In the result of any archaeological find the local authorities will be contacted for advice. Only vegetation and topsoil from the Rom Pad and Processing Facility footprint will be removed.

Operational Phase

Perimeter storm drains will be constructed around the process plant, ROM pad and ore stockpiles to intercept surface run-off. These drains will connect with the main mine drain and run-off will pass through the two-stage settlement ponds. Clear water will be discharged to the main mine drains discharging to surface watercourses. The drains and sedimentation ponds will be regularly maintained and cleaned out. Solids will be removed and taken to the waste rock dump.

Noise and Vibration

If necessary, 24 hour noise monitoring will be conducted at the crusher plant and the results used to develop appropriate mitigation measures. Workers will wear noise protection (ear plugs) at the grinding section, the crushing plant and around operational conveyors. The plant will undergo regular maintenance to ensure the machinery is in good working order and minimum noise levels are being produced. Where it is practical and feasible to do so, Albidon will install sound-insulation, noise attenuation devices and control rooms to decrease the average noise level exposure in normal work areas.

Air Quality

Air quality monitoring equipment will be installed in critical areas to assess the levels of dust being produced. Dust monitoring will be conducted in strategic working areas for respirable dust, nickel, copper, cobalt and lead dust to evaluate dust exposure levels to workers. Workers in dust areas will wear dust masks.

Acid Rock Drainage from Stockpile Areas

Exposure of the stockpiles to rainwater during the wet season may result in ARD and leaching of toxic materials into the groundwater regime. Testwork carried out to date indicates that ARD from waste rock is a very low risk. The turn around time for processing will be kept as efficient as possible to ensure that the time spent by ore in a stockpile is minimized thus reducing the amount of exposure of the ore to rainwater and thus reducing the ARD potential. Soils and groundwater in the vicinity of the stockpiles will be monitored as outlined in the monitoring plan. Should ARD be evident from waste rock dumps, plans to address this problem will be developed considering mitigating measures such as neutralization or sheeting of stockpiles from rainfall during the wet season.

Plant Water Management

Contamination of surface and groundwater may occur from contact between process spills, concentrate, tailings, wash water and storm water resulting in the carry over of spills into the plant site drainage system. Measures to protect surface water quality will include: -

- An impermeable (concrete) drainage system will be constructed around the flotation plant. All process plant spills will be collected in this drainage system connected to sumps and returned to the process;

- The wash water from hosing down and maintenance activities will be collected in the internal plant drain and re-circulated into the plant or treated. This water will be kept separate from storm water run-off; and

- Storm water drains will be of sufficient capacity, and kept clean and clear of debris to prevent overflow of the drains into processing areas.

Process water ponds will be lined with impermeable HDPE liners. This will prevent leaks that could impact on groundwater quality. Inspection pits or monitoring boreholes will be installed adjacent to the ponds to provide early warning of leaks and possible groundwater contamination. These monitoring measures are described in the surface water monitoring section below.

Raw water consumption will be controlled, optimised and efficiently used in the process plant. All process plant raw water inputs and effluent outputs will be identified and monitored and the data used to update the plant and site water balance. Albidon will implement a preventative maintenance programme to maintain and repair any leaking water pipelines and will continually review the plant site water balance and implement strategies to reduce water usage.
Contamination of water may occur due to accidental spills of oil, chemicals, reagents, tailings and equipment failure. To mitigate these potential impacts:-

- Oil traps will be installed around machinery in the mill to capture spills. The oil traps will be regularly serviced and cleaned. Oily residues will be stored in drums in a designated area awaiting collection by an approved recycling company;

- Chemical off-loading bays will be equipped with an impervious floor surface and containment to recover spillages and prevent ingress into the site drainage system.

- The handling and storage of all process chemicals and reagents around the site is described in **Section 7.11** of this report. An inventory control programme will be designed to track and document movement of process chemicals and reagents through storage facilities. Regular inspections of storage and containment areas will be conducted;

- A preventative maintenance programme will be implemented for all plant equipment, process infrastructure, drains and containment areas. This will involve regular inspection of all equipment to prevent spillage due to equipment failures;

- Chemical and reagent spills or leaks will be collected in sumps and returned to the process. Spill containment areas will be regularly cleaned to maintain storage capacity;

- Spilled materials will be removed and the area cleaned up as soon as possible;

- In addition to monitoring drainage from the process plant, Albidon will install piezometers in boreholes to monitor groundwater quality in the vicinity of the process plant; and

- In the event of a spill, spill response procedures and measures described in the Spillage Response Plan (to be developed by Albidon) will be followed.

Post Closure

All Stockpiles will be removed and processed through the plant. The surrounding areas will be subjected to a soil monitoring programme to identify whether the area has been impacted on by ARD or toxic leaching. In the event of contamination actions to rehabilitate the area will be implemented. All process infrastructure will be removed as and the area rehabilitated as outlined in **section 7.14.10**.

7.5 Tailings Storage Facility

Construction Phase

During the development of the Tailings Storage Facility, 59ha will be cleared of topsoil and of all the vegetation. Any large timber resources will be felled and made available to the general public or used during mine development. Topsoil will be stockpiled in an area for use in future concurrent rehabilitation works. In the result of any archaeological find the local authorities will be contacted for advice.

Operational Phase

The TSF will be designed as a zero discharge facility in order to mitigate any potential impact on the local seasonal streams. During the dry season there will be no drainage from the TSF. In the wet season, rainwater collecting on the upper surface of the TSF will be decanted to a sump and pumped to the plant where it will be recycled as process water. The large surface area of the TSF has determined that the return flow from the

TSF during the rainy season may be able to supply all of the process plant water needs and so the amount of dewatering water used in the process will be reduced and diverted to the sedimentation ponds for subsequent discharge to a local watercourse.

Run-off from the perimeter earth fill wall will be directed to the mine site drain and discharged to nearby watercourse. The TSF operations should have no impact on the stream.

Acid rock drainage test work (Net Acid Production Potential, NAPP and Net Acid Generation, NAG) carried out by ALS Environmental laboratories from Perth Australia, on two tailings samples (see Appendix VI) delivered by Albidon have indicated that although one tailings sample has a low NAPP (-15.6 kg/H_2SO_4/t) and a neutral NAG (7.5pH(OX)), the other has a high NAPP (139 kg/H_2SO_4/t) and very acidic NAG (2.2pH(OX)). Further analysis carried out through Albidon concurred that the tailings may be potentially acid forming (PAF).

Seepage of supernatant moisture and rainwater through the base of the TSF during the wet season could contaminate groundwater in the immediate vicinity of the mine. To prevent this occurring, the tailings entering the TSF will dosed with lime to prevent any potential for acidification of the tails over time. Mine dewatering will create a potential hydraulic gradient towards the underground mine. Groundwater quality will be monitored underground and from boreholes equipped with piezometers. These boreholes will be drilled around the TSF and between the TSF and the underground. Groundwater monitoring details are given in the groundwater monitoring section below.

Contamination of water from spillage of tailings during pumping to the TSF from the process plant will be prevented by using pipes or covered concrete drains and closely and regularly checking the line for leaks. Any spilled tailings material will be removed to the TSF.

Air Quality

To minimise dust generation, the wetted area of the tailings beach will be maximised during the dry season and if necessary water sprinkled on the TSF surface. Dust generation will be visually assessed during operations and if necessary, dust levels will be monitored. A dust complaints register will be kept at the mine.

Incidents and Public Safety

Failure of the TSF could occur due to over-topping of the dam wall or erosion of the perimeter earth fill wall. To prevent failure of the TSF, Albidon will operate the TSF according to the procedures outlined in the designer’s Safe Operating Manual. As a minimum, the following measures will be implemented:-

- Rainfall will not be allowed to accumulate on the upper surface of the TSF. Rainwater will be decanted and used as process water in the plant;
- In the event of a 1:100 year storm, excess water will be retained in the TSF and subsequently discharged via the decant;

- The dam wall, toe drain, filter drain outlets, freeboard, decant structure and beach above decant pipe will be inspected once per season and after any major climatic events by a competent person and an inspection record kept on site;

- In an emergency, procedures outlined in the Emergency Response Plan will be followed; and

- To ensure public safety, signs will be erected around the TSF to warn the public of the danger of downing and drinking any standing water.

Aesthetics

The TSF will attain a maximum crest height of 4 - 5 metres and is unlikely to protrude above the surrounding vegetation. It is unlikely that the TSF will impact the natural topography of the area.

Post-closure Phase

Unless a use of the tailings can be found (reprocessing), the upper surface of the TSF will be profiled, covered with compacted waste rock and re-vegetated at closure. The decant will be sealed. Surface run-off will be intercepted in the perimeter drain and discharged to the local Stream. No post closure environmental impacts are expected. Post closure inspection and groundwater monitoring are described in **Sections 7.14.** TSF decommissioning and site rehabilitation are described further in **Section 7.14 below.**

7.6 Mine Workshops

Construction Phase

During the construction of the Mine Workshops, the area will be cleared of some topsoil and of all the vegetation. Any large timber resources will be felled and made available to the general public or used during mine development. Topsoil will be stockpiled in an area for use in future concurrent rehabilitation works. In the result of any archaeological find the local authorities will be contacted for advice.

Operational Phase

Inadequate handling and storage of new and/or used oil may result in soil contamination. To prevent this occurring, new and used oil will be stored in accordance with Albidon's Materials Handling Procedure. The key measures are:-

- Oil will only be stored and handled in designated areas;

- Drains in areas where oil is stored and handled will be equipped with oil traps;

- Oil handling and storage areas will be equipped with impervious surfacing; containment, impact and fire protection and protection against the sun and rain; and

- Waste oil will be recycled and quantities of stored oil will be kept to a minimum.

The oil handling and storage areas will undergo regular inspections, which will determine service, maintenance and repair requirements.

All electrical transformers will be fitted on impervious surfacing with bund walls, in order to contain any transformer oil spills. The bund walls will be fitted with a valve to allow the collection of waste water and oil for appropriate disposal. No transformer oil containing PCB's will be used on site.

The workshop personnel (management, engineers, mechanics and operators) will receive training on oil handling and disposal. The programme will focus on environmental awareness, safe-handling procedures, spill reporting and spillage response/action.

Inadequate handling and storage of new and/or used batteries may result in soil contamination. To prevent this occurring, new and used oil will be stored in accordance with Albidon's Materials Handling Procedure. The key measures are:-

- Batteries will only be stored and handled in designated areas;
- Battery storage areas will be equipped with impervious flooring, containment, impact and fire protection and protection against the sun and rain;
- All spills will be treated as contaminated waste; and

Used batteries will be stored in a designated area awaiting collection by recycling company and the quantity of them in storage will be minimised.

Albidon will implement measures to prevent the contamination of surface run-off from the mine workshop area.

The washing of mobile equipment and machine parts will be carried out in wash bays equipped with impervious flooring and spillage containment. The wash bay drainage will pass through oil traps and then be released to the site drainage system. The oil traps will be inspected regularly to monitor condition and performance. Oil residue will be collected and stored in drums in a designated area, awaiting removal by a recycling company. Sludge in the oil traps will be treated and disposed of as a hazardous material at an approved site. If no appropriate site is found a bio-remediation system will be developed on site. This system will involve the mixing of waste oil with saw dust and organic material in order to encourage the natural breakdown of oil.

Oil traps will be installed in drains at all oil handling and storage areas in order to capture all oily residues. This will prevent the carry over of oil by storm water into the mine site drainage system.

Handling spills and poor housekeeping etc will be minimised and prevented by regular inspections of the workshop area. This will form part of a preventative maintenance programme to monitor potential sources of contamination.

Post Closure Phase

Alternative economic uses of the workshop will be considered post closure. In the event that no use is found the workshop will be dismantled and removed and the area reprofiled. A soil monitoring programme will be implemented to evaluate the level of contamination at the workshop area. Actions to rehabilitate the are will be implemented if necessary **(See section 7.14)**.

7.7 Underground Operations

Construction Phase

Topsoil and vegetation removed during construction of the access portal to the underground will be removed and stored in a designated area for use in future re-vegetation. The stored overburden topsoil will be vegetated in order to reduce erosion arising from wind and rainfall.

Operational Phase

Noise and Vibration

Mining equipment such as compressors, haul trucks, loaders, dozers and ventilation equipment will increase the mine site noise levels. The current daytime noise levels of ≅ 40 dB reflect the rural setting. The operation of mine equipment will be noticeable to people living near to the mine exclusion zone but is unlikely to be a nuisance. All mine machinery will be regularly maintained and noise attenuation devices fitted if necessary or sensitive areas screened by planted trees or profiled land.

Underground areas such as the stope face or drilling areas will be noisy, as such all operators in these areas will be required to wear hearing protection.

Vibrations on surface during blasting will be monitored on a quarterly basis to evaluate whether vibration levels are within the general safety limits defined by the USBM (United States Bureau of Mines). It is expected that surface infrastructure, e.g. buildings, dumps and tailings storage facility are unlikely to be affected by vibrations from underground operations.

Groundwater

Groundwater contamination will be minimised by ensuring that the maintenance and repair of vehicles and equipment is only carried out in areas designed for such activity i.e. mine workshops. The movement of any underground mobile fuel and lube tankers will adhere to specified procedures to prevent the contamination of soils from accidents involving oil and fuel. All underground workshops and washbays will be fitted with impermeable surfacing, bunding, silt and oil traps which will be regularly emptied and transferred to surface where the residues will be disposed of in line with Albidon's waste management plan.

Sewage facilities will be designed to be leak proof and sewage will be transferred to surface from underground storage tanks via dedicated leak proof containers for appropriate disposal above ground.

Underground Stability

Storm water and erosion management measures will include the construction of diversion channels around the perimeter of the box cut and profiling of the haul roads to redirect storm water run-off away from the underground operations. The underground mine will be dewatered to prevent the build up and accumulation of water. These measures in addition to ongoing review of underground design and cautious blasting practices will minimise the risk of underground stability.

Subsidence

Any areas potentially prone to subsidence will be monitored on a daily basis on surface. All areas subject to potential subsidence will be clearly marked with warning signs and the public will be warned of the dangers of entering caving areas through public consultation.

Waste Generation

Waste that is generated from the repair, maintenance and service of underground equipment will be handled, stored and disposed of according to Albidon waste management policy.

Indigenous Timber Resources

Albidon will implement a policy to only use managed timber resources during underground operations. No use of indigenous timber will be allowed onsite.

Public Safety

The public will be informed of the dangers of entering into areas of mining operations through public consultation, liaison with local community leaders and signposting. Mine security officers will remove unauthorised personnel from the site.

Post-closure Phase

Details of the decommissioning plan for the Munali underground operations are detailed in section 7.14 below.

7.8 Transport Infrastructure

Operational Phase

The generation of dust by heavy equipment and vehicles will be prevented by frequent water spraying on all mine access roads (to and from mine infrastructure onsite, and the mine access road from the Lusaka-Livingstone road). Vehicles will be regularly maintained to ensure that they are in good working order and therefore more efficient producing less noise and air emissions as compared to a poorly maintained vehicle fleet.

7.9 Construction Activities (Contractors Camp)

Contractors will be supervised and managed in a responsible fashion to minimise the impact of their activities.

Operational Phase

Site Preparation

The contractor will remove topsoil and store it in an area designated by Albidon for future use in mine site rehabilitation. At the same time, measures will be put into place to minimise soil erosion.

Construction

Hazardous waste produced by the contractor will be handled, stored and disposed of in accordance with Albidon Waste Management Policy and in places designated for storage of such material. The contractor shall be responsible for placing hazardous waste in designated areas.

General waste will be handled, stored and disposed of according to the procedures in Albidon's Waste Management Policy. The contractor will not be permitted to burn or bury waste materials. The contractor shall be responsible for placing general waste in areas designated by the mine.

Waste batches of concrete and other construction materials will be disposed of in areas designated by Albidon. The contractor shall be responsible for placing such waste in areas designated by the mine.

Contractor's Traffic

There will be increased levels of traffic and possibly accidents involving contractor traffic. The risk of accidents occurring will be minimised by the use of approved transport routes. The SHE Officer will conduct regular inspections/checks to verify compliance. The contractor will be monitored in terms of road-worthiness, safe driving practices and driving tests/licenses.

Construction Site Security/Safety

Construction sites will be clearly demarcated with restricted access. Warning signs will be erected in dangerous areas. The contractor will implement good housekeeping practices and will be monitored by the SHE Officer.

7.10 Spills Procedure

Accidental Releases/Spills

In the event of an oil or battery acid spill, the procedures outlined in the Albidon Emergency Response Plan (ERP) will be followed. The ERP details the measures to be effected include:-

- The key personnel to be notified;
- The location of any emergency equipment that will need to be used;
- Corrective actions – oil spills will be cleaned up using sawdust as an absorbent;
- Rehabilitation requirements; and
- Correct handling and disposal of any contaminated waste (soil).

The contamination of soil, air and/or water resulting from the spill of tailings filter cake, chemicals and reagents, acid, fuel, oil and concentrate will be minimised. Albidon will implement procedures for the transport of hazardous materials to, from, in and around the mine site. These procedures include but are not limited to: -

- Documentation and inventory control through a chain of custody;

- Emergency response training for all Albidon employees and contractor employees;
- Tracking and notification of shipment location and condition;
- Carrying of onboard emergency equipment;
- Use of designated transport routes only;
- Vehicle road worthiness checks and implementation of a preventative maintenance programme; and
- Random and unannounced en route safety inspections.

All outside contractors will adopt these procedures, which will be incorporated into all contract agreements.

Tarpaulins will cover open top bulk transport trucks in order to prevent spills resulting from the exposure of concentrate to rain and/or wind.

The contracts with haulage contractors will include clauses on Zambian and relevant regional/international standards relating to transport of hazardous materials. Mine transport infrastructure including roads, bridges, culverts and traffic signs will be subject to a preventative maintenance programme to ensure that they are kept in a good condition. This will reduce the number of road accidents, which could potentially result in soil or water contamination.

7.11 Materials Handling and Storage

Accidental Releases/Spills

The risk of a fuel spill occurring will be minimised by equipping all the fuel storage areas with statutory bunding containment (of 110% storage capacity) and concrete surfaces. Procedures outlined in the mine’s Spillage Response Plan will be followed in the case of significant fuel spills. These procedures include but are not limited to the clean-up action to be taken, the clean-up materials to be used and the appropriate disposal practices for contaminated soil and clean-up materials used. All spills will be dealt with in accordance with the Albidon’s Spillage Prevention, Control and Clean-up Plan.

Regular inspections of surface fuel storage tanks and pressure testing of underground fuel tanks will be carried out in order to minimise the risk of contamination of soils and water through handling or leak/rupture of a fuel tank. In addition monthly reconciliation of fuel stocks will be undertaken in order to detect any fuel loses.
Drainage from fuel storage and handling areas will be isolated from the mine site drainage system and passed through an oil trap prior to release. Oil traps will be regularly monitored and cleaned and drains will be kept clear. A detailed plan of the onsite drainage system, including the location of the settlement ponds, oil and silt traps, is shown in **Figure 7.1**.

Spills of oils, greases and chemicals during handling and storage will be immediately cleaned up following the procedures outlined in the Spills Prevention, Control and Clean-up Plan. Training will be given to employees handling oils, reagents and chemicals that will focus on potential risks, safe handling procedures, safety precautions, first aid, emergency response and appropriate disposal practices.

Hazardous Substances

Material Data Safety Sheets (MDSS's) will be obtained by Albidon for all the chemicals used on the site. These sheets will specify hazards, compatibility with other substances and specific handling, storage or disposal requirements. The end users will have copies of the relevant MDSS's and receive training on the hazardous substances used in their area of operations.

7.12 Waste Management

Operational Phase

Industrial Waste Generation

Significant quantities of scrap metal and empty containers will be generated. These should be sold or recycled to minimise the amount stored at the mine. All the industrial waste will be disposed of according to Albidon's Waste Management Policy and Scrap Sales Procedures. The waste will be stored in secure areas. The materials will be sorted to facilitate reuse/recycling. Scrap metal dealers and used equipment dealers will be encouraged to remove waste materials. Reusable materials such as empty drums, used conveyor belts and timber will be reused by the mine, sold or given away. Used tyres will be painted by the mine and used to mark the edges of roads, bends, operational areas and accident black spots.

Waste Separation

General waste generated onsite (wood, plastic and organic waste) will be separated on site. Three different coloured and labelled bins will be provided in appropriate areas.

Waste will be re-used where possible on or off site i.e. organic waste composted and wood waste re-used for construction or conversion into sawdust for oil spill absorption.

Waste that cannot be re-used or recycled will be disposed of in a designated landfill offsite.

Hazardous Waste Generation

Hazardous waste such as oils and grease will be stored in a secure area. The area will be covered, have a concrete floor and 110% containment capacity. Sawdust that is used to clean up oil and grease spills will be contained in a secure area and mixed with a small amount of organic material and soil in order to encourage the bio-remediation of the contaminated sawdust. The success of the bio-remediation system will be reviewed annually through an annual hydrocarbon monitoring campaign. Non-compatible hazardous waste will be stored at separate sites. Used oil will be sold to a recycling company and greases returned to supplier or incinerated according to approved disposal practices.

Medical Waste Generation

Medical waste from the mine clinic may cause contamination if not handled and disposed properly. All medical waste will be disposed of in accordance with Albidon's Waste Management Policy. In practice, all medical waste will be incinerated in an approved incinerator.

7.13 Occupational Health and Safety Plan

Albidon will implement internationally accepted occupational health and safety standards and procedures throughout its operations. This will create a safe workplace thereby protecting its employees from accidents and sickness. The key measures involved are described in the following sections.

7.13.1 Workplace Air Quality and Temperature

In addition to the air monitoring, good ventilation will be provided in the workplace. The condition of protective respiratory equipment and air quality monitoring equipment will be routinely checked and maintained, as well as any warning systems.

Protective respiratory equipment will be provided and worn by all employees when exposure to welding fumes, solvents and other substances are present in the workplace or exceed statutory limits. Respiratory protection will be worn at all times in dusty environments and when air monitoring data, indicates that respiratory protection is required. Dust masks will be issued to all employees working in areas where particulates (inert or nuisance dusts) may exceed the statutory limit of 10 mg/m^3 i.e. crusher plant and concentrate storage areas.

OHS officers will conduct routine inspections to ensure the appropriate respiratory protection equipment is in good working condition and being used correctly.

Thermometers will be installed in areas where high heat and humidity occur to ensure there are no detrimental effects on employees. Employees working in areas of high temperature and humidity will be allowed regular breaks.

7.13.2 Workplace Noise

All plant equipment (belonging to the mine and contractor) will undergo routine maintenance to ensure it is in good working order and to minimise noise levels.

Where it is practical and feasible to do so, Albidon will install sound-insulation and control rooms to decrease the average noise level exposure in normal work areas.

Albidon will adopt the international standard of 85 decibels (dB) for exposure of its employees to noise over an 8-hour shift. Employees will wear appropriate ear protection in workplaces where noise levels exceed 85 dB.

Safety officers will monitor noise levels and the use of protective equipment to ensure the appropriate and correct use of the protective equipment by employees.

7.13.3 Working in Confined Spaces

Entering into confined spaces such as tanks, vessels, sumps and excavations to carry out inspection, repair and/or maintenance can expose workers to the danger of toxic, flammable or explosive gases, or lack of oxygen. These spaces must be tested for the presence of gases or lack of oxygen and adequate ventilation provided before and during occupancy. Employees working in confined spaces, which may become contaminated or deficient in air, must wear appropriate air-supplied respirators. Suitably equipped observers must be stationed outside of confined spaces to provide emergency assistance if required to people working inside.

7.13.4 Handling and Storage of Hazardous Material

All hazardous (reactive, radioactive, corrosive and toxic) materials or substances will be stored in appropriate and clearly labelled containers or vessels. Fire protection systems and secondary containment will be provided to the storage area to prevent fires or the release of hazardous materials to the environment.

The storage and handling of hazardous materials will be carried in accordance with the Zambian regulations and Albidon's Materials Handling Procedures as outlined in the Environmental Management Plan.

7.13.5 Employee Health - General

Albidon will provide an onsite medical facility to deal with mining emergencies. The medical facility will be equipped with medical material, medicines and vaccines and be adequately staffed.

Pre-employment and regular medical examinations will be carried out 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 (Snellen Chart);
    - Chest X-ray (large 35 cm x 43 cm) indicating date and name of employee on X-ray plate;
    - Audiometry test - physical and visual inspection of both ears;
    - Lung function; and
    - Cardio-respiratory examination (general physical examination).

This examination will probably be performed at a medical facility in Mazabuka, Kafue or Lusaka.

Albidon 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.

Albidon will strive to reduce the risk of malaria by spraying offices and workshops as well as employee housing onsite and providing workers with insecticide treated nets.

Employees will also be informed and counselled with regard to HIV/AIDS to reduce the further spread of the disease.

The Chief Medical Officer (CMO) will keep a record of employee medical examinations, specific surveillance records and medical history.

7.13.6 Employee Safety - General

The general safety of employees while at work is the responsibility of Albidon, except in cases where the employee was acting in a negligent and dangerous manner.

Conveyors and similar machinery will be provided with a means of stopping them at any point. Guards will be fitted to all drive belts, pulley, gears and other moving parts to protect workers. Raised platforms, walkways, gantries, scaffolds, stairways and ramps will be equipped with handrails and non-slip surfaces. All electrical equipment will be grounded, well insulated and conform to applicable codes. Plant site piping will be colour coded for acid, water, compressed air, process solution etc.

Mine employees will be provided with hardhats, safety boots, overalls, ear and eye protection, dust masks and gloves as appropriate.

The Mining Explosives Regulations governing the safe storage, handling and transport of explosives to, in and around the mine will be strictly enforced. Only qualified and certified personnel will be allowed to carry out blasting operations.

Hazard signs will be erected or posted around the plant and mine site to warn employees and contractors of potential dangers.

Contact telephone numbers of persons and services to be notified in the event of an emergency will be posted on all notice boards.

7.13.7 Employee Training

Employees will receive specific training from accident prevention and safety officers concerning the hazards precautions and procedures for the safe storage, handling, transport and use of potentially harmful materials that are relevant to each employee’s job task and work area. The training provided will include key information from the Material Safety Data Sheets (“MSDS’s”) for potentially harmful material and substances. Employees will also receive training regarding safety, health and environmental matters including accident prevention, safe lifting practices, correct use of MSDS’s, safe chemical handling practices, and proper control and maintenance of equipment and facilities. This will aid in the prevention of accidents or chemical spills.

Training will also be given on emergency response systems and procedures including the location and proper use of emergency equipment, use of personal protective equipment, procedures for raising the alarm and notifying emergency response teams, and the proper response actions for each foreseeable emergency situation. Daily safety and environment briefings including inspections of personal protective equipment will be conducted by relevant supervisors or shift bosses.

A safety and environmental induction will be carried out for new employees and for any person arriving on site after a break exceeding two weeks or any contractor arriving on site. The safety induction will cover; the use of personal protective devices, dangerous areas, appropriate conduct, emergency response procedures and waste management. The induction will be compulsory for all persons entering the site.

Regular (daily) safety briefings will be carried out by underground shift bosses prior to shift commencement. Albidon will ensure that safety is a priority at Munali Mine.

7.13.8 Emergency Fire and Rescue Services

The Munali mine site is relatively remote from urban centres equipped with a fire fighting service, the nearest being Lusaka (approximately 80km by road). As such the mine will be unable to call on municipal fire services in the event of a fire or other emergency. Munali mine will therefore be equipped with its own fire tender and light fire tender utility vehicle. A volunteer mine rescue team will be established to assist in fire fighting services. This team will be provided with specialist training.

Fires, particularly those involving rubber tyred diesel powered vehicles, loose tyres and diesel fuel storage facilities are particularly problematic for underground operations. Unless a fire involving rubber tyres or quantities of diesel fuel can be extinguished completely in a very short space of time, enormous quantities of toxic gases and dense smoke will rapidly be released.

In order to reduce the potential for fire Albidon will ensure that machinery is well maintained, leaks of fuel or flammable fluids are controlled and the availability of both on-board and static fire fighting apparatus is regularly checked.

Refuelling will be carried out in accordance with Albidon’s refuelling procedures at designated areas fitted with appropriate fire fighting equipment and operated by trained staff.

An adequate supply of water and hoses will be made be readily available to combat any underground fire. All underground staff will be trained in combating fires.

All persons proceeding underground will be equipped with self contained self rescuers (SCSR). In addition, refuge stations will be strategically located throughout the mine. These will be built in or installed as a ready made unit and will either be equipped with a compressed air supply, oxygen candles or long duration SCSR's.

7.13.9 Health and Safety Records

In addition to the medical records kept by the CMO, the SHE Officer will maintain records of all significant environmental matters, including but not limited to accidents, monitoring data, occupational illnesses, spills, fires and other emergencies. This data will be used to evaluate and improve the efficiency and effectiveness of the environmental health and safety programme.

Health and safety statistics will be reported on at Albidon Management Meetings and included in annual mine environmental reports.

Emergency Measures

Albidon will develop an emergency management plan which will outline emergency measures to be undertaken in the event of a major loss incident such as (but not limited to), underground failures, fire, or tailings dam failure.

The Emergency Action Plan (EAP) will detail:-

- Immediate actions to be undertaken;
- Evacuation and/or containment measures; and
- Contact details for persons responsible for implementing emergency measures.

The emergency measures will be communicated to all relevant employees and the EAP will be posted at strategic working areas such as change houses and safety briefing rooms.

7.14 Post Closure Mitigation and Rehabilitation Measures

Albidon will implement a mine site reclamation plan at closure. The plan will focus on the reclamation of the underground facilities, tailings storage facility (TSF), ROM Pad, ore stockpile areas, process plant and workshop. The main objectives of the plan will be to:-

- Implement alternative economic activities in the area that are sustainable into the future;

- Ensure the safety of surrounding communities through public consultation and the erection of warning signs;

- Return the land to conditions capable of supporting the former land use (woodland and agriculture), or where this is not practical, or feasible, an alternative sustainable land use; and

- Prevent potential significant adverse effects on adjacent water resources, being groundwater and surface water.

7.14.1 Underground

Underground Infrastructure and Machinery

All underground equipment will be removed to surface for sale or re-use at alternative mine sites in Zambia or abroad. All removable infrastructure will be hoisted to surface for re-use or appropriate disposal. Albidon will develop an inventory of all underground infrastructure and design a closure plan relating to all underground infrastructure and equipment 3 yrs prior to closure.

Underground Stability

The underground will be designed with adequate factors of safety to ensure long-term stability. The stability will be monitored as part of the mine's post closure environmental monitoring programme.

Subsidence

Areas considered to be prone to subsidence will be monitored on a monthly basis for 5 years post closure and warning signs maintained. Any subsidence will be recorded and sink holes or significant caving areas will either be infilled or cordoned off in case of inadvertent access by the public.

Groundwater

At mine closure, mine dewatering will cease and the water table will gradually rebound to baseline levels. Due to the fact that the orebody is sulphidic and the sulphidic geology will be exposed to oxygen during underground operations, acid generation may occur as the groundwater rebounds to baseline levels and interacts with the oxidised sulphidic rock to produce sulphuric acid resulting in contamination of the groundwater resource. Ground water will be monitored monthly for 5 years post closure and the possibility of AMD closely followed.

In the event of significant acid generation in the immediate mine workings, Albidon will investigate measures to either treat or with close liaison with the relevant authorities restrict access to contaminated groundwater by potential users.

Public Safety

Warning signs will be erected around the mine and on approach roads to the mine to warn the public of the danger of falling into the caving area. The access shafts and decline will be made safe/blocked using a suitable method to prevent access.

7.14.2 Waste Rock Dumps

The waste rock dumps will be retained for use for mining, re-profiling, building material and/ or road aggregate (subject to the approval of the ECZ/MSD). If the waste rock is removed, a soil sampling programme will be implemented to evaluate any residual contamination arising from the natural leaching of the waste rock. The remaining soil will be treated if necessary and the area re-vegetated. If ECZ/MSD officers indicate that waste rock should not be used, the area will be re-vegetated where possible.

7.14.3 ROM Pad, Process Plant and Workshops

All ore on the ROM Pad and transient ore stockpiles will be processed. The area will be re-profiled to establish the natural drainage pattern.

The following plant and equipment dismantling and disposal practices will be applied to the crusher plant, mill, process plant and workshops, provided there are no demands on them from the local businesses or people:-

1. Removal of all brick buildings;
2. Breaking out and removal of all concrete foundations;
3. Removal of steel frames;
4. Demolish reinforced concrete structures and dispose of on site;
5. Remove HDPE liners and backfill all process ponds;
6. Remove electrical equipment, pumps, motors, and other fixed equipment;
7. Remove all above and below ground fuel storage tanks;
8. Cut up and remove all steel tanks and vessels;
9. Remove all pipelines;
10. Dig up and remove all below ground electricity cables;
11. Remove conveyor belting;
12. Remove all mechanical equipment;
13. Materials handling areas will be cleared of all raw materials;
14. General site clean up;
15. Site levelling and profiling to re-establish the natural drainage pattern across the site; and
16. Re-distribution of the stockpiled soils and re-vegetation of the site with indigenous grasses and trees.
17. Plant machinery, steel, HDPE liners, pipelines will be auctioned off or sold

Concrete foundations will be retained for use as foundations for future buildings if required.

Septic tanks will be emptied and filled in and the sludge dried for use in the re-vegetation process.

Scrap metals and equipment will be sorted and sold to the local community, businesses and scrap metal merchants. The company will remove all equipment and materials that cannot be reused, recycled or sold, to an approved non-hazardous disposal site.

Water Treatment Plant

Albidon will enter into negotiations with private, governmental and non-governmental organisations to identify whether the water treatment facility can be sold for use by a private, governmental or NGO water provider. This would ensure that a safe potable water supply is available to the surrounding community.

In the event that no alternative use can be found for the water treatment plant the plant will be removed as outlined above.

7.14.4 Tailings Storage Facility

At closure the upper surface will be re-profiled and re-vegetated. Stockpiled organic matter and soil from the initial site clearance will be spread over the storage facility in order to promote the growth of indigenous trees, shrubs and grasses transplanted from the mine nursery. Advice will be sought from a competent person regarding the species and diversity of vegetation to be established on the TSF. These trees will likely need to have high tolerance to dry and high sulphate conditions such as *Acacia polycantha, A. sieberana, Albizia adianthifolia, Peltophorum africanum,* and *Dichrostachys cinere*. The decant will be sealed.

The TSF outer slope angles of 18° will be resistant to erosion when re-vegetated. Slope run-off from the closed TSF is not expected to impact adjacent watercourses.

The chemical and physical characteristics of the final tailings are presented in **Appendix VI.** Testwork indicates that the tailings may be potentially acid forming (PAF) and may produce acidic drainage. To prevent the contamination of groundwater from seepage under the toe of the TSF a lime dosage addition system will be installed as part of the process plant infrastructure and will control the pH of the tailings being pumped to the TSF. No post closure impact on groundwater is expected.

A full review of the stability of the tailings dam and additional measures to be undertaken in order to safely close the tailings dam will be carried out by a competent external person(s) and a detailed tailings closure plan will be developed by the company 1 year before operations are scheduled to cease.

7.14.5 Transport Infrastructure

Transport infrastructure such as site access roads, bridges and drainage channels will be re-vegetated if the local community does not want in any way for them to be retained. This will be evaluated at the appropriate time pre-closure through the company's ongoing public consultation programme (s**ee Section 7.15.6)**.

7.14.6 Settlement Pond and Mine Site Drainage Systems.

After cessation of mine operations all settlement pond silt will be tested for contamination. The results of this test work will indicate the measures needed to stabilise the silt to avoid additional contamination of the surface and groundwater. The settlement ponds will be re-profiled with the addition of waste rock (subject to ECZ/MSD approval), previously stripped topsoil and organic matter and re-vegetated.

7.14.7 Re-vegetation

For the purposes of re-vegetation, stripped soil and organic material will be stockpiled for future use during site preparation as outlined in above. A nursery of young trees will be established on site within 5 years of operations for the concurrent and progressive re-vegetation of closed stable areas. The nursery will consist of species endemic to the local area and some colonizer species which are tolerant to dry, sulphide conditions likely to be experienced at the tailings dam. In general the stages of re-vegetation will be:-

- Development of the Nursery;
- Site stabilisation and profiling;
- Site contamination assessment in order to evaluate conditions needed for re-vegetation;
- Addition of stripped soil, fertiliser and organic material;
- Planting or transfer of trees from the nursery (under the supervision of a competent forester);
- Post planning care (watering, and fertilising); and
- Final site inspection to clarify if the re-vegetation is successful.

The areas that will be re-vegetated post closure include:-

i. Waste rock dump;
ii. Tailings dam;
iii. Ore stockpiles;
iv. Settlement ponds;
v. Drainage channels;
vi. Closed areas of the plant; and
vii. Roads, and areas underlying removed infrastructure.

The time table for successful re-vegetation of all relevant areas of the project area is 5 years post closure.

7.14.8 Contaminated Soil

A soil survey will be conducted at closure to identify any areas of inorganic and/or organic soil contamination. The soil survey will involve a programme of test pitting to a depth of 500mm, soil sampling and analysis. The number and location of test pits will be based on a site walkover/inspection at closure to identify potentially contaminated soils. A deeper soil inspection may be necessary at specific locations (pollution sources) depending on the findings of the near surface soil survey.

Inorganic soil contamination including copper, cobalt and sulphate will be treated on-site using neutralisation methods to reduce the concentration of contaminants in the soil solution. This may be achieved by adding lime to stabilise the soil pH between 5.3 and 6.5, the application of organic matter (decaying vegetation) and/or incorporation of organic materials to the soil.

Localised soil contamination resulting from the accidental spill of diesel and oil will be treated by the removal of contaminated soil from affected areas to an appropriate disposal facility or to the bio-remediation site.

Soil contaminated with chemicals, reagents or oils will be removed to an approved hazardous waste disposal site.

The ROM pad, ore stockpiles and process plant site will be re-vegetated following the removal of any remaining ore, process plant dismantling, removal from site of all equipment and materials, treatment or removal of contaminated soil (if any) and re-profiling of the area to re-establish natural drainage patterns. A soil improvement programme will be carried out using stockpiled organic matter and topsoil, prepared organic mulches and fertilizer. Indigenous plants, shrubs and trees will be transplanted from a nursery area.

The dismantling and removal from site of all buildings, sewage systems, workshops, fuel storage facilities, electrical and mechanical equipment and materials will be carried out, unless they can be put towards a sustainable use. The mine drainage sedimentation ponds will be cleaned (if necessary) and backfilled.

7.14.9 Public Safety

All hazardous areas will be sign posted and fenced off if necessary and the public informed of the associated dangers of inadvertent mine site access after closure through the companies ongoing public consultation programme (**see Section 7.15.6)**.

7.14.10 Post Closure Mine Site Inspection, Monitoring and Reporting

The Company will implement a programme of post closure environmental inspection and monitoring to assess the success of mine reclamation and verify that the various components of the closed mine are not adversely impacting adjacent watercourses and groundwater, and do not pose a potential health risk and/or danger to the public. An independent consultant will conduct the site inspection and environmental monitoring.

The Company proposes that post closure environmental inspection and monitoring be conducted bi-annually for the first 2 years to establish seasonal variations. Bi-annual site visits will be made in October (before the rains) and in April (at the end of the rains). Final inspection and monitoring will be conducted 5 years after mine closure. The findings of this inspection will determine whether or not any further post closure site inspection is necessary.

7.14.11 Post Closure Environmental Inspection

Post closure environmental inspections will focus on:-

- underground instability;
- Erosion on the waste rock dump sidewalls and upper surfaces;
- Erosion at the TSF;
- Success of establishing an indigenous vegetation cover on the TSF, process plant site, ROM pad and ore stockpile areas;
- Any activity by the general public or persons unknown that may adversely affect the stability of disused mine structures, pose a danger to the community or possibly result in environmental degradation; and
- The condition of site access roads, bridges and culverts.

Consultations will be held with local community leaders to listen to and record any issues of concern pertaining to the closed mine site.

7.14.12 Post-closure Environmental Monitoring

Post-closure environmental monitoring will include the following tasks:-

- Surface water sampling across the mine site; and
- Groundwater sampling at the plant area, TSF and workshop.

Surface water samples will be collected at the following sites: -

1. Drainage from the former process plant area;
2. Drainage from the former ROM Pad;
3. The flooded underground;
4. Drainage from the waste rock dump;
5. Drainage from the TSF;
6. Drainage from the workshop and former ore stockpile area; and
7. Local Streams

The surface water samples will be submitted to an independent accredited laboratory and analysed for the key parameters pH, EC, TSS, TDS, SO_4 and Ni. During the dry season most monitoring sites are likely to be dry except for underground mine.

Groundwater samples will be collected from the 6 piezometer boreholes located at the disused TSF, former process plant and workshop. The groundwater samples will be submitted to an independent accredited laboratory and analysed for the key parameters pH, EC, TDS, SO_4, and Ni.

7.14.13 Post-closure Environmental Reporting

The consultant will produce an annual post-closure environmental monitoring report at the end of years 1 and 2 and a final post closure environmental report at the end of year 5. These post closure environmental reports will be submitted to the ECZ/MSD and made available to all stakeholders. The reports will present the findings of the mine site inspections/walkovers and the results of the environmental monitoring programme. Where reclamation activities have not obtained the desired result, the consultant will make recommendations on what additional reclamation work is required to achieve full reclamation. Any areas of concern will be highlighted. The reports will include a post closure photographic record of mine reclamation.

No significant post closure environmental issues are anticipated. Environmental inspections and monitoring should cease in year 5, subject to approval from the ECZ/MSD.

7.15 Social Management Plan

The main objectives of the social management plan are: -

- To, wherever possible and economically feasible, preferentially maximise the use of local and provincial employment and business opportunities;

- To encourage the diversification of local businesses away from the mining sector; and

- Explain Albidon policies on environmental issues to the community and wider public, via public consultation processes during mining operations.

The proposed socio-economic and cultural impact mitigation measures are described below.

7.15.1 Maximising Local Employment and Economic Opportunities

Albidon will maximise local employment during mining operations by implementing a strategy that focuses on the employment of people from the Munali, Mazabuka and Kafue areas. The company is an 'equal opportunity' employer and in practice, the best applicant for the position will be offered employment. Local people will be given priority in employment subject to their experience and qualifications. Albidon will offer employees salaries and conditions of service commensurate with other mining companies operating in the country. Albidon will also implement training and development programmes for employees so that they acquire transferable skills that can be used elsewhere after the mine closure. A job seekers database will be developed by Albidon which will hold a register of job seekers. This database will be consulted when a vacancy occurs.

Albidon will implement a contractor engagement strategy that ensures local contractors are employed in preference to foreign contractors, subject to their ability to carry out the work. This action will improve contractor competency and managerial capacity of local contractors. Albidon will outline the safety standards and conditions that employees and contractors will have to comply with so as to promote a safer working environment. These conditions will include an HIV/AIDS awareness and prevention campaign.

Albidon will implement a retrenchment-training programme for its employees and also implement a counselling plan for workers going through retrenchment. This will aim at promoting sustainable livelihoods.

7.15.2 Local and Regional Economic Growth

Albidon will implement a local procurement strategy that supports local economic development. The Company will distribute information material through its procurement office explaining the procedures for doing business with Albidon, supplies and contracts. This will improve business multipliers and reduce unemployment.

Albidon will liaise with relevant local government ministries and departments, non-governmental organisations ("NGO's") and donor agencies to encourage the development of an Economic Diversification and Development Plan based on diversification away from the mining sector.

7.15.3 Land Use and Settlement

Albidon will liaise with the Chief and local community to establish safe pathways around the mine site and to ensure that these pathways are made known to local people. This will prevent inadvertent access into dangerous/hazardous areas of the mine site.

The mine site boundaries will be clearly demarcated and Albidon's land use and settlement policy clearly communicated to local communities and stakeholders. The boundaries will be marked on-site with beacons and the use of signposts. They will be shown on all mine plans. This will discourage the encroachment of local population on to the mine site. The local communities will be discouraged from using the mine site for settlement or their livelihoods.

Albidon will engage in natural resource management at the local community level to assist in the conservation of trees. This will involve the prevention and discouragement of further deforestation in accordance with Albidon's Environmental Policy. The programme will be conducted with the Forestry Department. Mine security will make regular patrols to prevent the clearance of woodland for cultivation and charcoal burning.

Albidon will ensure that all mine hazards are mapped and clearly marked on the site. They will raise awareness and provide general information on mine hazards through public consultation. Albidon will move settlers and/or cultivators from hazardous areas and offer adequate compensation. Albidon mine security will patrol these hazardous areas throughout the year to prevent people from entering them.

Albidon will promote awareness of the water quality in its effluent streams and the risks associated with its consumption as drinking water. Signs in local languages/symbols will be erected alerting the public of drowning, sickness etc. The aim will be to discourage the use of mine surface water by local communities.

7.15.4 Resettlement Action Plan

African Mining Consultants is currently in the process of developing a Resettlement Action Plan on behalf of Albidon. This report will be made available as an addendum to this EIA once it has been completed.

7.15.5 Health Plan

Albidon will open a mine clinic at Munali for its employees and their immediate dependents, for the lifetime of the mine. The Company will implement an HIV/AIDS awareness and prevention programme in consultation with local HIV/AIDS organisations and government initiatives. Albidon will also conduct malaria spraying at the mine site and nearby areas and assist Health Services to spray villages close to the mine.

7.15.6 Public Consultation

Albidon will continue the public consultation process throughout the life of the mine and hold consultative meetings with stakeholders at regular intervals. This will aid in the development of friendly and trusting relationships between Albidon and the local population.

8 MINE SITE REHABILITATION COSTS

The following costs have been estimated to carry out mine site decommissioning and reclamation works and conduct post closure inspections and environmental monitoring at the Munali mine site.

8.1 Mine Decommissioning and Rehabilitation Costs

The project area covers a largely disturbed woodland area that has been impacted by agricultural activities.

There are two possible scenarios for mine decommissioning and rehabilitation:-

1. Mining continues by another company after completion of the Albidon Mining Project. In this case, only the ROM pad, ore stockpiles, process plant, TSF, workshop, re-fuelling station, evaporation ponds and sedimentation ponds will be decommissioned and rehabilitated at closure; and.

2. No further mining at Munali. In this case, decommissioning and rehabilitation of the whole site including the underground and waste rock dump will be necessary.

Albidon's current decommissioning and rehabilitation plan assumes that mining operations at Munali will not continue after the end of the project (Scenario 2). The estimated cost of decommissioning and rehabilitating all mine components is given below.

8.2 Estimated Cost of Mine Site Reclamation Tasks

8.2.1 Process Plant, Workshop and Re-fuelling Station Decommissioning Cost

The basis of estimating the process plant, workshop and re-fuelling station dismantling and disposal cost is based on results of a detailed costing study undertaken at Zambia Consolidated Copper Mines Limited (ZCCM) Copperbelt mines in Zambia by Golder Associates Ltd in 1997, during the preparation of mine Environmental Impact Statements for each of the ZCCM mines (World Bank Funded Project).

The study involved a survey of each mine plant site to identify the dismantling tasks. The labour and plant equipment requirements were determined and unit rates for each task then calculated. A detailed log was compiled of all buildings, structures and equipment (including estimate of quantity of construction materials) and the unit rates for dismantling and disposal tasks for each item on the log was quantified. The costs calculated are considered to be a good indication of the likely cost to be incurred during dismantling and disposal of process plant and equipment because the approach was thorough and methodical.

The plant site dismantling and disposal unit rates (US$/ha) calculated for the Nkana, Chambishi, Nchanga, Konkola, Mufulira and Luanshya copper mines (1997 EIS) are shown in **Table 8.1**.

At the relatively new Chambishi mine (1960s), the open spaces between buildings and plant are reflected in a lower plant site dismantling and disposal cost, while the high density of buildings and plant at the older Nkana mine (1930s) results in a significantly higher dismantling and disposal cost.

Table 8.1 ZCCM - Plant Site Dismantling & Disposal Cost, 1997 EIS

Mine Plant Site	Dismantling and Disposal Unit Cost (US$/ha)
Nkana Mine *	$103,571
Nchanga Mine	$59,895
Mufulira Mine	$57,333
Luanshya Mine	$55,266
Konkola Mine	$50,844
Chambishi Mine **	$39,482

* Relatively old mine with high density of plant/buildings across the mine site
** Relatively new mine with low density of plant/buildings across the mine site

The Munali process plant, workshop and re-fuelling station dismantling and disposal costs are likely to be similar to that of Chambishi Mine. Allowing for an annual inflation rate of 1.5 % per annum between 1997 and 2006, the estimated decommissioning and disposal unit rate for the Munali mine is US$43,171/ha. The footprint of the Munali process plant, workshop and re-fuelling station is approximately 4.5 ha. The estimated dismantling and disposal cost is US$43,171 x 4.5 ha = US$196,727. This figure does not take into account any revenue generated from the sale of scrap materials and equipment, which will offset decommissioning costs.

A soil contamination survey will be carried out after the process plant has been dismantled and disposed of. A sum of US$15,750 (US$3,500/ha) is included in the decommissioning and closure cost for the cleanup of contaminated soils present (if any).

The estimated unit rate for grading and re-profiling the plant site to re-establish natural drainage is US$9,000/ha. This cost is based on local earthworks rates of US$3.00/$m^3$ and an average re-profiling depth of 300mm. The estimated cost of process plant site grading and re-profiling is US$9,000/ha x 4.5 ha = US$40,500.

8.3 The Underground Decommissioning Cost

Underground decommissioning activities and costs are presented in **Table 8.2**. The total decommissioning cost estimate is US$ 17,500

Table 8.2 Underground Decommissioning Cost

Activity/Task	*Cost US$*
Removal of floating platform and dewatering pumps	5,000
Removal of dewatering pipeline	4,500
Removal of electrical equipment and cables	2,500
Removal of scrap materials	2,000
Blocking of pit ramp to prevent unauthorised access	1,000
Backfilling and profiling of sedimentation ponds	2,500
Total Open Pit Decommissioning Cost	**US$17,500**

8.3.1 Tailings Disposal Facility, Evaporation and Sedimentation Ponds Decommissioning Cost

The main decommissioning activities and costs associated with the TSF, evaporation and sedimentation ponds are presented in **Table 8.3**. The total decommissioning cost estimate is US$ 292,500

Table 8.3 TSF, Evaporation & Sedimentation Ponds Decommissioning Cost

Activity/Task	*Cost US$*
Re-profiling upper surface of TSF	90,000
Application of 0.5 m thick waste rock protective cover to TSF	150,000
Sealing TSF decant	2,500
Backfilling and re-profiling evaporation and sedimentation ponds	50,000
Total TSF Decommissioning Cost	**US$292,500**

8.4 Mine Site Re-vegetation Cost

The estimated cost to re-vegetate the mine site based on local input prices and labour rates is US$ 1,300/ha. The cost breakdown by activity is agricultural/chemical inputs US$ 800/ha; mechanical equipment US$ 190/ha; and labour US$ 310/ha. The total mine site re-vegetation cost estimate is US$ 47,528. Re-vegetation costs by mine component are summarised in **Table 8.4.**

Table 8.4 Mine Site Re-vegetation Costs

Mine Component	Area (ha)	Unit Rate (US$)	Re-vegetation Cost (US$)
Waste rock dump	12.5	1,300	16,250
ROM pad and ore stockpiles	4.3	1,300	5,590
Process plant site	3.5	1,300	4,550
Tailings storage facility TSF	9.8	1,300	12,740
Evaporation & sedimentation ponds	5.5	1,300	7,150
Mine workshop	0.9	1,300	1,170
Re-fuelling station	0.06	1,300	78
Total Re-vegetation Cost	**31.11**	**1,300**	**US$47,528**

Mine site re-vegetation should be completed in one wet season.

General Site Clean up and Erection of Warning Signs

A sum of US$ 10,000 has been included in the mine decommissioning and rehabilitation cost estimate for general site clean up and erection of signs around the mine area and waste rock dump to warn the public of potential dangers/hazards.

8.5 Total Munali Mine Decommissioning and Rehabilitation Cost Estimate

The total decommissioning and rehabilitation cost for the Munali mine site including a 15% contingency is given in **Table 8.5.**

Table 8.5 Total Munali Decommissioning and Rehabilitation Cost

Item No.	Activity/Task	Scenario 1 Cost US$	Scenario 2 Cost US$
1.	Decommissioning process plant, workshop and re-fuelling station.	196,727	196,727
2.	Treatment of contaminated soils (if any).	15,750	15,750
3.	Re-profiling of process plant, workshop and re-fuelling station.	40,500	40,500
4.	Open pit decommissioning.	0	17,500
5.	TSF, evaporation & sedimentation pond decommissioning.	292,500	292,500
6.	Re-vegetation of mine site.	*31,278	**47,528
7.	General site clean up.	10,000	10,000

Item No.	Activity/Task	Scenario 1 Cost US$	Scenario 2 Cost US$
Sub Total		586,755	620,505
15% contingency		88,013	93,075
Total Decommissioning and Rehabilitation Cost		US$674,768	US$713,580

* excludes waste rock dump
** includes waste rock dump

The Munali mine decommissioning and rehabilitation cost estimate is US $674,768 (Scenario 1) and US$713,581 (Scenario 2).

8.6 Post-closure Site Inspection and Environmental Monitoring Costs

The Munali post closure inspection and environmental monitoring cost estimate is US$43,700. This cost is the estimated total cost over the 5 year post closure monitoring period. The cost breakdown for these activities is given in **Table 8.6.**

Table 8.6 Post Closure Inspection and Environmental Monitoring Cost

Item No.	Post-closure Environmental Activity	Qty	Unit	Rate US$	Cost US$
1.	Site Inspections x 5 Visits Mine site inspection to be carried out by independent consultant Consultant's accommodation and transport	 15 15	 days days	 $600 $250	 $9,000 $3,750
Sub Total					$12,750
2.	Environmental Monitoring x 5 Visits Technician to collect water samples Water sampling consumables Analysis of water samples Technician's transport and accommodation	 15 - 65 15	 days l.s. e.a. days	 $350 $500 $120 $200	 $5,250 $500 $7,800 $3,000
Sub Total					$16,550
3.	Post-closure Environmental Reporting Preparation of 2 annual and final post closure environmental monitoring reports by independent consultant	24	days	$600	$14,400
Sub Total					$14,400
Total Post Closure Environmental Inspection and Monitoring Cost					$43,700

APPENDIX I

ALBIDON ZAMBIA LIMITED ENVIRONMENTAL POLICY, COMMUNITY POLICY & SAFETY AND HEALTH POLICY

ALBIDON LIMITED

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Environment Policy

Albidon is committed to achieving compatibility between economic development and the maintenance of the environment. It therefore seeks to ensure that, throughout all phases of its activities, Albidon personnel and contractors give proper consideration to the care of flora, fauna, air, land and water, and to the community health and heritage which may be affected by these activities.

To fulfil this commitment, the company will observe all environmental laws and, consistent with the principles of sustainable development, will;

- Progressively establish and maintain company wide environmental standards for our operations throughout Africa.
- Integrate environmental factors into planning and operational decisions and processes.
- Assess the potential environmental effects of our activities, and regularly monitor and audit our environmental performance.
- Continually improve our environmental performance, including reducing the effect of emissions, developing opportunities for recycling, and more efficiently using energy, water and other resources.
- Rehabilitate the environment affected by our activities.
- Conserve important populations of flora and fauna that may be affected by our activities.
- Promote environmental awareness among Company personnel and contractors to increase understanding of environmental matters.
- Environmental policies will adhere to World Bank guidelines.

Signed

Donal Windrim
Managing Director
Albidon Limited

ALBIDON LIMITED

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Community Policy

As an integral part of the community, we recognise and act on our responsibilities. We work with communities to develop and nurture positive relationships built on mutual understanding and respect. Building these long term partnerships is essential for our business success.

To achieve this we:

- Value and respect human rights
- Engage by listening, considering and responding
- Communicate in an open and transparent manner
- Respect cultural diversity and protect cultural heritage
- Require our behaviour to be consistent with this policy.

As we invest in exploration, development, production and closure we, in consultation with host communities, government authorities and other organisations:

- Encourage and support community development
- Encourage and support initiatives to enhance social benefits such as environment, health and education
- Identify and facilitate opportunities for employment, training and business relationships directly and through our contractors and suppliers.

We monitor, continuously improve and publicly report our activities and performance.

Signed

Donal P. Windrim

Donal Windrim
Managing Director
Albidon Limited

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Safety and Health Policy

Albidon is committed to developing a culture and management system that supports its Safety and Health values by encouraging behaviours and implementing processes that ensure the safety and health of all employees, contractors, customers and the communities associated with our operations.

The Company's Safety and Health Principles are as follows:

- All incidents and injuries are preventable on and off the job.
- No business activity will come before safety and health.
- Accountability for safety and health rests with the individual.
- Individuals must identify, assess and manage hazards.
- Legal obligations are the foundation for our safety and health standards.
- Individuals will be trained and equipped to ensure an incident free workplace.
- Safety and health policies will adhere to World Bank guidelines.

Signed

Donal P. Windrim

Donal Windrim
Managing Director
Albidon Limited

APPENDIX II

PUBLIC CONSULTATION – MINUTES AND LIST OF ATTENDEES

TOUR OF THE NICKEL PROJECT IN MUNALI HILLS AND MEETING WITH MAZABUKA MEMBER OF PARLIAMENT AND LOCAL DIGNITARIES – WEDNESDAY 1ST JUNE 2005

The visiting team comprised of:

1.	Mr. Alfred Chikomba	-	Head Man
2.	Robert Chilobya	-	Local Magistrate
3.	Hon. MP Griffiths Nang'omba	-	Member of Parliament
4.	Miss Olivia Woodland	-	Corporate Solicitor
5.	Mr Dale Rogers	-	Project Manager
6.	Mr Martin Broome	-	Principal AMC

The meeting was held in the kitchen/mess building in Albidon's exploration camp at the Munali Nickel Project site.

An outline of the potential project as given by Dale Rogers and Martin Broome. The positive result from the recently completed Scoping Study, likely timing of the project, steps that need to be taken by Albidon in completing a Feasibility Study and possible size of the operation were discussed. Olivia Woodland discussed the impact to the area, indicated that it would most likely be an underground mine not an open cut which will mean minimal impact on land and dwellings in the area. It was stressed that there is a decision point in August/September (following completion of drilling) and that the Feasibility may not progress past that point. No discussion of relocation of any part of the village will be undertaken until necessary and the base line social survey has been completed. It was stressed that Albidon will keep the local residents informed and will consult with them if the operation progresses to become a mine. There was general consensus between the parties that consultation is of paramount importance and will be much appreciated on both sides. The visitors welcomed the advent of the mining and Martin Broome went through the detail the process of water monitoring and bores and ensuring it did not have an adverse effect on the residents of Mazabuka and will assist in any way such as putting down bore holes if convenient for both parties. The visitors were looking forward to the commencement of mining, if the project proceeds, and the opportunities which will flow to the community.

TOUR OF THE NICKEL PROJECT IN MUNALI HILLS AND THE IRRIGATION PROJECT – MONDAY 25TH JULY 2005

The visiting team arrived at 12:15 hours and taken into the canteen where safety induction leaflets were handed out outlining safety procedures to follow whilst on site and went through the leaflets before the presentation and tour took place.

The visiting team comprised of:

1.	Mr. C Ngoma	-	His Worship the Mayor
2.	Mr. MM Chiinda	-	District Commissioner
3.	Hon. A N M Nakalonga, MP	-	Member of Parliament for
4.	Mr. N A Phiri	-	Officer Commanding
5.	Ms Annie H Mangunje	-	Area Councilor
6.	Mr. Alfred Kawale	-	Area Councilor
7.	Mr. E I Changangu	-	Town Clerk Mazabuka
8.	Mr. M Mulonda	-	Chief Committee Clerk
9.	Mr. E Nchema	-	Union Official
10.	Mr. Pelekelo Munuaka	-	CPL
11.	Ms Cathrine Mufaya		

Absent With Apologies:

His Royal Highness Chief Naluama – car broke down on way to meeting.

Wiscort Banda (Geologist) conducted the presentation starting with the introduction of the Albidon members of staff on site. Mr. Mulonda introduced the visiting team.

The Brief presentation by Wiscort covered the history of the project and who had been there before and when Albidon took over the project. He talked about what had been done to be at the stage were the project is now – the feasibility study stage. He informed the visiting delegates that the study so far has been very encouraging. He mentioned that although progress has been made, the project is not making any profits at all from the activities so far- contrary to the mislead view that Albidon is already making money from nickel exports at Munali. A mention was made to the effect that there was potential to develop the Munali Project further (depending on the outcome of the feasibility study). He mentioned that as well as Munali, Albidon currently holds several other prospecting licenses, some recently granted and therefore the company was very much around in Zambia.

Stakeholders needed to work hand in hand to see the project through as this will greatly benefit the local population and the country at large.

On specific time frame to start mining and how many people would be employed, Wiscort said that this largely depended on the outcome of the ongoing studies. He added that the plan for the year is to work on the completion of the feasibility study and to continue with exploration in the northern area to expand the current resource.

The visitors were then invited for comments/questions:

The MP wondered whether or not with the advanced technology Albidon would look at other by-products such as gold and also wanted to know the life span of the project. The answer was that while Munali has shown high values of Ni and PGM (particularly Pt and Pd) gold values were negligible. The life span of the project/mine would depend on the tonnage that will come out of current studies and the annual production rate.

On the refining methods to be used. The visitors were told that several options were currently being explored. It was however made clear that no local plant currently existing in Zambia is capable of processing nickel.

A mention was made to the effect that the company was using Alfred H Knight for sample preparation before sending to ALS Chemex in Australia for analysis and that Albidon was committed to using all available local resources before looking at outside options.

The Union Representative wanted to find out how employees were protected in terms of stability of employment. Wiscort responded that there were three types of employees in place as at now – those contracted by Albidon directly, those contracted through GeoQuest and casual workers. He said that no one is employed on permanent basis and therefore did not necessarily need to be unionized. A mentioned was made, however, to the fact that the company was now beginning to take on people on contract directly- not entirely through a subcontractor as was before- a sign of more commitment to the people.

A concern was raised about water levels and if there was a monitoring system in place. An assurance was made that this was already in place and that preliminary investigations show that the water table is around 30m in the resource area.

The visiting member of parliament whose constituency actually is where the irrigation project is being carried out assured Albidon that the irrigation project was not connected in any way with Albidon and the Munali Nickel project but that if agreeable and if the water pumped from the mining activities is safe for irrigation, it could be pumped from the Munali Nickel project to be used by the local farmers for irrigation.

A tour in vehicles up hill was undertaken and thereafter a vote of thanks was given by Mr. Mulonda re-emphasizing the need for open dialogue between the project leaders and the local authorities other than Lusaka.

The visiting team and Albidon members of staff on site agreed to a follow-up meeting to be arranged for offshore Senior Management of Albidon and The Mazabuka Council officials to meet at a later date.

At the end of the tour, the visiting team were given coffee as a token and also handed out the Albidon booklet. All in all very positive comments from the visitors and a fruitful tour with a lot of enthusiasm for the future.

28th July 2005

TOUR OF THE NICKEL PROJECT IN MUNALI HILLS – SUNDAY 21ST AUGUST 2005

The visiting team comprised of:

1.	Mr Nick Day	-	CFO/Company Secretary
2.	Miss Olivia Woodland	-	Corporate Solicitor
3.	Mr Dale Rogers	-	Project Manager
4.	Mr Ashley Bosworth	-	Site Infrastructure/Logistics
5.	Mr Wiscort Banda	-	Project Geologist
6.	Mr Robert Chilobya	-	
7.	Mr Alfred Chikomba	-	Head Man
8.	His Royal Highness Chief Naluama		

Wiscort started the presentation starting with the introduction of the Albidon members of staff on site. Petroce introduced the visiting team.

The presentation by Nicholas Day covered the history of the project and who had been there before and when Albidon took over the project. He talked about what had been done to be at the stage where the Project is now from the Scoping Study – the Feasibility Study stage. He informed the visiting delegates that the study so far has been very encouraging. He mentioned that although progress has been made, the project is not making any profits at all from the activities so far- contrary to the mislead view that Albidon is already making money from nickel exports at Munali. A mention was made to the effect that there was potential to develop the Munali Project further (depending on the outcome of the feasibility study). He mentioned that as well as Munali, Albidon currently holds several other prospecting licenses, some recently granted and therefore the company was very much around and seriously committed to exploration in Mazabuka, Zambia.

Stakeholders needed to work together to see the project through as this will greatly benefit the local population and the country at large.

On specific time frame to start mining and how many people would be employed, Nick said that this largely depended on the outcome of the ongoing studies but this could be anywhere from 100 to 250 employees, contractors and suppliers. He added that the plan for the year is to work on the completion of the feasibility study and to continue with exploration in the northern area to expand the current resource.

The visitors were then invited for comments/questions.

The life span of the project/mine would depend on the tonnage that will come out of current studies and the annual production rate.

On the refining methods to be used. The visitors were told that several options were currently being explored. It was however made clear that no local plant currently existing in Zambia is capable of processing nickel.

The visiting team and Albidon members of staff on site then were given a tour of the core sample shed and explained the drilling and sampling process and agreed to a follow-up meeting to be arranged at a later date.

Very encouraging comments from the visitors and a successful tour.

Munali Environmental Impact Assessment (EIA)
Public Consultation Meeting

Project Name: Munali Nickel Project

Developer: Albidon Zambia Limited

Location: Munali Exploration Camp

Date: 09th November 2005

Minutes of the Munali Nickel Project EIA Public Consultation Meeting held at Munali Exploration Camp on 09th November 2005 at 10:00 hrs. The purpose of the Meeting was to ensure that public views are taken into account during preparation of the Project EIA/SIA, in accordance with Part III Environmental Impact Statement Regulation 8 (2) of the Zambian Environmental Impact Assessment Regulations, 1997.

Invitation letters were sent out two weeks before the meeting with two public notices appearing in two different daily papers.

Documentation describing the Munali Project was distributed as guests entered the meeting place.

OPENING REMARKS

Chairman, Mr. Dale Rogers opened the meeting at 10:45 hrs. Mr. Rogers welcomed Honourable Chief Naluama, distinguished guests, ladies and gentlemen to Munali. He then introduced the following key Albidon personnel:-

Mr. Dale Rogers (Chairman) – Project Manager;
Ms. Olivia Woodland – Albidon Solicitor
Mr. Ash Bosworth – Senior Site Manager;
Mr. Wiscort Banda – Exploration Geologist; and
Mr. Petros Phiri – Senior Logistics Officer.

And African Mining Consultants (AMC) representatives:-

Mr. Mbita Chifunda - Mining & Environmental Consultant; and
Dr. Mitulo Silengo - Socio-economic Consultant.

The Chairman requested all present to sign the attendance register giving their name, company/organization represented and address. A copy of the attendance register is attached to these minutes.

FLIP CHART PRESENTATION OF THE MUNALI NICKEL PROJECT

Introduction

Mr. Rogers started by describing the infrastructure, mineral resource and metallurgy.

Infrastructure: Munali is close to capital city, highway, rail, power and water supplies.

The Munali mineral resource key facts are stated as:

General resource : 4.1mt @ 1.35% Ni,

By products : ~1g/t Platinum+Paladium (55,500t Ni metal).

This number will alter after further drilling and the Feasibility study is completed.

Key Achievements in 2004 – 2005

- US$4 million was spent on drilling.
- Approximately 50 people from the local area are employed by Albidon.
- A positive scoping study was completed in March 2005.
- Decided to proceed with feasibility study.
- Another US$3 million has been spent so far in 2005.
- New targets have been identified at Munali and the district.
- Albidon not certain whether Project will proceed at the present time, as this can only be determined after the feasibility study is completed.

Munali Feasibility Study

Feasibility study to be completed in the middle of 2006. The study commenced in April 2005, with a budget of approximately US$4.5 million.

The study is considering the following:-

- Infill drilling to improve confidence in the resource.
- Detailed mine design and scheduling.
- Geotechnical and hydrological studies.
- Metallurgical test work.
- Infrastructure studies.

- Environmental and social impact studies.
- Statutory approvals and development agreements with Government.

Metallurgical test work

If the feasibility is positive, it is proposed to build a concentrator on the site and sell the concentrate. The process flow sheet will comprise of:

- Crushing and grinding.
- Flotation and extraction of the nickel bearing minerals.
- Every effort will be made to get optimum extraction of by – products such as the PGMs i.e. Platinum and Paladium group metals.
- A smelter is not economic.

Mine Development

It is planned that mining will be carried out by underground methods. There will be a small box cut for the start of the tunnel going underground. The exact mining method used underground is still to be determined as part of the Feasibility Study.

Mine Infrastructure

The mine infrastructure will consist of but not be limited to:

- Power from the main grid;
- Concentrator/treatment plant;
- Roads and tailings storage facility;
- Surface facilities e.g. office, workshop etc.;
- Box cut and portal;
- Decline ramp;
- Ventilation facilities; and
- Pump station.

Possible Development Schedule

Only if the feasibility study is positive, then the development schedule will be as follows:

- 4th Quarter 2005 – infill drilling and additional metallurgical work;

- 1st and 2nd Quarter 2006 – proceed with engineering studies and development agreement. Complete Social and Environmental studies;

- 3rd Quarter 2006 – Project financing discussions; and

- 4th Quarter 2006 – Start up of project construction.

Environmental and Social Baseline Studies

Study commenced in September 2005. The study is covering:

- Climate;
- Air quality;
- Topography;
- Geology;
- Hydrogeology;
- Hydrology;
- Terrestrial & Aquatic Flora & Fauna;
- Land Use and Land Classification Evaluation;
- Background Radiation Survey;
- Noise;
- Infrastructure & communications; and
- Socio-economics.

Environmental Impacts

The main environmental impacts include but are not limited to:

- Visual impacts as a result of structures that will be erected;

- Land use change and land clearance i.e. agriculture land;

- Effect on air quality as a result of dust e.g. from tailings facilities, vehicle movements etc.;

- Surface and ground water contamination due to accidental spillages of chemicals etc.;

- Flora and fauna impacts due to the land clearance;

- Noise and vibration as a result of the operations; and

- Public safety etc.

Social Impacts

The social impacts of the project include:-

Interaction with Chinkomba village

- Location of the village is close to the deposit as such there will be interaction of workers with the people of the village thus requiring a resettlement life; and
- Access road passes through the village so poses a threat to pedestrians.

Employee Responsibility

Albidon's social policy is based on employee's right to choose:-

- Where to live i.e. Munali, Kafue or Mazabuka. Albidon will provide transport to ferry workers from Mazabuka and Kafue;
- Which schools to send their children to;
- Level of health care for dependants; and
- Concerning all other social issues.

Economic Benefits

The economic benefits of the project include but are not limited to:-

- Diversification of the economy;
- Skills development;
- Local Business enhancement;
- Wages, royalties, PAYE, local and regional purchases;
- Skills acquisition;
- Health issues; and
- Job opportunities.

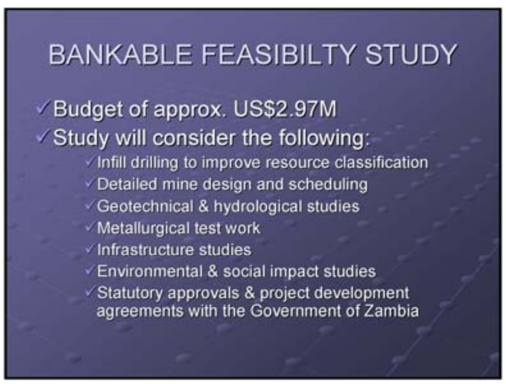
Please note that no houses will be built in Munali. Miners will live in nearby villages or towns.

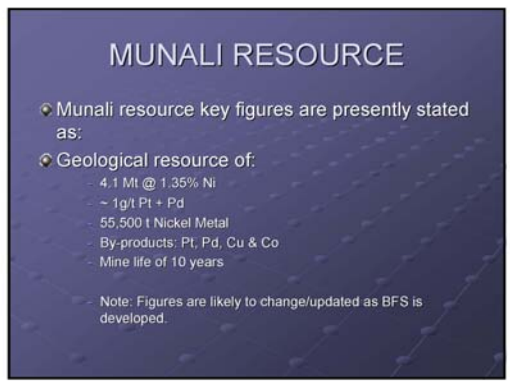
Mine Security and Public Safety

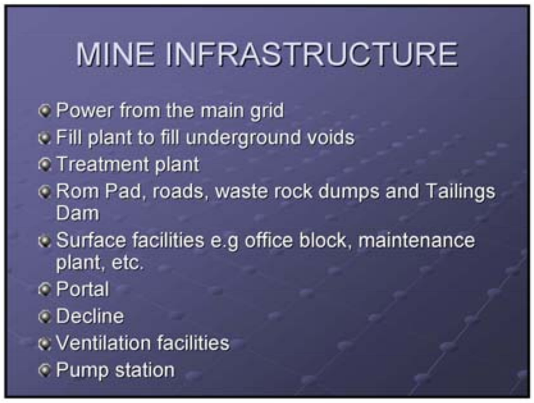
There will be a restricted zone around the mine site. No person will be allowed to enter the mine site according to Part XXI of Mining Regulations (MR) 2103. Albidon will keep the community informed regarding mining operations and social and environmental issues and seek to discuss future plans with Government and the Council.

Mr. Rogers' presentation finished at 11:45 hours after which he invited the people to a question and answer session.

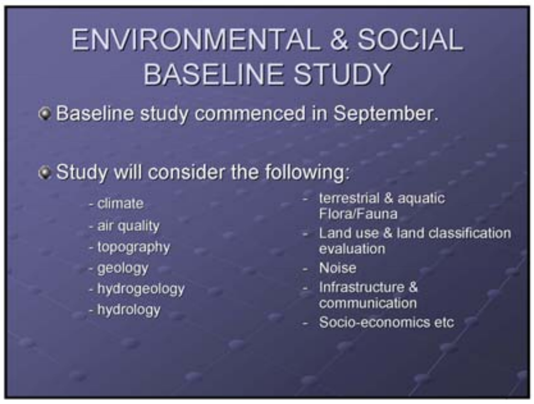
Public Consultation Meeting Slide Show, 9th of November 2005






MINE INFRASTRUCTURE
Power from the main grid
Fill plant to fill underground voids
Treatment plant
Rom Pad, roads, waste rock dumps and Tailings Dam
Surface facilities e.g office block, maintenance plant, etc.
Portal
Decline
Ventilation facilities
Pump station


PROJECT DEVELOPMENT SCHEDULE
2nd Quarter 2005 – Infill drilling & additional metallurgical work.
3rd Quarter 2005 – Review and decision to proceed with engineering studies and concentrate on marketing negotiations.
4th Quarter 2005 – Project financing discussions.
1st Quarter 2006 – Start up of project construction

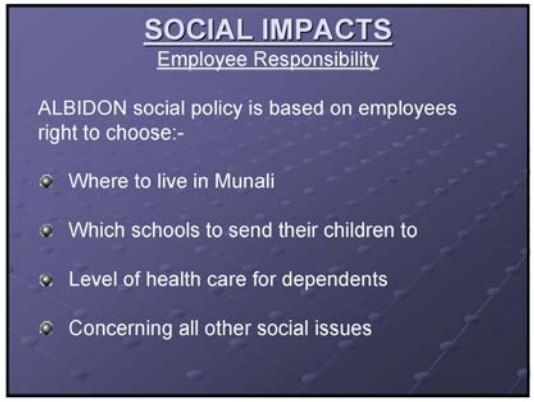

ENVIRONMENTAL & SOCIAL BASELINE STUDY
Baseline study commenced in September.
Study will consider the following:
- climate
- air quality
- topography
- geology
- hydrogeology
- hydrology
- terrestrial & aquatic Flora/Fauna
- Land use & land classification evaluation
- Noise
- Infrastructure & communication
- Socio-economics etc


ENVIRONMENTAL IMPACTS
Mine Site Impacts
Visual impacts as a result of buildings that will be constructed
Land use & Clearance
- Agriculture
Air Quality
- Dust
- Tailings


ENVIRONMENTAL IMPACTS
Mine Site Impacts
Surface Water
- Rivers & Dambos
- Current Fieldwork
- Contamination
- Treatment
Groundwater
- Pumping
- Water Table
- Contamination


ENVIRONMENTAL IMPACTS
Mine Site Impacts
Flora and Fauna
Land Clearance & Disturbance
Noise and Vibration
Blasting & Transport
Archaeology
General Releases
Safety


SOCIAL IMPACTS
Resettlement of Chinkomba Village
Location
Management
Compensation
Material Assistance
Access Road
Transport
Water Bores


SOCIAL IMPACTS
Employee Responsibility
ALBIDON social policy is based on employees right to choose:-
Where to live in Munali
Which schools to send their children to
Level of health care for dependents
Concerning all other social issues


SOCIAL IMPACTS
Economic Benefits
Diversification of Economy
Skills Development
Local Business Enhancement
Local infrastructure
Wages, Royalties, PAYE, local and regional purchases


SOCIAL IMPACTS
Skills Acquisition
Health Issues
Job Opportunities
Immigration


SOCIAL IMPACTS
Housing
Miners to live in Kafue
Construction of senior staff mine houses at Munali
Material assistance to miners to build own houses


SOCIAL IMPACTS
Immigration
Dilution of culture
Disputes between locals and immigrants
Strain on services


SOCIAL IMPACTS
Investment in Social Infrastructure
Pipe mine water to surrounding villages.
Assistance to hospital, schools and non-government institutions around Munali area
Assistance to projects that benefit the community
Maintenance of 9km road from mine to the main road and surrounding villages


SOCIAL IMPACTS
Mine Security and Public Safety
Restricted zone around the mine site
No person will be allowed to enter the mine site (Part XXI MR 2103)
Mine will keep community informed regarding mining operations and social and environmental issues


SOCIAL IMPACTS
Public Consultation
Public Information Centre to be opened in Munali
Complaints register
Consult regularly with Mazabuka Town Authorities and community representatives


THE FUTURE
ONGOING CONSULTATION
EIA/SIA REPORT SUBMISSION
PUBLIC DISLCOSURE OF ESIA
ESIA APPROVAL
PROJECT DEVELOPMENT

Pictures from the Munali EIA Public Consultation 09/11/05






QUESTION AND ANSWER SESSION

Mr. Jonathan. Mufaya *Councillor Nasenga Ward*
Question: What is the hectarage of Munali project? The area is surrounded by hills, what is going to happen to the fields? Are we going to have acid and fumes like we see at Chilanga Cement? What will happen to the water and the safety of the people because of the box-cut?

Answer: *Dale Rogers* – First part of the question on how big the area will be…unfortunately until we finish the feasibility study, we are not sure. The footprint/size is substantially smaller than you see on the Copperbelt. The second part is acid and fumes from Chilanga Cement. It is important to understand that Albidon do not intend to build a smelter. The smelter you see at Chilanga and on the Copperbelt have stacks. Our intention is to have a concentrator using water process with fewer impacts similar to Chilanga. The third part is water and water bodies. Consultants have been engaged to tell us about hydrogeology and put in test boreholes to see how water flows in relation to the mine.

Mr. Moses Sichibonje *Settlement Chairman, Mugoto*
Question: We are happy to have the mine in Mugoto but are concerned with drilling in the fields. What steps are Albidon going to take since this is the planting season? After the feasibility studies, some farmers are going to be affected. Where are you going to take the farmers? If things are positive, Albidon is going to benefit. What will happen to the displaced, are they going to be compensated?

Answer: *Dale Rogers* – For drilling in the fields, Albidon have been compensating people. Second part, concerning resettlement, we will be making every effort to ensure the impact to local farmers is kept to an absolute minimum. Discussions with the Chief with regard to alternative available areas are going on. For those people who are affected, Albidon will pay compensation based on size of land, what is there and crops grown.

Mr. Philip Mweene *Mazabuka District Council*
Question: The situation in the Third World is that local people are taken unawares. In case the project is positive, construction will start in the 4th quarter of 2006. People have established better structures and prepared fields. Was it not better to forewarn people in advance? Let us be specific, tell us so that we plan properly. Your meeting dispels rumours we hope you are telling us the truth and we will hold you by the truth. No person will be allowed to enter mine site. How much area is restricted area?

Answer: *Dale Rogers* – There is a fine line between creating high expectations and not tell the people the truth. We were concerned that if we started talking about these issues, it was going to cause a lot of disruption since the project may start in September 2006. Albidon felt it was important since there were a lot of rumours and discussions. It is important for people to know that nothing is going to happen in12 months time. Part of the problem is that the Feasibility Study has not been finished to ascertain size of facilities that will be here. What that means is that, we wanted to start talking to people, although we do not know who will be affected. What we expect is that 1st quarter of 2006, the size and infrastructure proposed is going to be sited.

Pastor Kenani Ndhlovu *Chairperson Mazabuka District AIDS Task Force*
Question: What strategies do you have for HIV/AIDS? Some of your employees may be migrant labour, what impacts and prevention support for HIV/AIDS do you have? Do you have a strategy in place?

Answer: *Dale Rogers* – That is one thing that is on the list. We will look at issues as part of the Feasibility Study. We have talks and discussion in the exploration camp concerning HIV/AIDS issues. As part of the development agreement (DA), we have to complete human resources and training plans. Before GRZ signs the DA, it has to be happy with our plan. That will include education and assistance. It will be good to sit down with you to discuss all these issues.

Mr. Preston Chonde *Mazabauka Municipal Council*
Question: Apologies from the Town Clerk who is unwell. I would like to welcome the mining company to Mazabuka, with our vision to attain City status in 2015. We want to

emphasise as a Local Authority that we should try to avoid flight of wealth from Chinkomba and Mazabuka. Follow-up question to Councillor Mufaya. Since you are going to do shaft mining, you will be pumping out water from the underground. This might affect boreholes just within the project area. I suggest you put up measures of pumping this water to Chinkomba dam for use by farmers. You mentioned that you have no intention of putting up a smelter, are you going to sell concentrate on world market or use infrastructure on the Copperbelt? In case you find that Nickel is plenty here, are you going to consider putting up a smelter? I would like to have an idea of cost of a smelter. Last point about drilling, how deep is your mine going to be so that in future we will boast that we have the deepest mine?

Answer: *Dale Rogers* – Last question first. The deepest drilling is 400m below surface which is quite shallow for underground mine. We do not think that the Munali mine will be the deepest mine in Zambia. We have drilled 400m and we hope to go further. We are drilling a little bit from south of the ore body. Mazabuka is our Local Council and hope the project will be beneficial to the district. In the near future, we shall come to the Council with Ms Woodland to discuss the project. In the DA, there is a section talking about local enterprises and business development. GRZ has to be satisfied with programs we are suggesting. The reason is to see most benefits retained where the project is. Water was part of the question the Town Clerk asked me about. My answer then and still is that we are going through hydrological studies therefore we do not know how much water will be generated. If there is surplus water, we will make sure it is used wisely. In fact we hope there is surplus water but we do not know that yet. We don't intend to build a smelter. Nickel smelters will cost \$800m-\$1billon. The size of the mine cannot sustain that. We don't know what we will find in the future, it will be guess work. Albidon will be selling concentrate. There maybe 10 nickel smelters in the world. Extraction of nickel from concentrate is completely different to the extraction of copper. There is no facility on the Copperbelt to extract nickel hence our intention is to sell concentrate. 70 to 80% of the value of that concentrate will be retained in Zambia.

Snr. Headman Noel Mweenda *Mwenda Palace*
Comment: **Tonga Proverb**: (Literal Translation) if a house is burning, the house attached to it would be next. We i.e. people of Mwenda's area should be considered in benefits of the project since we share the boundary with Chief Naluama.

Mr. Christopher Hamoonga *Mugoto Settlement Committee*
Question: Four to five fields have been destroyed by trucks and pegs have been put the in the fields. How are the owners going to plough? Be open to those farmers and tell them their position.

Answer: *Wiscort Banda* – Albidon is burying all sumps. The pegs are being put for easy identification of the position of the holes. These are only 30cm in diameter. For every area disturbed farmers are compensated.

Chilwa Chimuuka *Resident Development Committee Chairperson*
Question: Our concern is about soil fertility, comparing yields before and after drilling. People compensated do they involve experts to value what is lost?

Answer: *Dale Rogers* – Clearly people have to be compensated.

Wiscort Banda – compensation is paid according to yield per area, number of square meters affected and expected. Some prefer being given corn while others prefer money. All compensation is documented.

Jonathan Mufaya *Nansenga Ward Councilor*
Comment: Agriculture extension officers can be used to determine compensation and witness the transaction.

Fides Chilala *Chinkomba Village*
Comment: The drill is in my field. My field has so many roads. My maize only grew knee high in the previous season. The crop was crushed. I was not consulted on the extent of the destruction. I was called to get money without agreeing to the compensation.

Answer: *Wiscort Banda* – It is unfortunate that such a thing happened. The farmer should be involved. In this case, her two sons were involved in the measuring of the area. In future, we shall centralise the procedure so that the farmer will agree that they have been involved in the process.

Mr. Preston Chonde *Mazabauka Municipal Council*
Interjection: He needs to elaborate on Mineral Rights.

Answer: *Wiscort Banda* – when you buy land, you own it up to 1 m depth. Mineral rights are owned by government. Parties, the Mine Company and people, need to have mutual benefit. I was asked to explain compensation. I am not sure why I should say something about mineral rights.

Mrs. Bonaventure Mweemba Chipimo *Mazabuka District AIDS Task Force (Gender and Equity)*
Question: How many women out of 50 have you employed?

Answer: *Dale Rogers* – There is one woman. There is no discrimination. Those who are qualified will be employed.

Patrick Musweu *Mazabuka Business Association*
Appeal: Our concern is business development and contracts. We would like to appeal that when operations start, we should be considered. We may not have expertise in mining but our members have experience in supplies. As Mazabuka residents, we have little chance to get contracts in Solwezi or the Copperbelt. We are asking for your consideration.

Answer: *Dale Rogers* –Employment is first. The first step in the social study is this meeting. We have put out forms asking the local community about their education and skills. Our policy is to understand the local workforce first and radiating from the area then to Mazabuka and other towns. The second part involves business development – that is part of the DA with GRZ. We need to have the right business development plan. At the minimum, the basics of the plan are to take a census of local industry. We shall take that every 12 months so that if there is any work that is disseminated, our preference is to use locals as much as possible. But there are specialist areas that may not be available locally.

Mr. Mudenda George *Director National Museum Lusaka*

Question: When I looked at your Feasibility Study, you have not included issues of cultural heritage preservation. During the process of carrying out the Feasibility Study, what process have you put in place in case you find artefacts which are a heritage to Zambia?

Answer: *Dale Rogers* – That is one other issue that we needed to add to the list are historical sites. We should add that to the list. Mbita has been engaged to carry out environmental studies.

Mbita Chifunda – For the artefacts and cultural issue, we shall engage someone from the National Heritage Commission. Your concern will be included in the baseline study.

Ms. Maureen Dimuna *Mugoto Dunavant*

Comment: Albidon machinery should stop operating by 31 October to allow early planting of cotton especially for fields directly affected by drilling operations.

Answer: *Wiscort Banda* – We appreciate that the mainstay of the people is agriculture. We do not just drill anyhow. There is a schedule to follow. Because of that, we cannot stop drilling so early if we have to meet targets. So we depend on mutual agreement with farmers, paying as much as they would have made.

Dale Rogers

Thank you everyone, especially dignitaries and other who travelled here. This process is going to go on for several months for us to hear views and issues. Our best endeavour is to keep people informed. Thank you for coming. I now ask His Royal Highness to say something.

His Royal Highness Chief Naluama

In Tonga: Thanked the community for responding to the invitation in large numbers. He further thanked Albidon for keeping its promise to meet and consult with the local people and also for involving the locals at every stage of the development of the project. He observed that Albidon has been open to discussions and dialogue since the project started and that whatever activities Albidon is carrying out in the village has been communicated and agreed upon with him and other interested parties.

Mr. Wilson Sunduka Office of the District Commissioner, Mazabuka

Address: I am happy about the consultation meeting today. Government's responsible role is to ensure that negative and positive impacts that bear on local people and impact on agricultural productivity in Chinkomba need to be talked about. I am happy to note that Albidon have offered to pay in kind. It shows that the company values environmental services that people in Chinkomba are enjoying. To Albidon management please continue working with the local people. To Chief Naluama, GRZ is happy that you are supporting the project. Thank you.

Mr. E Zulu Environmental Council of Zambia
Comment: The department of Environmental Council of Zambia is supportive of all projects which are aimed at benefiting the people and that the meeting held on that day was a welcome move as this was one of the requirements by the department he further stated that this was going to be included in Albidon's ToR. The department will also ensure that all the issues by the community are addressed by Albidon.

The closing prayer was given by Mrs. Dimuna and the meeting closed at 13:45 hours.

List of Attendees, Public Consultation Meeting for the Munali EIA, 9th November 2005 at Albidon (Z) Camp, Munali Hills, Mazabuka

Facilitators: Mitulo Silengo/Mbita Chifunda/Margaret Mwila

Project Presentation: Dale Rogers

Interpreter: Alfred Kawale

Purpose of Meeting: The purpose of the meeting was to disclose and consult the interested and affected parties about the proposed Albidon Munali Nickel project in the area.

1) Eardius Mulunguma	Mubuyu Farm
2) Marie Lubukhof	Mubuyu Farm
3) E. H. Zulu	Environmental Council Of Zambia –Lusaka
4) E. P. Sunkutu	Environmental Council Of Zambia –Lusaka
5) Humprey K Mwale	Environmental Council Of Zambia –Lusaka
6) Mrs. Ngenda AK	Naluama School
7) Miss Rhoda Hamalala	Naluama RDC Chairperson
8) Mr. Osborne Hamainda	Kachenge Village Headman
9) Mr. T Chimuka	Mugoto RDC Chairperson
10) Mr. Moses Sichibonje	Mugoto School .Chairperson
11) Mr. Ray Mulunga	Naluama Local Court
12) Christopher Hamoomba	Chinkomba Village
13) Chief Naluama	Naluama Palace
14) N Mwenda	(Rep. for Chief Mwenda) Mwenda Palace
15) Phillip S Mwenda	Mugoto Co-Operative Society
16) R. M Chilombya	Naluama Local Court
17) Musako M L	Mugoto Co-operative Society
18) Preston Chonde	Mazabuka Municipal Council
19) Mr. Jonathan Mufaya	Box 670144 Mazabuka
20) C.Ngoma	Mazabuka Municipal Council
21) S. D. Nyoni	Mazabuka Municipal Council
22) Mangwatu Gladwin	Turnpike-Riverside Box 48 Kafue
23) Yvonne Mulala	Lusaka Museum Box 50491
24) Mudenda George	National Museum Box 50491
25) R. Mwale	Zambia Police Nega Nega
26) HT Shawa	Zambia Police Nega Nega
27) P .Nyoni	Mazabuka
28) Dick Kashimba	Mazabuka Municipal Council
29) Alfred Mwame	African Mining Consultants
30) Mutale Mwamba	PO Box 192 Plan Zambia
31) David Munyandi	PO Box 46 ZANIS Mazabuka
32) W. Phiri	ECZ Box 35131
33) Mr. Wilson Sunduka	Office Of The District Commissioner
34) Chipalo Nicatius	Naluama Agriculture Camp, Mazabuka
35) Dimuna Maureen	Mugoto Dunavant Box 670332 Mazabuka
36) Chilobya Enos	Mungoto Basic School Box 208 Kafue
37) Munombwe Webson	Mugoto Settlement Box 208 Kafue
38) Bonaventure M Chipimo	Mazabuka District HIV/AIDS Task Force
39) Verna V Mudenda	God Our Help Ministries, Mazabuka
40) Maron Masambo	Naluama Local Court
41) Beninjala Simeon Mambo	Box 290 Mazabuka

42) Namangwala	Mugoto Rural Health Centre, Mazabuka
43) Abel Tunono	AMC Kitwe
44) Kelvin Moonga	Chikomba
45) Evans	Chikomba
46) Samson Mwindilila	Chikomba
47) Abel Mweete	Chikomba
48) Edward Hamaluba	Chikomba
49) Geofrey Liposo	Chikomba
50) Gift C Mwiinga	Chikomba
51) Egnitious Hamoonga	Chikomba
52) Justin Moonga	Chikomba
53) Reagan Mwaanabo	Chikomba
54) Enias Chilipa	Chikomba
55) Rodrick Mwete	Chikomba
56) Cryford H Chilala	Chikomba
57) Obby Boda	Chikomba
58) Moonga Cornwell	Chikomba
59) Choombe Odden	Chikomba
60) Morgan M Moonga	Chikomba
61) Boston Hacholwe	Chikomba
62) Given Cholelwa	Chikomba
63) Ditter Muyuya	Nakaya
64) Wilson Hachoolwe	Nakaya
65) Solias Moonga	Chikomba
66) Godwin Mulyakubinda	Box 208 Kafue
67) Charles Chiyota	Chinkomba
68) Kennedy Mutale	District Forestry Office Box118
69) Annie Mangunje	Box 22 Nega Nega
70) A P Hachibala	Vilenge
71) Patrick Musweu	Mazabuka District Business Association
72) Ballard M Chilika	Chief Retainer (Naluama)
73) Smart C Ndililwa	Chief Retainer (Naluama)
74) Mildred Mwinga	Mazabuka District
75) E Mudonga	Chinkomba
76) Peter Hagole	Chakola
77) Irene Chiyota	Chinkomba
78) Fanny Musaka	Plan Mazabuka
79) Etimoni	Chinkomba
80) C. Mwaaka	208
81) B .Mulyakubinda	208
82) Phinias Juula	208
83) Shadreck Habunyama	208
84) Peter Hajanika	Cell 097 852904 /No 2708 Matero
85) Neliya Hamaluba	208
86) Patricia Chiyala	208
87) Maureen Mwiinga	208
88) Loveness Malambo	208
89) Matilda Cheelo	208
90) Kennah Chiputa	208
91) Phunda Haataka	208
92) Ester Chiyota	208
93) Zazi Shamyuwa	208
94) Mazy Tamujulu	208

95) Alisi Imayala	208
96) Edith Muchape	208
97) Mrs. Renjo Chilobya	208
98) Mrs. Dailes Muyakubinda	208
99) Mutinta Mizinga	Chikomba
100) Astrider Bankombo	Chikomba
101) Estar Mwiinga	Chikomba
102) Shelly Mwiinga	Chikomba
103) Shelly Maonga	Chikomba
104) Glecy Chiyoba	Chikomba
105) Rodia Muleya	Chikomba
106) Ivy Mweemba	Chikomba
107) Francis Choongo	Chikomba
108) Eless Hamaluba	Chikomba
109) Stella Chabika	Chikomba
110) Lensy Gwada	Chikomba
111) Samatha Cheembo	Chikomba
112) Naomi Mwinga	Chikomba
113) Bridget Choongo	Chikomba
114) Abbigirl Mutinta	Chikomba
115) Mary Chiyota	Chikomba
116) Manyalita Chiyota	Chikomba
117) Samalia Syalutete	Chikomba
118) Loline Moonga	Chikomba
119) Joyce Cisamu	Chikomba
120) Christine Ceelo	Chikomba
121) Juliyen Chiyota	Chikomba
122) Miliam Sikaputa	Chikomba
123) Winnie Habanyama	Chikomba
124) Neliya Kasamu	Chikomba
125) Junita Hamaluba	Chikomba
126) Juicy Choobe	Chikomba
127) Kanungo Habombo	Chikomba
128) Progy Habanyama	Chikomba
129) Covester Chiyota	Chikomba
130) Jenipha Kasimbo	Chikomba
131) Wilady Chilwalo	Chikomba
132) Best Chiluka	Chikomba
133) Blauten Mwinga	Chikomba
134) Gist Julia	Chikomba
135) Mwinga Kanungo	Chikomba

List of Invitees to Public Consultation Meeting on EIA, Munali Field Camp, Wednesday 9th November 2005

1./ Mr. G. Kangamba
Director of Mines and Minerals Development Department
Ministry of Mines and Minerals Development
P.O. Box 31969
Lusaka

2./ Director of the Geological Survey Department
Ministry of Mines and Minerals Development
P.O. Box 31969
Lusaka

3./ Mr. A. Mphende
Director of Mines Safety
Ministry of Mines and Minerals Development
Off Kanyanta Avenue
P.O. Box 21006
Kitwe

4./ Mr. E. Zulu + two
Director of the Environmental Council of Zambia
Environmental Council of Zambia
ECZ Building
Plot 6975 Ridgeway
P.O. Box 35131
Lusaka

5./ Director of Water Affairs
Water Affairs Department
Ministry of Energy and Water Development
P.O. Box 50288
Lusaka

6./ Secretary of the Water Board
Ministry of Energy and Water Development
P.O. Box 50288
Lusaka

7./ Zambia Wildlife Authority Director
Zambia Wildlife Authority
P.O. Box 1
Chilanga

8./ Commissioner of Lands
Ministry of Lands
Mulungushi House
P.O. Box 50694
Lusaka

9./ Local Chiefs Representatives
Munali Site

10./ District Forestry Officer
Department of Environment and Natural Resources
P.O. Box
Mazabuka

11./ District Social Development Officer
Social Development Department
Ministry of Community Development & Social Welfare
P.O. Box
Mazabuka

12./ His Royal Highness Chief Mwenda

13./ His Royal Highness Chief Naluama

14./ Hon. MP Mazabuka Central Constituency

15./ Hon. MP Chikankata Constituency

16./ Mazabuka AIDS Multisectional Initiative

17./ Mr. Chiinda – The District Commissioner, Mazabuka

18./ Mr. Ekan Chingangu - The Town Clerk, Mazabuka Municipal Council

19./ Mr. James Malala- Senior Projects Officer, Small Enterprise Development Board (SEDB)

20./ Mr. Patrick Musweu – Chairman - District Business Association (Mazabuka Entrepreneurs Association)

21./ Mr. R. M. Chilobya – Naluama Local Court Justice

22./ Mr. Shamayuwa Shealah Tintin, Head teacher, Naluama School

23./ Mr. Sheppard Mudaala Hamunyangwa – Headteacher Mugoto Basic School

24./ Mr. Webson Munombwe -The Block Supervisor, Ministry of Agriculture and Cooperatives, Mugoto

25./ Mrs. Bonaventure Mweemba Chipimo - The District Aids Task Force Coordinator – Mazabuka

26./ Mrs. Maurina Dimuna - Dunavant Representative, Mugoto

27./ Plan Zambia, Mugoto Rural Health Centre, Mugoto

28./ The District Development Planner, Mazabuka

29./ The Environmental Health Technologist – Mugoto Rural Health Centre

30./ **The Parish Priest, Catholic Church, Naluama**

31./ **The Pastor, Seventh Day Adventist Church, Naluama**

32./ **The Programme Manager , Plan Zambia, Mazabuka**

33./ **The Manager, Lusaka Museum.**

34./ **Alfred Kawale**

35./ **ZNBC, Lusaka.**

36./ **The Police Commanding Officer**
Mazabuka District

37./ **The Councillor**
Mazabuka District

38,/ **Mr Guy Robinson**
Kushiya Farm

39/ **Munali Coffee Farm**

40/ **The Police Commanding Officer**
Nega Nega

41/ **The Loans Committee Chairman**
Mugoto

42/ **The Zone Secretary**
Mugoto

43/ **Zambia News Agency (2)**

44/ **Zambia National Broadcasting Services**

Munali Environmental Impact Assessment (EIA)

Public Consultation Meeting

Project Name: **Munali Nickel Project**

Developer: **Albidon Zambia Limited Incorporated in the Republic of Zambia - Reg.**

Location: **Munali Exploration Camp**

Date: **20th April 2006**

Minutes of the Munali Nickel Project EIA Public Consultation Meeting held at Munali Exploration Camp on 20th April 2006 at 14:00 hrs. The purpose of the meeting is to inform the public about the progress made by Albidon in the exploration programme. The was also called to inform the people about the coming relocation of some people before the start of the construction for the new mine, in accordance with Part III Environmental Impact Statement Regulation 8 (2) of the Zambian Environmental Impact Assessment Regulations, 1997.

Pre-Community Meeting

African Mining Consultants in conjunction with the Albidon team met with Chief Naluama and his entourage before meeting with the members of community for orientation and briefing.

Wiscort/Mbita

- The chief was shown areas that will be affected immediately for relocation and was informed that the relocation was going to be done in phases with the 1st phase affecting about six families and the second phase about 20 families and that other phases would follow at a later stage.
- Concentrator will be located in the field.
- Exact areas pointed out to the Chief

Chief

- Need to find area where all the affected for 1st relocation will be settled
- Need to move every household as one unit
- Ntobolole has been rejected as being too far
- The Chief suggested that maybe some villagers would want to go back to their original villages before they came to settle at Chinkomba
- Look at Makulu as an option for relocation
- Need to look at the original registration to ensure we relocate original settlers

Opening Remarks

Wiscort started by welcoming all the people to the meeting and then he informed them that the main focus for the meeting was to inform them about relocation of farmers who will be affected by the operations of the mines. Wiscort called upon Mbita to make the presentation.

Mr. Mbita Chifunda further explained as follows:

- Exploration coming to an end in June this year
- Albidon expects to start on the second phase of the Project in August this year.
- Using a map for the area, the people were shown the areas that were going to be affected which had names and numbers on it.
- The meeting was therefore to agree on the relocation and get a feedback from the people on this exercise.
- He pointed out that it was Albidon's wish to ensure that the affected farmers were relocated near the mine for them to benefit from this development.
- Albidon to help build structures and where need be clear the fields.

After the presentation, Mbita invited the people to a question and answer session.

QUESTION AND ANSWER SESSION

Mr. Skinner Tantamujulu (Chinkomba Village)

Question: How many people are going to be affected in this relocation exercise?

Answer: Mbita (AMC)

About 26 house holds are to be affected in this relocation exercise.

Mr Skinner Tantamujulu (Chinkomba village)

Question: – Are all these farmers?

Answer: Mbita (AMC)
Yes

Mr W Musombwe – Agriculture Extension Officer:

Comment: The farmers registered in the area are 226. When farmers are relocated, they should be shifted to a place which is nearer to proper infrastructure like roads, and near towns to enable them sell their products easily and also at a fertile land. The place for relocation should have schools, health centres and they should also have access to clean water. He emphasised on the need for all the suggestion to be considered before relocation is implemented.

Answer: Mbita (AMC)

Comments appreciated and will be considered before the start of the exercise.

Mr Skinner Tantamujulu

Question: where will these people be taken to?

Answer: Mbita (AMC)

Albidon/Chief are currently looking at options available at the moment such as farms nearby which are not being fully utilized (Billy's Ottis and Makuku) and any other place where the government will provide.

Mr Skinner Tantamujulu

Question: In case people are taken to the place where with a lot of trees, will land be cleared so that people will have problems in cultivation?

Answer Mbita (AMC)

As much as possible, Albidon will try to help the people so that this exercise does not bring suffering upon them. In this regard, people will be engaged from among the affected people to clear this land and something for the work.

Irene Hakola

Question: Will the company build a basic school, provide water and health centre?

Answer: Mbita (AMC)

Will put up facilities where there is none or where there are these facilities, improve on them. Water will also be provided.

Question: Since the company will not put up facilities such as schools, health centres etc. what are the immediate plans for children attending school nearer to where they are living now?

Answer: Mbita (AMC)

That point has been noted and we are going to consult the top management of Albidon and we will come back to you later.

B Gwaba:

Who are the 26 families involved?

Answer: Mbita (AMC)

Only 6 have been identified as at now and these will be talked to after the meeting. The rest will be identified and informed as the project progresses

Question: What would happen to those people who were found in the area before resettlement?

Answer: Mbita (AMC)

Project is not segregating but will cater for all those who will be relocated.

Question: What will happen to those that have fields affected and not their homes?

Answer: Mbita (AMC)

Albidon to find them alternative land for farming only

Question: What if land is too far from where they are staying at the moment?

Answer: Mbita (AMC)

We never thought about that but we have noted the point and top management will look into it.

Ms Salia

Suggestion to above question from: Albidon should look for land and resettle them where they will be farming.

Answer: Comment noted and Albidon management to be consulted.

Christopher Haamanga

Question: Are the boundaries of the mine known?

Answer: Wiscort (Albidon)

The area owned by Albidon is very large but not all will be affected immediately. At every stage people will be involved and informed.

Comment: Company workers working through field should not help themselves with groundnuts etc.

Answer: Wiscort (Albidon)

Point taken and all employees will be warned about this trend.

Comment: By July/August cotton farmers would not have harvested their crops, so what would happen to their crops?

Answer: Mbita (AMC)

Albidon will either compensate them for the crop or help them harvest quickly by hiring labour (options to be looked at by Albidon management).

At this time, Mbita called upon the Chief to address the people.

His Royal Highness - Chief Naluama

The Chief thanked all the people for coming to the meeting. He informed them that Albidon was a good company because it was always in touch with the Chief informing him about the progress being made at the mine. He informed the people that a committee will be formed that will look at finding alternative land for those affected. They should be very patient and give Albidon chance to develop their area. The land that will be given to the people will be land that would support their agriculture activities.

Comments by Mr Chiyota

Mr. Chilobya pleaded with the people to give their chief time to find them good alternative land for them. He said he was assured by the Chief that nothing will be done that will disadvantage them.

The meeting closed at 16:30 hours. The families that will be affected in the first relocation were told to remain behind.

Munali Environmental Impact Assessment (EIA)

Public Consultation Meeting

Project Name: **Munali Nickel Project**

Developer: **Albidon Zambia Limited Incorporated in the Republic of Zambia - Reg.**

Location: **Munali Exploration Camp**

Date: **12th May 2006**

Minutes of the Munali Nickel Project EIA Public Consultation Meeting held at Munali Exploration Camp on 12th May 2006 at 11:00 hrs. The meeting was a follow-up to that held on 20th April 2006 which was only attended by the Chief, Councillors and residents of Chinkomba village. The meeting included other stake holders as shown from the attendance list. The meeting was held in order to inform the public about the progress made by Albidon in its exploration programme. It was also called to inform the people about progress made in the compilation of the environmental and social impact assessment study, in accordance with Part III Environmental Impact Statement Regulation 8 (2) of the Zambian Environmental Impact Assessment Regulations, 1997.

Pre-Community Meeting

A preamble meeting was held with Chief Naluama and his entourage in order to brief him on what was to be discussed at the meeting.

Main Consultative Meeting

The meeting started off with the singing of the National Anthem in the local language. Mr. Wiscort Banda (Senior Exploration Geologist for Albidon), then welcomed the delegates to the meeting. This was followed by the official introduction of the Chief and his entourage which in included the Mayor of Mazabuka Mr Chiinda, Mazabuka Central Member of Parliament Hon. Griffiths Nangoma and other dignitaries. Albidon's Chairman Valentine Chitalu was also introduced to the meeting. AMC representatives, Mbita Chifunda (Environmental Engineer) and Dr. Mitulo Silengo (Socio-Economic Expert) were also introduced.

PROJECTOR PRESENTATION OF THE MUNALI NICKEL PROJECT

Mr Mbita Chifunda (Environmental Consultant from AMC), started by assuring the public that their comments and concerns would be included in the EIA report that will be submitted to the Environmental Council of Zambia by the end of May. He further stated that the draft report would also be made available at Mazabuka Municipal Council, Kafue Council offices and Environmental Council of Zambia Lusaka for people to go through and make some comments. A summary in Tonga to enable many people to understand the issues that are addressed in the report would be provided. He then went through the presentation which basically touched on a number of issues as follows:

1. The Munali Nickel Project coverage area, location and the infrastructure in place. The mineral resources in the area and percentages.

2. He told the meeting that Albidon's Large Scale Mining Licence has been approved for the Munali Nickel Project and that this will enable the company develop the enterprise zone to proceed once the Feasibility studies are completed. He further explained that the issuance of the Mining Licence would allow for the development of the Enterprise Deposit, as well as any additional deposits discovered within the Munali Intrusion or in the surrounding district and that Albidon had identified new targets at Munali and the district at large.

3. The meeting was informed that the Feasibility Study which commenced in April 2005 would be completed by the end of June 2006 with the budget of approximately US$4.5m. An update of activities still on going was outlined as:

   a) Completion of an updated resource estimate for Enterprise Zone;
   b) Step-out drilling with the aim of increasing the Enterprise resource;
   c) Geotechnical and hydrological studies;
   d) Metallurgical improvements to optimise the quality of Ni-Cu-Co-PGM concentrates;
   e) Documentation of Environmental and Social impact studies; and
   f) Project financing discussions..

   He further explained that if the Feasibility study is positive, it is proposed to build a concentrator on site and sell concentrate. The process flow sheet will be comprised of:

   a) Crushing and then grinding
   b) Flotation to rejection of country rock and extract the Nickel bearing minerals and that every effort will be made to get optimum extraction of by-products such as the PGM's

   He emphasised again that the smelter was not economic for the size of the project.

4. The mining method was further explained as:

   a) Mining will be completed by underground methods.
   b) There will be a small box cut for the start of the tunnel going underground and that the exact mining method to be used underground is still being determined as part of the Feasibility Study.

5. The mine infrastructure would comprise of:

   a) Power from the main grid
   b) Concentrator/Treatment plant
   c) Roads and tailing storage area
   d) Surface facilities e.g. office, workshop etc
   e) Box cut and portal
   f) Decline
   g) Ventilation facilities
   h) Pump station

6. Environmental and social Baseline Study

The meeting was updated on the environmental and social baseline study which commenced in September 2005 which took into consideration the following:

a) Climate
b) Air quality
c) Topography
d) Geology
e) Hydrogeology
f) Water
g) Terrestrial and aquatic
h) Flora/Fauna
i) Land use and land classification evaluation
j) Noise
k) Infrastructure and communication
l) Socio-economics

7. Environmental Impacts

The mines site will experience the following impacts:

a) Visual impacts as a result of buildings that will be constructed
b) Land use and clearance (thus agriculture will be affected)
c) Air Quality
   - Dust
   - Tailings – he explained that management of tailing will be through planting of trees around the dam – this would reduce dust and apart from the trees, measures will be put in place to avoid spillage.
d) Surface water:
   Measures will be put in place to capture all water from the mine into a pond. This will be monitored as well to ensure that water is safe before realising it into the natural environment.
e) Ground Water:
   Albidon will ensure that ground water was not polluted

f) Flora/Fauna – Albidon will consult with the Forestry Department before the project construction. A meeting will beheld with the Forestry Department to take note of vegetation in the area and see how best to protect it. Albidon will endeavour to promote vegetation of the area.

g) Land Clearance and Disturbance – Usage of land to change

h) Noise/Vibration – Albidon will put in place preventative measures so that the noise will not affect the community.

i) Public Safety – Measures to be put in place to ensure that not too many people enter the mines unless those authorised to do so.

8. Social Impacts

a) Location of the new Village
   Consultation already in place and affected people will be informed in stages – the essence that Albidon would like to see that the affected people benefit from the Project.

A census has already been carried out which include such items as houses, fruit trees, farm land and that the aim of the census was not to leave people worse off than Albidon found them.

All concerns/comments from people are being taken on board e.g the people had rejected Ntobolole as a resettlement area and Albidon together with Chief Naluamba has taken into consideration this out come by looking for an alternative land.

Albidon would like to utilise the villagers to build their own houses so that they can earn a living by being paid other than hiring an outside contractor and to provide building materials. This was well received by the villagers. The company will also clear the fields where need be.

Other facilities such as health, schools will be looked into by improving existing facilities and putting up new facilities where none exists.

c) Employee Responsibility
The meeting was told that Albidon's Social Policy is based on employees' right to choose:

- Where to live
- Which school to send their children to

It was also emphasised that the level of health care for dependents will be looked into and other social issues will also be tackled as they arise.

d) Economic Benefits
The meeting was reminded that the people in the Chinkomba village and surrounding areas will benefit greatly as follows:

- Diversification of economy from that of farming only to mining as well.
- Skills development people will benefit from skills acquired for working at the project
- Local Business Enhancement – the company will utilise as much as possible the local business men in the area for its requirements.
- Local infrastructure will improve in the area
- The wages, royalties, PAYE, paid to individuals and councils will improve the financial status of both the council and individuals
- The project needless to say will provide job opportunities

e) Housing
The company does not intend to build a town at Munali but workers will be supported to own their own houses and some will live in local areas or nearby towns.

f) Mine Security and Public Safety
The mining area will be a restricted zone and no person will be allowed to enter the mine site (Part XXI MR 2103)

In a nutshell Albidon will keep the community informed regarding mining operations and social and environmental issues and seek to discuss future plans with Government and relevant authorities.

Mr Chifunda concluded his presentation by outlining the possible Project Development Schedule as:

1	End of June	-	Completion of Feasibility Study
2	End of May	-	Submission of the final EIA report to ECZ
3	3rd Quarter 2006	-	Start up of the project construction
4	3rd Quarter 2006	-	Continuation of Project financing discussions
5	2nd Quarter 2007	-	First production of nickel ore

Comments were then invited as follows:

1. V Chitalu – Chairman, Albidon Zambia
   Mr Chitalu thanked the Chief, dignitaries, and others for having time to be at the meeting. He further went to say that Albidon was fully aware that the success in any area needed people's support and for this, Albidon was willing to listen to the concerns and views of the people.

   He further stated that although the project has both negative and positive impacts the benefits will far out weight the negative impacts. The shareholders are grateful for the people's friendliness and hard working nature. He thanked the chief and everyone present and hoped that they will continue to accept Albidon in future as has been shown through the local leadership. He further stated that Albidon would continue consultations with all stake holders and that it is the company's belief that to uplift the company, it must carry with it the community.

2. His Worship the Mayor commented as follows:
   He expressed happiness to be part of the team and that he was satisfied with the presentation. The Council has some interest in the Albidon Project in the following areas:

   a) Social and economic welfare of the people in ensuring that they are protected and are better off than before the Project.
   b) To ensure that the company succeeds because the company's success would leave behind Mazabuka great benefits as the company will be the first mining company in Mazabuka.

      He further informed the meeting that Albidon has ensured that all local leaders were involved at every stage of the project and that all promises to the Council have been met. He appealed to the local people to cooperate with the company in order to enjoy the benefits it would bring to the area.

3. Hon G Nangoma MP Mazabuka Central commented as follows:
   a) That the mine, being the first in the district, could have generated a lot of fears but fortunately, Albidon involved all cooperating partners from the time the Project started and two years ago the community was addressed by the Deputy Minister of Mines and Minerals Development about the importance of the project.

c) He emphasised that the Government was fully behind the project

d) He commended the local people for having supported the project and that hopefully today's presentation had answered a lot of question they may have had.

e) The Member of Parliament still questioned why Albidon was not ready to put up a smelter if the company has projected so much ore in the area.

f) He further urged Albidon to consider offering shares to locals

g) He hoped that Albidon will fulfil all the promises given to the people and the progress of the Project was being closely monitored.

4. Acting District Commissioner

The Acting District Commissioner spoke on behalf of the Commissioner currently on leave and commented as follows:

a) The office of the District Commissioner was impressed with the consultation process and observed that the input of the locals was being considered by the company. He further mentioned that the Government appreciated the leadership of Chief Naluama as this can be seen by the way he was in forefront at every meeting assuring his people.

b) He further mentioned that Government's policy was to woo investors into the country and that it attaches great importance to mining due to past experience in terms of economic grown. Government is therefore encouraging new mines that are coming up. It was also Government's policy to support local community and that the Commissioner's doors are open to both the Community and Albidon for further consultations.

Question and Answer Session

Dr Mitulo Silengo coordinated the question and answer session. In his opening remarks he pointed out that concerns could also be put in writing and left at Munali site or at the Council offices in Mazabuka where the company would arrange to collect these from.

1. Mr Mukofu Chipilaluka (Mines Safety Department – Kitwe)

Question: His question was preceded with a comment - He was happy with the professionalism of the presentation.

a) What is the Project Life time?
b) Apart from Nickel what are minerals is Albidon looking for?
c) How is the company going to go about **Tailing** Management?

Response: a) Project life line is about 10 years (Valentine)
a) Look at other minerals such as copper, cobalt, and Platinum
group of minerals to mention but a few. (Valentine)

c) Tailing – there will just be one tailings dam (Mbita)

2. Mr Philip Mweene
Questions: a) what is the extent of Albidon licence boundaries?
b) How many dams will there be for tailings?
c) Where are the people going to be resettled?

Response: a) About 800 plus square metres but not every inch will be mined.
(Valentine)
b) One tailing dam (Mbita)
c) Albidon still looking at alternatives but will definitely relocate
people after land is found with essential facilities. (Valentine)

3. Mr Clamwell Mweenda (Representing Chief Mweenda)
Comment: a) He commented that Albidon should reach a signed agreement
with the Chief before relocating the people. Relocation should not be done without an agreement as people in other areas have experienced problems in the past due to lack of written down agreements. He made reference to the Gwembe issue.

He raised another concern on Management change and what would happen then with the promises from the current management.

Response: The concern is much appreciated and suggestion will be taken on board (Valentine)

Management Change will not affect these agreements and obligations of the company will remain in force. Copies of these agreements will be distributed to all parties. These will assist in resolving any issues if need be. (Valentine)

4. Ms Fanny Musaka (Community Development Coordinator Plan)

Question: Plan was looking at about 95 children whom it has sponsored from the Village. How many of these children will be affected and how far are they going to go? Hopefully not too far as Plan would like to continue the relationship it has with these children.

Response: Albidon together with Chief Naluama are tirelessly looking at resettling the people near the project so that they could benefit from the project. The company will however work with Plan to see how best to resolve this issue. (Mitulo).

5. Mr. Delux Lungulo (Disciples International)
Question: How sure can people be that the promises being given to them would be fulfilled? There is need to involve locals to monitor that what is being promised come to pass.

He also wanted to find out the estimated number of workforce from the locals.

Response: 200 – 300 direct employees with about 1,000 – 2,000 indirect employees (Valentine)

6. Mr Roger Mwale (Chief Inspector of Police Nega Nega)
Comment: He observed that all areas had been touched apart from Security.

Response: Albidon has not had the need to worry about security on site as the employees have been honest and heathical but in future the company will look at ways and means to working the Zambia Police. (Valentine)

7. Collins Simwanza (Clinical Officer – Mugoto Clinic)
Question: Any HIV/AIDS Policies in place?

Response: HIV/AIDS – the company recognises that if we do not have a healthy workforce production would be affected. It will therefore have a very robust HIV/AIDS Policies in place to protect the employees and their immediate families and to some extent the community at large. (Valentine)

8. Mr Francis Kasongola (Riverside Institute)
Question: Will employees have freedom of worship?

Response: Freedom of worship is enshrined in the Laws of Zambia and the company will not contradict these Laws. Further the company will respect the cultures/customs of the people. (Valentine)

9. Mr Peter Chola (Department of Water Affairs)
Question: Why not build a town in Munali Area? Apart from the aforegoing question Mr Chola was happy about the other aspects of the project. He also observed that in the absence of a township people will be forced to erect squatters in the mining area as according to him people are like fish they flow with water. He also urged the company to resettle people in an orderly manner.

Response: Albidon will find ways of ensuring that employees have a choice as to
where they would want to live. Critical staff to have houses on site.
This will assist employees in two ways:

a) Own their own houses as Albidon would not like to see what happened on the Copperbelt repeat itself – employees were not empowered with owning own houses. (Valentine)

b) Transport will be provided for those not on site. (Valentine)

10. Mr Patrick Musweu (Chair Local Business Association – Mazabuka)

Question: How will the company transport products from the mining area to say Nega Nega? Will the company build rail lines etc and if so what will happen to people that will be affected by the developments of building roads or rail lines?

Response: Albidon is looking at both rail and road for product transportation and will use facilities available for the purpose. The product will be taken say to Nega Nega by road and load product on rail from there and this method will have less impact to people living along the road. Again the company will respect all work measures as per Zambian Laws. The company will be working closely with the Ministry of Mines and other Government Departments on issues such as improvement of road networks etc. (Valentine)

Closing remarks from the District Commissioner's office was just to remind the population that the Electrol Commission of Zambia had given 14days to registered voters to inspect the register and verify that the names and other information is correctly entered in the register.

In closing Dr Mitulo emphasised that the company recognised the importance of community engagement and that NGOs are being identified to help resolve some of the issues that may arise e.g HIV/AIDS and the District Aids office would be a very important partner in this area.

His Royal Highness Chief Naluama was called upon to give his final closing remarks before a prayer and singing of the National Anthem

His Royal Highness Chief Naluama:

His Royal Highness Chief Naluama thanked the people for coming to the meeting. He assured the people that Albidon was a serious and committed company as they have done all that they said they would do from the start. He assured the people that he will ensure that the people are not disadvantaged as a result of the project. He further called on the people to cooperate with Albidon to ensure that the project starts.

Meeting ended at 15:45hrs

APPENDIX: Attendance List for Public Meeting for Environmental and Social Impacts Studies held on 12 May at Albidon (Z) Camp, Munali Hills, Mazabuka

Facilitators: Margaret Mwila

Project Presentation: Mbita Chifunda/Mitulo Silengo

Interpreter: Alfred Kawale

Purpose of Meeting: The purpose of the meeting was to update and consult interested and affected parties about the Nickel Project at Munali

No.	Name	Address
1.	His Royal Highness Chief Naluama	Chinkomba Village
2.	Councillor Alfred Kawale	Nega Nega
3.	Mr Cronwell Mweemba	Chief Mweenda's Rep
4.	His Worship the Mayor G Ngoma	Mazabuka Municipal Council
5.	Acting District Commissioner Mr.	Mazabuka Municipal Council
6.	Hon. G K Nangiomba	MP Mazabuka Central
7.	Town Clark Mr E I Chingangu	Mazabuka Municipal Council
8.	Councillor Anne Mangunje	Nega Nega
9.	Patrick Musweu	Mazabuka District Bus. Association
10.	James Malala	SEDB Mazabuka
11.	M Mulela	Business Association
12.	Partson Siamuzyulu	Business Association
13.	Christine Vicky Mataka	Business Association
14.	Rose N Muzumbwe	Business Association
15.	P Chola	Water Affairs Dept. Lusaka
16.	Patrick Hachilela	
17.	Clement Matente	Clements Longrange Nega Nega
18.	Lissie Bankomba	Clements Longrange Nega Nega
19.	Jeni Chilima	Clements Longrange Nega Nega
20.	Henry Chibulu	Box 46, Mazabuka
21.	Annie H Mangunje	Box 22 Mazabuka
22.	Leonard H Munkombwa	Box 22 Mazabuka
23.	Beatrice Haloba	Box 22 Mazabuka
24.	Mr Wilson M Siadunka	District Administration
25.	R Mwale	BIO Mazabuka
26.	R M Chilobya	P Justice Naluamal Court
27.	Pastor K M Ndhlovu	District Aids Coordination Advisor
28.	S Mwaba	Mines Safety Department – Kitwe
29.	C Mukofu	Mines Safety Department- Kitwe
30.	J Lublinkhof	Mubuyu Farms Ltd
31.	W Lublinkhof	Muyubu Farms Ltd
32.	C Limwanya	Zambia Police
33.	L S Ndombo	O.C Mazabuka Police
34.	R Mwale	Nega Nega Police
35.	H T Shawa	Nega Nega Police
36.	Stainner Tambamutuba	Mugoto Settlement
37.	Helema	Mugoto Settlement
38.	Jeni Chilimba	
39.	Goodwin Ngomolu	Chikola

40.	Maureen Dimuna	Chikola Dunavant
41.	Bruno Chikonta	Chief Mweenda
42.	Alfred Chisengere	Mugoto
43.	Streid Bankombo	Mugoto
44.	Reagan Mwanaabo	Chinkomba
45.	Chipo Simucheka	Chinkomba
46.	E Libana	Mazabuka
47.	J Mwiinga	Mugoto
48.	Elina Mikulz Chanda	PO Box 22 Mazabuka
49.	B Mweemba-Chipimo	PO Box 67022 Mazabuka
50.	Edess Milambo	Chinkomba
51.	Eli Chilunka	Chinkomba
52.	Mareat Haakoola	Mawaya Mugoto
53.	Goodfellow Hamainda	Mugoto
54.	Gertrude Kamanga	Chikabo
55.	Alustina Kamaya	Chikabo
56.	Venna N Chilobya	Chinkomba
57.	Radia Chiyota	Chinkomba
58.	Lister Chiluka	Chinkomba
59.	Julet Mweete	Chinkomba
60.	Nelia Kasamu	Chinkomba
61.	Christin Cheelo	Chinkomba
62.	Philder Hacitaka	Chinkomba
63.	Mary Mweemba	Chinkomba
64.	M Chikombo	Nacifa
65.	G Chikombo	Chinkomba
66.	Sheli Mwiinga	Chinkomba
67.	M Moonga	Chinkomba
68.	Matildah Cheelo	Chinkomba
69.	Enaka Mundonga	Chinkomba
70.	L Kasamu	Chinkomba
71.	Lita Mweemba	Chinkomba
72.	Ana Hamayuwa	Chinkomba
73.	Kazua Cheelo	Chinkomba
74.	Shelly Sichanje	Chinkomba
75.	Mrs R Chilobya	Chinkomba
76.	Morine Mwiinga	Chinkomba
77.	Mildren Mwiinga	Chinkomba
78.	Sanalia Choole	Chinkomba
79.	Lister Chikolo	Chinkomba
80.	Mariam Sikaputa	Chinkomba
81	Keleriya Mulimba	Chinkomba
82.	Alvera Mangwatu	Nansenga Clinic
83.	Nancy Chiyota	Chinkomba
84.	Happiness Hayota	Chinkomba
85.	Grori Chiyota	Chinkomba
86.	Margret Hakoola	Chinkomba
87.	Ireen Hakoola	Chinkomba
88.	Agness Mudonga	Chinkomba
89.	Ireen Mweemba	Chinkomba
90.	Grace Kamwata	Chinkomba

91.	Lodiya Muleya	Chinkomba
92.	Nedy Chimvwede	Chinkomba
93.	Stellah Chaabika	Chinkomba
94.	Enius Chaipa	Chinkomba
95.	Alfred Samende	Chinkomba
96.	Gracious Josiya	PO Box 395
97.	Alex	Chinkomba
98.	W Namalongo	Chinkomba
99.	Linat Moonga	Chinkomba
100.	Alise Silumesi	Chinkomba
101.	Allience Mwiinga	Chinkomba
102.	Lillian Mwiinga	Chinkomba
103.	Susan Sitali	Chinkomba
104.	Loveness	Chinkomba
105.	Mrs Siakavula	Chinkomba
106.	Ireen Chiyota	Chiyota
107.	Samaliya Cheembo	Chinkomba
108.	Abbygirl Mutinta	Chinkomba
109.	Jairy Weluma	Chinkomba
110.	Goodfellow Hamainda Kalama	Chinkomba
111.	Ealry Chiluka	Chinkomba
112.	Doreen Butola	Chinkomba
113.	Florence Kayimbwa	Mugoto
114.	Lifin Milambo	Mugoto
115.	Velonica Chilundika	Chinkomba
116.	Francis Kasongola	PO Box 53 Kafue
117.	Kenneth Choopa	PO Box 53 Kafue
118.	Robson Kamboni	PO Box 29 Kafue
119.	Abite Mweene	PO Box 144
120.	Richard Mwiinga	
121.	Shepand Chikombo	
122.	Chaamwa Munyati	Mugoto
123.	Enos Chlobya	Mugoto
124.	Christopher Hamoonga	Mugoto
125.	Shareck Habanyama	Mugoto
126.	Gift Mweemba	Mugoto
127.	Semy Choomya	Mugoto
128.	Mwanapabu Frisby	Mugoto
129.	Sebastian Banda	Mugoto
130.	Moses	Chinkomba
131.	John	Chinkomba
132.	William Hachifwa	Chinkomba
133.	Clara Mwiinga	Chinkomba
134.	Dennis Sikazwe	Mugoto
135.	Friday Hachibula	Mugoto
136.	Abel Muweete	Chinkomba
137.	W Hamunda	Kachenje
138.	Simeon Chiinda	Kukuka
139.	Peteta Chluka	Chinkomba
140.	Lato K Mweemba	Chinkomba
141.	Sailas Mwangangala	Chinkomba

142.	Sim Hamunyangwa	Chinkomba
143.	S T Shamayuwa	Chinkomba
144.	Danny Nzala	Chinkomba
145.	Fanny Hachifa	Chinkomba
146.	Noel F Kawanu	PO Box 370013 Mazabuka
147.	Pastor Henry Kashweka	PO Box 370013 Mazabuka
148.	Delux Lufugulo	PO Box 370013 Mazabuka
149.	Collins Simwanza	PO Box 60 Mazabuka
150.	Susan Buttler	Kafue
151.	Collasol Chibota Nakayeye	
152.	Fanny Munsaka	Plan Zambia
153.	Emelia Feribo	
154.	Mathias Hachifwa	
155.	James Jobola	Naluama School
156.	William Kayuni	
157.	Jefelley Liposo	
158.	Sylvester Mweetwa	
159.	Stephen Mwiinga	
160.	Kennedy Muyema	Nega Nega
161.	Watson Choonya	Nega Nega
162.	Coster Choonga	Nega Nega
163	Roy Mwiinga	Naluama L.A
164.	Sylvester Hamanda	Mugoto School
165.	Collard Mwka	Mugoto School
166.	Bislom Bankombo	Chinkomba
167.	Francis Choongo	Chinkomba
168.	Justine Hamainda	Mugoto School
169.		Mulwao
170.	Briswel Mulyakubiba	Mugoto
171.	Erick Muvwela	Mugoto
172.	Luackson Hanyinde	Chakola
173.	Abert Malilwe	Mugoto
174.	Livay Mweemba	Nikayeye
175.	Mule Hanjenie	Gwembe
176.	Pendence Shamaluwa	Chakola
177.	Obert Chilobya	Chinkomba
178.	Ephet Mwiinga	Kasaka
179.	Clement Kalunda	Kasaka
180.	Eliot Namulonga	Kasaka
181.	Thomas Chikasa	
182.	Haster Chibilika	Chinkomba
183.	Peter Hangandu	Muzovu
184.	Gnocent Muhoba	
185.	Phinias Juula	Chinkomba
186.	Fransis Chikoko	Chinkomba
187.	Samson Mnidkola	Chinkomba
188.	Bruno chikanta	Chief Mwenda
189.	Alfred Chisengele	Mugoto
190.	Cathrine Bankombo	
191.	Given Malambo	Mugoto
192.	Mary Chivwende	Mugoto

193.	Mable Mulu	Chinkomba
194.	Fanny	Mugoto
195.	S Bankombo	Mugoto
196.	Bhagoo (Snr)	Bhagoo Group of Companies
197.	Seedat Samad	Bhagoo Group of Companies
198.	Hacklen Mugwagwa	Nzingu
199.	Phinias Malambo	Nzingu
200.	Gerard Manulu	Mugoto
201.	George Hamoonga	Chinkomba
202.	Namenela Prosper	
203.	Rhwe Kaniini	Hapwaya School
204.	Rodcees Chiiloko	Chinkomba
205.	Efraimo Hamoonga	Chinkomba
206.	Charles Mutoba	Hachibala
207.	Kingstone Moyo	Mugoto
208.	P S Mweene	Mugoto
209.	K Malombo	Mukuku
210	Tilo Chimuka	Kapinga
211.	Paul Siachibala	Kakunka
212.	Luka	Mafwele
213.	Simon Mulaka	
214.	Philip Mufayai	Simuyobo
215.	Emmauel Chitanga	Luleeko
216.	Webson Munobwe	Naluame Settlement
217.	Chipalo F	Naluama Camp
218.	Owen Musune	Naluam
219.	Friday Moonga	Mugoto Sec

APPENDIX III

TERMS OF REFERENCE FOR THE MUNALI EIA &

ENVIRONMENTAL COUNCIL OF ZAMBIA APPROVAL LETTER

MUNALI

Munali Nickel Project

Environmental Impact Assessment

Draft Terms of Reference

1. Introduction

In accordance with the requirements of the Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations, 1997, Part III Regulation 8 (3) MUNALI is required to submit Draft Terms of Reference (TOR) for its Munali Nickel Project to the Environmental Council of Zambia (ECZ) for approval.

2. Scope of Work

The main objective of the ToR is to ensure that the Munali Environmental Impact Assessment (EIA) addresses all Project environmental and social impacts.

Environmental Consultants

African Mining Consultants (AMC) of Kitwe Zambia have been appointed by MUNALI as environmental consultants for the Project Bankable Feasibility Study. AMC will undertake the EIA.

MUNALI will direct AMC to provide information on all matters specified in EIA Regulations, Part III, Regulation 11 and other matters as are considered necessary by the Council.

Public Consultation Meeting

A Project Public Consultation Meeting will be undertaken to ensure public views are taken into account in preparation of the EIA. The meeting will be advertised in the National Press and invitations identified stakeholders.

The results of the Public Consultation Meeting will be taken into account in preparing the EIA.

EIA Document Structure

The proposed structure of the Munali EIA document conforms to the requirements of both the Zambian Environmental Regulations and international practices.

<u>Proposed Munali EIA Structure</u>

1. Executive Summary
2. Introduction
3. Legislation
4. Public Consultation
5. Project Description
6. Baseline Environmental & Social Study

7. Project Environmental and Social Impacts
8. Mitigating Measures
9. Environmental & Social Management Plan
10. Environmental Protection Costs

Baseline Environmental and Social Study

A 12 month detailed and comprehensive baseline environmental study of the project area will be undertaken to cover:-

- Climate;
- Air quality;
- Topography;
- Geology & Hydrogeology;
- Hydrology;
- Aquatic flora and fauna;
- Terrestrial flora and fauna;
- Land use and land classification evaluation;
- Background radiation survey;
- Noise;
- Archaeological & Cultural sites;
- Infrastructure and communications; and
- Social/cultural/economics

Environmental Impacts

The Munali Nickel Project may have significant environmental and social/ cultural/economic impacts. The principal impacts to be addressed in the EIA are:-

Environmental Impacts

- Hydro-geology.
  - seepage from waste rock dumps and tailings dams impairing groundwater quality
  - lowering of groundwater levels

- Hydrology.
  - river and stream diversion scheme around open pits
  - effects on surface water flow regime and quantity
  - surface runoff rates to surface waters
  - siltation of rivers and streams
  - effects on surface water quality of mine dumps and plant area runoff, tailings dam drainage and discharge of mine water

- Landscape.
  - visual impact of open pits, waste rock dumps, tailings dams, river diversion dams, diversion canal and plant area
  - use of water dams as amenities

- Terrestrial and aquatic flora and fauna.
  - loss of natural habitat
  - loss of timber resources

- restricted movement of fauna
- effects on flora and fauna bio-diversity
- creation of new aquatic environments
- natural regeneration of woodland
- fish breeding and fish stocks

- Land use.
  - effects on land use and land potential in immediate project area and surrounds

- Infrastructure & Communications.
  - effect of increased road traffic
  - electrification of the Munali area

- Air Quality.
  - effects of dust generation from mining & blasting, ore and waste tramming, primary crushing, waste dumps and tailings blow on ambient air quality

Social/Cultural/Economic Impacts

- Effect on employment opportunities in the project area.
- Construction of a mine village and associated infrastructure.
- Influx of new people attracted by enhanced employment opportunities.
- Friction between local people and immigrants and refugees vying for jobs.
- Resettlement of people living in the immediate project area.
- Effects of injection of money into local economy through salaries.
- Improved business opportunities especially for service industries to the mine.
- Opening up of mine roads providing easier access to forest reserve areas.
- Improved social/community services such as rural clinics, schools and recreation facilities

3. Schedule

The Project Bankable Feasibility Study (BFS) commenced in August 2005 and is planned to finish in April 2006. The EIA is a key element of the BFS, which will be used to solicit funds for project development.

In order to complete the EIA by June 2006 it will be necessary to begin the baseline environmental study in October 2005. The baseline will be complete in March 2006. AMC plan to complete the EIA in June 2006.

ECZ/INS/101/04/1

September 30, 2005
The Project Manager
Albidon Zambia Limited
P. O. Box 350799
LUSAKA

Dear Sir,

TERMS OF REFERENCE FOR THE EIA STUDY ON THE PROPOSED MUNALI NICKEL PROJECT

Reference is made to the submitted Terms of Reference for the EIA of the proposed Munali Nickel Project.

The Environmental Council of Zambia (ECZ) has reviewed your Terms of Reference (ToRs) in line with the Environmental Impact Assessment (EIA) Regulations of 1997 (Regulation 8(3) and 9(4)). Our review shows that you have complied with the above Regulations on the procedure for preparing ToRs and conducting an Environmental Impact Study.

The ECZ has therefore approved your ToRs and advise that you can proceed to undertake the EIA study with the following additions:

- Include/Outsource the services of a Water Expert or Hydrologist to the study team.
- The component on monitoring and auditing of environmental impacts should be included as 4.0
- Include/outsource the services of an archaeologist to the study team.
- Ensure public participation of all affected and interested stakeholders by holding scoping meeting and attach the minutes to the study report as evidence of consultation.
- Elaborate on project description details (Process, preparation phase, construction phase and operation phase in the main document and outline the relevant legislations
- Project alternatives should be highlighted indicating at least two including the *No Project/Zero Option*
- Housing for the workers (if any) should be included in the document

After inclusion of the stated items the Council has **no objection** in you proceeding with the study.

The Council looks forward to continue working with you.

Yours faithfully,

Patson Zulu
Manager - Inspectorate
For/Director
ENVIRONMENTAL COUNCIL OF ZAMBIA

APPENDIX IV

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA)

RAPID BIOASSESSMENT PROTOCOLS

LOCATION: Chinkomba Dam

FORM COMPLETED BY: Mbita Chifunda and Collins Chipote

DATE: 13th January 2006

TIME: 11:40 hrs

UTM	**REASON FOR SURVEY:** Munali Nickel Project - EIA

SITE PHOTOGRAPH:

WEATHER CONDITIONS	**Now:**	**Past 24 hours:**
	☐ Rain (steady rain)	☐ Rain (steady rain)
	☒ Showers (intermittent)	☒ Showers (intermittent)
	☐ Clear / Sunny	☐ Clear / Sunny
	Cloud cover: 80 %	Cloud cover: 75 %

Has there been heavy rain the last 7 days?: ☒ YES ☐ NO

Air temperature: 25 °C **Other**:

WATERSHED FEATURES	**Predominant surrounding land-use:** ☐Forest ☐ Commercial ☐ Field / Pasture ☐ Industrial ☐ Agricultural ☐ Other ☒ Residential	**Local watershed NPS pollution:** ☒ No evidence ☐Potential sources ☐ Obvious sources **Local watershed erosion:** ☒None ☐ Moderate ☐ Heavy
RIPARIAN VEGETATION (18 meter buffer)	**Dominant vegetation type.** ☐ Trees ☒ Shrubs ☐ Grasses ☐ Hebaceous **Dominant species present** *Bridelia-Homalium-Syzygium cordatum*	
INSTREAM FEATURES	**Estimated reach length**: 50 m **Estimated stream width**: 25 m **Estimated stream depth**: 0.68 m **Channelled**: ☐ YES ☒ NO	**Canopy cover:** ☐ Partly open ☐ Partly shaded ☐ Shaded ☒ Other **Proportion of reach represented by stream morphology types:** Riffle: 20 % Run: 10 % Pool: 70 % **Dam present**: ☒YES ☐ NO
LARGE WOODY DEBRIS - LWD	**LWD**: None **Density of LWD**: N/A	
AQUATIC VEGETATION	**Dominant type:** ☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating ☐ Floating algae ☐ Attached algae ☒ None **Dominant species:** not identified	
WATER QUALITY	**Temperature:** 20.5 °C **Specific conductance:** 0.01mS/cm **Dissolved oxygen:** 8.5 mg/l **pH**: 6.2 **Turbidity**: 0 NTU **WQ Instrument:** Horiba U 10 WQC **Water Odours:** ☒ Normal/None ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Fishy ☐ Other **Water surface oils:** ☒ None ☐ Slick ☐ Sheen ☐ Globs ☐ Flecks ☐ Other **Turbidity** (if not measured): ☐ Clear ☐ Slightly turbid ☐ Turbid ☐ Opaque ☒ Stained ☐ Other	

<table>
<tr><td colspan="2">SEDIMENT / SUBSTRATE</td><td colspan="4">Odours:
☐ Slight ☐ Moderate ☐ Profuse ☐ Chemical ☒ None ☐ Other

Deposits:
☐ Sewage ☐ Petroleum ☐ Sludge ☐ Sawdust ☐ Paper fiber ☒ Sand
☐ Relict shells ☐ Organic ☐ Other
Substrate composition: Inorganic: 100 % Organic 0%</td></tr>
<tr><td colspan="3">Inorganic substrate composition:
(should add up to 100 %)</td><td colspan="3">Organic substrate composition:
(does not necessarily add up to 100)</td></tr>
<tr><td>Substrate type</td><td>Diameter (mm)</td><td>Composition in sampling reach</td><td>Substrate type</td><td>Description</td><td>Composition in sampling reach</td></tr>
<tr><td>Bedrock
Boulder
Cobble
Gravel
Sand
Silt
Clay</td><td>
> 256
64-256
2-64
0.06-2
0.004-0.06
< 0.004</td><td>

5%
15%
60 %
15 %
5 %</td><td>Detritus

Muck-Mud

Marl</td><td>Sticks, wood, coarse plant material.

Black very fine organic material.

Grey, shell fragments.</td><td>0 %

0 %

0%</td></tr>
</table>

HABITAT ASSESSMENT FIELD DATA SHEET

Habitat Parameter	Condition Category			
	Optimal	**Sub-optimal**	**Marginal**	**Poor**
1. Epifaunal substrate / available cover	Greater than 50% of substrate favorable for epifaunal colonisation and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonisation potential (i.e., logs / snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonisation potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonisation.	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 **14** 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool substrate characterisation	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation
SCORE	20 **19** 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small - shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 **17** 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel flow status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 **17** 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6. Bank stability (Score for each bank. Determine left or right side by facing downstream).	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE, Left bank	10 9	8 **7** 6	5 4 3	2 1 0
SCORE, Right bank	**10** 9	8 7 6	5 4 3	2 1 0
7. Vegetative protection. (Score for each bank)	More than 90% of the stream bank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption	70-90% of the stream bank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than	50-70% of the stream bank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant	Less than 50% of the stream bank surfaces covered by vegetation; disruption of stream bank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.

	through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	one-half of the potential plant stubble height remaining.	stubble height remaining.	
SCORE, Left bank	10 9	8 7 6	5 4 3	2 **1** 0
SCORE, Right bank	10 9	8 7 6	5 4 3	2 **1** 0
8. Riparian vegetative zone width. (Score for each bank).	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12- 18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6 - 12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE, Left bank	10 9	8 7 6	**5** 4 3	2 1 0
SCORE, Right bank	10 9	8 7 6	**5** 4 3	2 1 0

AVERAGE SCORE	**11.6**	
TOTAL SCORE	**116**	**SUB - OPTIMAL HABITAT**

APPENDIX V

CHINKOMBA VILLAGE CENSUS

Chinkomba Village Census 14th – 17th April 2006 (Albidon)

	Households	Age	Sex	Structures	Fruit trees
1	**George Hamoonga**	48	M	642 x 584 x 290 CIS	
	Kissless Shangandu (Wife)	45	F	372 x 257 x 260 CIS	
	King Hamoonga	21	M	273 x 345 x 240 CIS	
	John Hamoonga	19	M	565 x 256 x 230 CIS	
	Millone Hamoonga	17	F	241 dia x 310 h Kitchen GT	
	Kiston Hamoonga	15	M	243 dia x 280 h GT	
	Aturna Hamoonga	13	F	350 dia x 200 h Goat Pen	
	Josiphat Hamoonga	11	M	170 dia x 180 h	
	Lusyomo Hamoonga	9	F		
	Lute Hamoonga	7	F		
	Enock Hamoonga	6	M		
2	**Ringson Chiluka**	32	M	320 x 465 x 400 GT	
	Mutinta Chiluka	29	F		
	Elly Chiluka	7	F		
	Shelly Chiluka	3	F		
	Jeriyen Chiluka	9	F		
	Media Chiluka	1	F		
3	**Cornwell Moonga**	28	M	507 x 269 x 230 CIS	
	Ruthy Moonga (Wife)	25	F	226 x 260 x 220 GT	
	Giveness Moonga (Wife)	20	F	506 x 272 x 248 CIS	
	Reagan Mwanaabo	20	F		
	Lenty Moonga	5	F		
	Marvelous Moonga	2	F		
	Addy Malambo	2	F		
	Priscilla Mainza	12	F		
	Vanjinkel Shambaba	10	M		
4	**Jailos Kasamu Choombe**	71	M	780 x 480 x 380 CIS	
	Neliya Kasamu (Wife)		F	370 dia x 260 h Kitchen	
	Lice Bankombo (Wife)		F	345 x 240 x 220 CIS	
	Amos Miyanda		M	276 dia x 260 h Kitchen	
	Ovias Miyanda		M	652 x 380 x 240 CIS/Flattened drum	
	Ngandu Kasamu		M	300 x 260 x 212 CIS	
	Thomas Kasamu		M		
	Households	**Age**	**Sex**	**Structures**	**Fruit trees**
	Mutinta Kasamu		F		
	Alick Gwaba		M		
	Ovias Miyanda Jr.		M		
5	**Abel Mweete**	63	M	340 x 235 x 220 GT	1 Papaya
	Kelly Mweete	16	M	236 dia x 180 h Gt	
	Grace Mweete	13	M		
	Patrick Mweete	10	M		
6	**Abel Mwiinga**	66	M	290 x 220 x 300 GT	

	Households	Age	Sex	Structures	Fruit trees
	Sheti Mwiinga (Wife)	49	F	345 x 250 x 360 GT	
	Samaria Mwiinga (Wife)	58	F	255 x 235 x 340 GT	
	Sheli Moonga	47	F	300 x 255 x 340 GT	
	Simon Mwiinga	37	M	310 x 250 x 220 CIS	
	Phinias Mwiinga	23	M	325 dia x 350 h Kitchen GT	
	Alex Mwiinga	19	M	160 dia x 170 h Goat pen GT	
	Gift Mwiinga	22	M	519 x 370 x 390 GT	
	Given Mwiinga	18	M	330 dia x 290 h GT	
	Cheemba Mwiinga	15	M	350 x 254 x 400 GT	
				252 x 220 x 380 GT	
				500 x 360 x 420 GT	
				404 dia x 360 h GT	
				415 dia x 220 h Goat pen GT	
7	**Shadreck Mweete**	41	M	292 x 259 x 210 Flattened drum sheets	3 papaya
	Juliet Hamainda (Wife)	40	F	770 x 470 x 320 CIS	5 bananas
	Rodrick Mweete	19	M	380 x 279 x 230 Flattened drum sheets	
	Agness Mweete	22	F	470 dia x 300 h Kitchen GT	
	Obrack Mweete	17	M	300 x 230 Pole/wire mesh GT pigeon coup	
	Oscar Mweete	13	M	300 x 230 Pole/wire mesh GT pigeon coup	
	Justian Mweete	11	M	444 x 350 x 230 Pole/bamboo GT goat pen	
	Mwendalubi Mweete	6	M		
	Mercy Mweete	5	F		
8	**Kennedy Chilobya**	31	M	762 x 524 x 300 CIS	
	Rosemary Chilobya	21	F	290 dia x 340 h Kitchen GT	
	Households	**Age**	**Sex**	**Structures**	**Fruit trees**
	Stedn Chilobya	5	M		
	Margret Chilobya	3	F		
	Busiku Chilobya	1	M		
	Umpe Simutwe	14	M		
9	**Robert Chilobya**	71	M	740 x 375 x 240 CAS	
	Renjo Muwezwa Chilobya	45	F	382 x 382 x 230 CAS	
	Oberth Chilobya	39	M	890 x 780 x 360 Cement plastered/CIS	
	Miyanda Chilobya	28	F	385 dia x 320 h Kitchen GT	
	Pricius Chilobya	20	F	310 x 250 x 260 Goat pen pole/GT	
	Chinyama Chilobya	17	F		
	Chinjila Chilobya	13	F		
	Muchimba Chilobya	6	F		
	Chikokola Mwiinga	5	M		
10	**Kelvin Moonga**	31	M	870 x 295 x 250 CIS	
	Catherin Moonga	27	F	300 x 247 x 320 GT	
	Junior Moonga	6	M	243 x 210 x 120 Goat pen GT	
	Trevor Moonga	4	M		
	Ester Moonga	2	F		

	Households	Age	Sex	Structures	Fruit trees
11	**Justin Moonga**	27	M	541 x 330 x 230 CIS	
	Mathar Moonga	23	F	290 x 254 x 320 GT	
	Deocadra Moonga	4	F		
	Deosister Moonga	2	F		
	Ester Moonga	1	F		
12	**Mary Mweemba**	50	F	550 x 419 x 420 GT	
	Phostinah Hakaaba		F	280 dia x 320 h Kichen GT	
13	**Morgan Moonga**	34	M	774 x 456 x 370 Cement platered/CIS	
	Ireen Moonga	25	F	825 x 520 x 350 CIS	
	Chinyama Moonga	10	F	150 x 200 x 170 Toilet GT	
	Petronella Moonga	7	F	510 dia x 320 h Open/pole kitchen GT	
	Junior F Moonga	5	M		
	Florence Moonga	1	F		
	Households	**Age**	**Sex**	**Structures**	**Fruit trees**
	Debra Sala Moonga	3	F		
	Teddy Moonga	44	M		
14	**Petrous Chiluka**	65	M	887 x 526 x 410 Cement plastered/CIS	
	Yoni Chiluka	26	M	400 x 276 x 360 GT	
	Judah Chiluka	21	M	390 x 340 x 270 GT	
	Febeyo Chiluka	19	M	452 x 350 x 320 GT	
	Best Chiluka	17	M	340 dia x 280 h GT	
	Abiut Muyuni	16	M	556 x 340 x 330 GT	
	Nchimunya Muyuni	12	M	300 x 200 x 280 Toilet GT	
				300 x 200 x 280 Bathroom GT	
				300 x 200 x 280 Toilet GT	
				300 dia x 290 h Goat pen GT	
15	**Vincent Hachomba**	35	M	736 x 257 x 230 CIS	
	Micah Mwiinga Mwepu	26	F	280 x 254 x 120 GT	
	Gift Mwiinga	13	M	330 dia x 220 h Kitchen GT	
	Goodwin Mwiinga	10	M		
	Gelly Mwiinga	7	F		
	Grace Mwiinga	6	F		
	Gloria Mwiinga	3	F		
	Simbai Mwiinga	21	M		
16	**Rogers Chiluka**	41	M	486 x 276 x 360 GT	
	Delly Bweluma	30	F	571 x 436 x 325 Cement plastered CIS	
	Gift Chiluka	19	M	388 dia x 360 h GT	
	Silvia Chiluka	15	F	230 dia x 340 h Granary GT	
	Derrick Chiluka	13	M	160 dia x 260 h Pole/bamboo storage GT	
	Philis Chiluka	11	F		
	Happy Chiluka	8	M		
	Collen Chiluka	6	M		
	Edwin Chiluka	4	M		

	Households	Age	Sex	Structures	Fruit trees
	Vera Chiluka	2	F		
17	**Davy Choolela**	39	M	765 x 460 x 400 CIS	
	Ugen Choolela	16	M		
	Households	**Age**	**Sex**	**Structures**	**Fruit trees**
	Minivah Choolela	13	F		
	Ronivah Choolela	7	F		
	Senivah Choolela	5	F		
18	**Given Choolela**	36	F	655 x 648 x 360 CIS	1 Papaya
	Prudence Choolela		F	380 dia x 400 h Kitchen GT	
	Phillimon Choolela		M	230 dia x 180 Grain store Bamboo/pole GT	
	Virginia Choolela		F	150 x 170 x 150 Toilet GT	
	Bridget Renjo Choolela		F		
	Patricia Choonya		F		
19	**Joshua Syakulida**	65	M	780 x 480 x 345 CIS	
	Mulimba Kelesiah (Wife)	66	F	310 dia x 360 h GT	
	Enias Chaipa	19	M		
	Sikumbuzo Nkomo	16	M		
	Elijah Mwiinga	11	M		
	Patricia Mainza	32	F		
	Shallon Moonga	12	F		
	Richard Moonga	9	M		
20	**Judith Chiluka**	42	F	310 x 535 x 360 GT	
	Bornface Chiluka	25	M	210 x 275 x 275 GT	
	Ian Hamatendu	20	M		
	Egifay Hamatendu	20	M		
	Macy Hamatendu	18	F		
	Precious Hamatendu	15	F		
	Caloline Hamatendu	13	F		
	Regan Hamatendu	9	M		
	Kent Hamatendu	6	M		
21	**Vincent Habanyama**	31	M	537 x 505 x 255 CIS	
	Winnie Mudonga (Wife)		F	260 dia x 200 h Kitchen GT	
	Morgan Habanyama		M		
	Gift Habanyama		F		
	Cruver Habanyama		F		
22	**Households**	**Age**	**Sex**	**Structures**	**Fruit trees**
	Shadreck Habanyama Mwiinga	48	M	530 x 370 x 560 GT	2 Mango
	Elizabeth Kalonga	60	F	308 x 210 x 450 GT	
	Herbert Habanyama	24	M	280 dia x 370 h Kitchen GT	
	Josphat Habanyama	21	M		
	Patricia Habanyama	20	F		

	Households	Age	Sex	Structures	Fruit trees
	Mwiinga Habanyama	2	M		
	John Habanyama	5	M		
23	**Phinius Juula**	52	M	580 x 650 x 320 CIS	1 Banana
	Gift Juula	14	M	245 x 340 x 380 GT	2 Papaya
	Cathrine Juula	16	F	310 dia x 340 h GT	2 Mango
	Lonar Juula	18	F	210 x 150 x 150 Toilet GT	
	Annie Juula	30	F		
	Junior Juula	8	M		
	Richard Juula	26	M		
	Gorden Juula	21	M		
	Wilson Juula	24	M		
	Veronic Juula (Wife)	49	F		
	Samson Mwindilila	69	M		
24	**Luckson Mwwinga**	24	M	707 x 282 x 240 CIS	
	Mildred Mwiinga (Wife)	19	F		
	Lweendo Mwiinga	3	M		
	Charity Mwiinga	8 months	F		
25	**Solias Moonga**	29	M	437 x 250 x 260 GT	
	Joyce Moonga (Wife)		F		
	Memory Moonga	4	F		
	Brenda Moonga	2 months	F		
	Priscila Moonga	2	F		
26	**Winter Sichanje**	28	M	290 x 470 x 380 GT	
	Christine Cheelo (Wife)	22	F	220 dia x 320 h Kitchen GT	
	Recho Sichanje	4	F	120 dia x 150 h Chicken house GT	
	Trust Sichanje	2	M	130 x 180 x 300 Goat pen GT	
	Households	**Age**	**Sex**	**Structures**	**Fruit trees**
27	**Elita Sicaanje**	77	F	310 x 500 x 360 GT	
	Nedy Sicaanje		F	350 x 240 x 360 GT	
	West Sicaanje			180 x 200 x 150 Bath house GT	
				340 dia x 340 h Kitchen GT	
28	**Justine Chivwende**	42	M	358 x 213 x 3200 GT	1 Lemon
	Mary Hamainda (Wife)	37	F	772 x 450 x 380 GT	4 Mango
	Cathrine Nkombo (Wife)	32	F	270 dia x 340 h Kitchen GT	1 Guava
	Iness Chivwende	20	F	422 x 250 x 390 GT	
	Ivy Chinyama Chivwende	14	F	302 x dia 320 h GT	
	Chipo Mutale Chivwende	12	M		
	Changu Kambela	11	F		
	Shurity Mutale Chimvwende	10	F		
	Malambo Chivwende	8	M		

	Households	Age	Sex	Structures	Fruit trees
	Moonga Kambela	10	F		
	Luuka Kambela	8	M		
	Ester Chivwende	5	F		
	Choolwe Chivwende	4	F		
	Stanley Chivwende	2	M		
	Luumba Chivwende	11 months	M		
	Austrides Mweemba	1 months			
29	**Stella Chabika**	38	F	210 x 430 x 360 GT	
	Obby Mbanda		M	290 dia x 340 h Kitchen GT	
	Ferister Chivwende		F	180 x 200 x 150 Toilet GT	
	Jeseta Chivwende		F		
	Grece Chivwende		F		
30	**Prize Chivwende**	29	M	270 x 254 x 260 CIS	
	Mirriam Sikaputa (Wife)	20	F		
	Vincent Chivwende	9 months	M		
	Kelvin Chivwende	8	M		
	Households	**Age**	**Sex**	**Structures**	**Fruit trees**
31	**Ephraim Hamoonga**	65	M	300 x 540 x 400 GT	7 Mango
	Lodia Muleya	48	F	230 x 250 x 320 Gt	
	Gennia Hamoonga	23	F	310 dia x 380 h Kitchen GT	
	Lawrence Hamoonga	26	M		
	Romirah Hamoonga	29	F		
	Peter Moonga	17	M		
	Jennifer Moonga	15	F		
	Venon Moonga	13	M		
	Dan Hamoonga	9	M		
32	**Weeklef Chivwende**	33	M	448 x 244 x 210 GT	
	Lay Malambo (Wife)		F	248 dia x 320 Kitchen GT	
	Prince Mwiinga		M		
	B Mwiinga		M		
	Priscott Chivwende		F		
33	**Odden Choobe**	29	M	940 x 420 x 340 CIS	
	Matildah choobe (Wife)	28	F	260 dia x 320 h GT	
	Oscar Choobe	9	M		
	Milumbe Choobe	6	M		
	Beckham Choobe	1	M		
	Maureen Sitali	9	F		
34	**Conas Chikombo**	44	M	785 x 465 x 400 CIS	1 Mango
	Grace Chiyota (Wife)		F	310 x 250 x 180 GT	7 Papaya
	Moilady Chikombo		M	284 x 234 x 190 GT	1 Peach

	Households	Age	Sex	Structures	Fruit trees
	Feriaty Chikombo		M	222 x 257 x 190 GT	
	Osward Chikombo		M	438 dia x 220 h Kitchen GT	
				170 x 160 x 170 Toilet GT	
35	**Jericho Mwiinga**	28	M	883 x 280 x 250 CIS	
	Maureen Mwiinga	25	F	250 dia x 320 h Kitchen GT	
	Eugene Mwiinga	7	M		
	Junior Mwiinga	3	M		
	Households	**Age**	**Sex**	**Structures**	**Fruit trees**
36	Chipo Simucheka	28	M	200 x 280 x 380 GT	1 Mango
	Mweete Malambo (Wife)	26	F	270 x 460 x 420 GT	
	Renate Moonga (Wife)	21	F	280 dia x 360 h Kitchen GT	
	Ivonny Simucheka	6	F	150 x 100 x 50 Chicken house GT	
	Ester Moonga	1	F	200 dia x 200 h Pigeon coup GT	
	Bless Simucheka	9	M	200 dia x 200 h Goat pen GT	
37	**Vernon Ngongolo**	29	M	290 x 490 x 200 CIS	
	Alice Hamayalu	18 (Wife)	F	300 dia x 300 h Kitchen GT	
38	**Kingwell Bankombo**	30	M	280 x 600 x 250 CIS	
	Edith Mucape (Wife)	22	F	250 x 350 x 460 GT	
	Cathrine Bankombo	7	F	320 dia x 450 h Kitchen GT	
	Cidady Bankombo	18	M	200 dia x 260 h Chicken house GT	
				200 dia x 300 h Toilet GT	
				300 dia Bamboo/pole Goat pen	
39	**Thomasy Chikasa**	56	M	260 x 300 x 400 GT	
	Gilbert Kafwa	20	M	270 x 490 x 500 GT	
	Gloria Kafwa	18	F	350 x 300 x150 Grass/Mud structure	
	Samuel Kafwa	16	M	310 x 310 x 400 Kitchen GT	
	Dorothy Kafwa	14	F	150 dia x 200 Maize barn	
	Paul Kafwa	12	M	160 x 150 x 180 Pole/bamboo goat structure	
	Joseph Kafwa	10	M	200 x 150 x 200 Toilet GT	
40	**Contredy Moonga**	39	M	510 x 880 x 400 CIS	
	Lorreen Moonga (Wife)	30	F	335 dia x 400 Goat house GT	
	Gift Moonga	17	M	200 dia x 150 Chicken house GT	
	Given Moonga	15	M	200 dia x 150 h GT	
	Giviness Moonga	13	F	200 dia x 150 h Toilet grass structure	
	Luyando Moonga	9	M		
	Cabinet Moonga	7	M		
	Patrisha Moonga	5	F		
	Households	**Age**	**Sex**	**Structures**	**Fruit trees**
41	**Belden Gwaba**	36	M	400 x 300 x 350 GT	
	Lenzy Kasamu (Wife)	32	F	748 x 465 x 368 CIS	

	Households	Age	Sex	Structures	Fruit trees
	Evious Gwaba	14	F	285 x 258 x 360 GT	
	Vigostik Gwaba	17	M		
	Vivian Chinyama Gwaba	10	F		
	Addington Gwaba	9	M		
	Alicia Gwaba	3	F		
	Belden Gwaba Jr.	3 months	M		
42	**Goodwin Mulyakubinda**	42	M	960 x 460 x 400 CIS	
	Daris Kasamu (Wife)	39	F	390 x250 x 260 CIS	
	Kredrick Mulyakubinda	20	M	300 x 260 x 280 CIS	
	Briston Mulyakubinda	15	M	160 dia x 100 h Chicken house	
	False Mulyakubinda	12	F	320 x 370 x 250 Hammermill house CIS	
	Fridah Mulyakubinda	9	F	210 x 170 x 180 Goat house GT	
	Siglas Mulyakubinda	26	M	180 x 200 x 180 Toilet GT	
				390 dia x 400 Kitchen GT	
				190 dia x 400 Maize barn	
				250 x 150 x 150 Bath house GT	
43	**Enos Chilobya**	79	M	470 x 740 x 400 CIS	
	Jano Chilimbo (Wife)	60	F	310 x 450 x 400 GT	
	Love Chilobya	18	F	300 dia x 400 h Kitchen GT	
	Mark Manchini	6	M	200 dia x 400 Maize barn GT	
	Luyando	4	M		
44	**Failod Mudonga**	26	M	500 x 250 x 240 CIS	1 Mulberry
	Ageness Mwiinga (Wife)		F	390 x 240 x 380 Kitchen GT	
	Triven Moonga		M	150 x 150 x 180 Shop Plastic/grass/pole	
45	**Rodger Chiyota**	27	M	350 x 260 x 190 CIS	2 Mango
	Mayaba Hamoonga	22	F	320 dia x 360 h Open pole GT	
	Royd Chiyota	2	M		
	Households	**Age**	**Sex**	**Structures**	**Fruit trees**
46	**Geofrey Chiyota**	35	M	740 x 460 x 380 CIS	2 Mango
	Marvis Chikoko	32	F	340 dia x 320 h GT	1 Banana
	Happiness Chiyota	14	F	150 x 150 x 300 Toilet GT	1 Mulberry
	Pamela Chiyota	10	F		
	Mainga Chiyota	8	M		
	Miyoba Chiyota	5	M		
	Lushomo Chiyota	1	M		
47	**Mary Chiyota**	33	F	290 x 220 x 150 CIS	
	Ireen Chiyota	30	F	460 x 240 x 230 GT	
	Haboombe Kanungo	16	M		
	Mwiinga Kanungo	11	M		
	Mainza Kanungo	9	M		
	Kasamba Kanungo	14	F		

	Households	Age	Sex	Structures	Fruit trees
	Melai Banda	4	F		
	Junior Mangaba	8 months	M		
	Chintu Gwaba	7	F		
	Mazuba Chiyota	4	M		
48	**Charles Chiyota**	48	M	740 x 480 x 400 CIS	
	Royda Makolita (Wife)	41	F	190 x 150 x 190 Toilet CIS	
	Loreen Chiyota	21	F	330 x 260 x 380 GT	
	Trust Chiyota	19	M	320 dia x 440 h	
	Covester Chiyota	16	M	230 x 270 x 220 GT	
	Oviety Chiyota	14	F		
	Onety Chiyota	11	F		
	Carol Chiyota	7	F		
	Clement Chiyota	3	M		
	Busiku Chiyota	8 months	M		
49	**Fidess Chilala**	50	M	480 x 310 x 210 CIS	8 Mango
	Viness Maleka		M	360 dia x 420 h Kitchen GT	
	Households	**Age**	**Sex**	**Structures**	**Fruit trees**
50	**Stanley Makolita**	39	M	440 x 300 x 250 CIS	1 Papaya
	Phares Mweemba (Wife)	30	F	310 x 260 x 400 GT	
	Grace Makolita	16	F		
	Judith Makolita	13	F		
	Brandina Makolita	11	F		
	Manwell Makolita	8	M		
	Lweendo Makolita	4	M		
	Kelvin Moonga	10 months	F		
	Nchimunya Mweemba	17	M		
51	**Oliver Chiyota**	42	M	470 x 260 x 230 CIS	
	Joyce Cisamu (Wife)	37	F	290 x 230 x 380 GT	
	Ositer Chiyota	18	M	350 dia x 380 h	
	Lonia Chiyota	16	F	260 dia x 240 h	
	Emeldah Chiyota	4	F	260 dia x 240 h	
	Phostena Chiyota	8	F		
	Trace Chiyota	13	F		
52	**Fanny Mudonga**	31	M	500 x 260 x 240 CIS	
	Mable Manyepa (Wife)	28	F	240 dia x 380 h Kitchen GT	
	Ollen Mudonga	10	M	260 dia x 240 h Kitchen GT	
	Oliveness Mudonga	7	F		
	Evedence Mudonga	4	F		
	Curent Mudonga	5 months	M		

	Households	Age	Sex	Structures	Fruit trees
53	**Litah Mweemba**	49	F	270 x 410 x 220 CIS	
	Floler Habanyama		M	240 x 280 x 280 GT	
	Wiston Habanyama		F	280 dia x 300 h GT	
	John Habanyama		M	200 dia x 160 GT	
	Sherry Habanyama		F		
	Wisper Moonga		M		
54	**Childder Hachitaba**	25	F	340 x 244 x 210 GT	
	Gift Chilobya	7	M		
	Kasamba Hachitaba	2	F		
	Households	**Age**	**Sex**	**Structures**	**Fruit trees**
55	**Milner Habanyama**	26	M	759 x 467 x 360 Cement plastered CIS	2 Mango
	Enaby Manyepa (Wife)	22	F	280 dia x 400 h Kitchen GT	
	Precious Habanyama	3	F		
	Love Habanyama	9 months	F		
56	**Cryford Habanyama Chilala**	35	M	515 x 550 x 280 CIS	
	Ester Njebe (Wife)		F	290 x 324 x 220 GT	
	Nick Habanyama Chilala		M	340 dia x 380 h Kitchen GT	
	Prisca Habanyama Chilala		F	240 dia x 300 h Goat house GT	
	Marvin Habanyama Chilala		M	150 dia x 280 h Toilet GT	
	Same Habanyama Chilala		M		
	Mapenzi Habanyama Chilala		M		
57	**Febber Mudonga**	28	M	500 x 250 x 210 CIS	
	Ennah Ndebe (Wife)	23	F		
	Trust Mudonga	7	M		
	Collence Mudonga	4	M		
	Kelody Mudonga	2	M		
	Lelven Mudonga	1	M		
58	**Clever Chilobya**	43	M	470 x 730 x 500 CIS	
	Esther Chiyota (Wife)	44	F	350 dia x 400 Kitchen GT	
	Choolwe Mweene	14	M	230 dia x 300 h Goat house GT	
	Cliff Mweene	1	M	280 x dia x 180 Maize barn GT	
	Brenda Mweene	12	F		
	Sandra Mweene	10	F		
	Hope Mweene	7	F		
59	**Austin Chilobya**	36	M	280 x 340 x 400 GT	
	Vena Chiputa (Wife)	34	F	470 x 700 x 900 CIS	
	Mwiinga Chilobya	15	M	250 x 450 x 300 Goat house GT	
	Twaambo Mazungu	17	M	200 dia x 300 h Goat house GT	
	Fidelis Chilobya	13	M	300 dia x 150 h Maize barn GT	
	Kalau Chilobya	11	M	150 dia x 100 chicken house GT	

	Households	Age	Sex	Structures	Fruit trees
	Mutinta Chilobya	8	F	150 dia x 100 chicken house GT	
	Moonga Chilobya	1	M	100 x 400 x 100 Chicken hatchery GT	
	Households	**Age**	**Sex**	**Structures**	**Fruit trees**
				350 dia x 500 h GT	
				300 dia x 150 h Bath house GT	
60	**Briswell Mulyakubinda**	49	M	490 x 270 x 300 CIS	5 Papaya
	Fined Chiinda (Wife)	47	F	300 dia x 340 h Kitchen GT	2 Banana
	Brighton Mulyakubinda	28	M	190 dia x 200 h Goat house GT	
	Burton Mulyakubinda	25	M		
	Getrude Mulyakubinda	23	F		
	Joevy Mulyakubinda	21	M		
	Mathias Mulyakubinda	15	M		
	Joshua Mulyakubinda	9	M		
	Graison Mulyakubinda	7	M		
61	**Elita Chitebula**	82	F	640 x 250 x 250 House GT	
	Lewis Hamainda	19	M	400 dia x 340 h Kitachen GT	
	Elyinah Mulyakubinda	49	F	160 dia x 100 h Chicken house GT	
	Gloria Kafwa	20	F	460 x 250 x 360 House GT	
				280 dia x 290 h Goat house GT	
				260 x 240 x 290 House GT	
				200 dia x 130 h Maize barn	
				200 dia x 200 h Toilet	
62	**Brighton Kamanya**	28	M	356 x 240 x 400 House GT	
	Dollin Kamanya (Wife)	20	F	280 dia x 300 h Kitchen	
				280 dia x 300 h Kitchen	
63	**Burton Kamanya**	25	M	376 x 230 x 400 House GT	9 Mango
	Deziner Hamaziba (Wife)	20	F	320 dia x 300 h Kitchen GT	
	Lewis Kamanya	2	M	320 dia x 300 h Kitchen GT	
				320 dia x 300 h Kitchen GT	
				150 dia x 200 h Chicken house	
				100 dia x 150 h Pigeon coup	
				200 dia x 150 h Bath shelter GT	
	Households	**Age**	**Sex**	**Structures**	**Fruit trees**
64	**Helby Chibilika**	32	M	890 x 525 x 400 CIS	
	Gestinah Hamoonga (Wife)	23	F	350 dia x 400 Kitchen GT	
	Hurst Chibilika	5	M	300 x 200 x 350 Toilet GT	
	David Howell Chibilika	3	M	150 x 150 x 150 Goat house GT	
	Hildah Munyati	18	F		
65	**Kezya Cholela**	32	F	370 x 350 x 400 GT	
	Susan Sitali		F	350 x 300 x 400 GT	
	Manddana Nbook		F	250 x 230 x 600 GT	
				200 dia x 400 h Kitchen GT	

	Households	Age	Sex	Structures	Fruit trees
66	**Peter Chiluka**	66	M	879 x 702 x 360 CIS	5 Mango
	Easter Mwiinga (Wife)	61	F	200 x 150 x 400 Toilet GT	1 Banana
	Rolnard Chiluka	43	M	180 dia x 320 h Pole/bamboo/GT	
	Judith Chiluka	42	F	360 dia x 360 h Pole/bamboo/GT	
	Roger Chiluka	41	M	375 dia x 400 h Kitchen GT	
	Janne Chiluka	39	F	230 x 310 x 380 GT	
	Leseire Chiiowa	15	F	400 dia x 300 h GT	
67	**Salia Ngandu**	63	F	590 x 255 x 230 CIS	
	Lesson Mwanza	19	F	289 x 212 x 200 CIS	
	Matron Chaara	18	F	256 dia x 310 h Open mud kitchen GT	
	Stever Chaara	10	F	320 dia x 240 Goat pen GT	
	Vera Salia	12	F		
	Anar Salia	8	F		
	Vister Salia	5	M		
68	**Mangalita Chiyota**	79	F	750 x 471 x 380 CIS	15 Mango
	Risty Chiyota	34	M	190 dia x 320 h Kitchen GT	1 Papaya
	Briget Chiyota	18	F	380 x 250 x 240 GT	
	Castol Sibeene	14	M		
	Richy Mwiinga	1	M		
	Households	**Age**	**Sex**	**Structures**	**Fruit trees**
69	**Keegan Chilwalo**	24	M	400 x 270 x 225 GT	
	Abigail Chilwalo (Wife)	23	F	400 x 270 x 220 CAS	
	Lister Chilwalo	4	F	360 dia x 400 h GT	
	Andrea Chilwalo	10 months	M		
	Mildred Cheelo		F		
	Collins Chilwalo	19	M		
	Littress Chilwalo	15	F		
	Willard Chilwalo	11	M		
	Nkombo Hankombo	8	M		
	Early Chiluka	58	F		
	Kasamba Hankombo	9	F		
	Memory Shasinyanga	1	F		
70	**Mary Tantamuchulu**	63	F	780 x 760 x 400 CIS	4 Mango
	Vincent Chuuzya	22	M	330 x 220 x 340 GT	1 Banana
	Nowa Munda	55	M	470 dia x 360 h Kitchen GT	
	Nickson Hangoma	12	M	470 dia x 360 h Kitchen GT	
	Chelo Gift	10	M	210 dia x 300 h Maize barn GT	
				310 x 280 x 400 GT	
				300 dia x 220 Goat house GT	
71	**Sheely Sichanje**	35	F	760 x 460 x 420 CAS	1 Banana
	Phillas Shingoma	18	M	240 x 210 x 300 GT	

	Households	Age	Sex	Structures	Fruit trees
	Patricia Kamboni	16	F	260 x 260 x 320 GT	
	Prisca Kamboni	13	F	270 dia x 300 h GT	
	Chimunya Kamboni	11	F		
	Fiedance Chitala	9	F		
	Trines Mweemba	6	F		
72	**Bislom Bankombo**		M	600 x 400 x 400 CIS	
	Astridah Bankombo		F	290 x 240 x 230 Grocery CIS	
	Moses Choombe			150 x 150 x 60 Chickem house CIS	
	Braveness Bankombo			310 dia x 380 h Kitchen GT	
	Clivious Bankombo			270 dia x 250 h Goat house GT	
	Cliston Bankombo				
	Mutinta Bankombo				
	Households	**Age**	**Sex**	**Structures**	**Fruit trees**
73	**Coilard Mwaka**		M	250 x 250 x 380 GT	12 Mango
	Christabel Mwaka	1992	F		15 Papaya
	Mufuya Mwaka	1994	F		4 Banana

APPENDIX VI

ACID ROCK DRAINAGE TESWORK

ALS Environmental

Surrogate Control Limits

- No surrogates present on this report.

ALS Environmental

CERTIFICATE OF ANALYSIS

Client	: Albidon Limited	*Laboratory*	: ALS Environmental Perth	*Page*	: 1 of 9
Contact	: MIKE DUNBAR	*Contact*	: Shaun Crabb	*Work Order*	: EP0600830
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E-mail	: miked@hartree.com	*E-mail*	: Shaun.Crabb@alsenviro.com		
Telephone	: 08 9389 6300	*Telephone*	: 61-8-9209-7655		
Facsimile	: - Not provided -	*Facsimile*	: 61-8-9209-7600		
Project	: Munali	*Quote number*	: ----	*Date received*	: 7 Apr 2006
Order number	: - Not provided -			*Date issued*	: 2 May 2006
C-O-C number	: - Not provided -			*No. of samples*	- *Received* : 6
Site	: - Not provided -				*Analysed* : 6

ALSE - Excellence in Analytical Testing

NATA

WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory 825

This document is issued in accordance with NATA's accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

This document has been digitally signed by those names that appear on this report and are the authorised signatories. Digital signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatory	*Position*	*Department*
Kim McCabe	Inorganics Supervisor	Inorganics - NATA 825 (818 - Brisbane)
Kim McCabe	Inorganics Supervisor	Stafford Minerals - NATA 825 (818 - Brisbane)
Peter Dickenson	Senior Spectroscopist	Inorganics - NATA 825 (10911 - Sydney)
Shaun Crabb	Laboratory Manager	Perth Inorganics - NATA 825 (15847 - Perth)

Page Number : **2 of 9**
Client : **Albidon Limited**
Work Order : **EP0600830**

ALS Environmental

Comments

This report for the ALSE reference EP0600830 supersedes any previous reports with this reference. Results apply to the samples as submitted. All pages of this report have been checked and approved for release.

This report contains the following information:

- **Analytical results for samples submitted**

When moisture determination has been performed, results are reported on a dry weight basis. When a reported 'less than' result is higher than the LOR, this may be due to primary sample extracts/digestion dilution and/or insuffient sample amount for analysis. Surrogate Recovery Limits are static and based on USEPA SW846 or ALS-QWI/EN38 (in the absence of specified USEPA limits). Where LOR of reported result differ from standard LOR, this may be due to high moisture, reduced sample amount or matrix interference. When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for process purposes. Abbreviations: CAS number = Chemical Abstract Services number, LOR = Limit of Reporting. * Indicates failed Surrogate Recoveries.

- **Surrogate control limits**

The analytical procedures used by ALS Environmental are based on established internationally-recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house procedure are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported herein. Reference methods from which ALSE methods are based are provided in parenthesis.

Page Number : **3 of 9**
Client : **Albidon Limited**
Work Order : **EP0600830**

ALS Environmental

Analytical Results

Analyte	CAS number	LOR	Units	Test 16 Scar Tailings	Test 42 Scar Tailings	x1003 WASTE ROCK	x1004 WASTE ROCK	x1005 WASTE ROCK
Sample Matrix Type / Description :				SOLID	SOLID	SOLID	SOLID	SOLID
Sample Date / Time :				4 Apr 2006 15:49	4 Apr 2006 15:49	7 Apr 2006 15:30	7 Apr 2006 15:30	7 Apr 2006 15:30
Laboratory Sample ID :				EP0600830-001	EP0600830-002	EP0600830-004	EP0600830-005	EP0600830-006
EA002 : pH (Soils)								
pH Value	12408-02-5	0.1	pH Unit	8.4	8.5	9.4	9.3	9.2
EA009: Nett Acid Production Potential								
Net Acid Production Potential		0.5	kg H2SO4/t	-15.6	139	2.3	-73.4	-87.3
EA010: Conductivity								
Electrical Conductivity @ 25°C		1	µS/cm	391	226	148	181	227
EA011: Net Acid Generation								
pH (OX)		0.1	pH Unit	7.5	2.2	3.6	11.4	11.4
NAG (pH 4.5)		0.1	kg H2SO4/t	<0.1	62.7	2.3	<0.1	<0.1
NAG (pH 7.0)		0.1	kg H2SO4/t	<0.1	96.3	3.2	<0.1	<0.1
EA013: Acid Neutralising Capacity								
ANC as H2SO4		0.5	kg H2SO4 equ	158	151	4.1	86.5	95.9
Fizz Rating		1	Fizz Unit	3	3	2	2	2
EA055: Moisture Content								
Moisture Content (dried @ 103°C)		1.0	%	<1.0	<1.0	<1.0	<1.0	<1.0
ED040S : Soluble Sulphate by ICPAES								
Silicon	7440-21-3	1	mg/kg	11	12	34	20	14
ED040T : Total Sulphate by ICPAES								
Sulphate as SO4 2-	14808-79-8	100	mg/kg	2380	1100	480	160	190
ED042T: Total Sulphur by LECO								
Sulphur - Total as S (LECO)		0.01	%	4.65	9.47	0.21	0.43	0.28
ED093T: Total Major Cations								
Sodium	7440-23-5	10	mg/kg	820	510	3140	4350	3090
Potassium	7440-09-7	10	mg/kg	3300	2360	740	270	740
Calcium	7440-70-2	10	mg/kg	29000	20200	11800	35900	31800
Magnesium	7439-95-4	10	mg/kg	60600	47800	4300	4010	7950
EG005T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	11800	8480	9260	8730	8430
Antimony	7440-36-0	5	mg/kg	<5	<5	<5	<5	<5
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	20	10	10	<10	<10
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	107	93	36	4	11
Cobalt	7440-48-4	2	mg/kg	57	76	25	36	24
Copper	7440-50-8	5	mg/kg	74	92	46	85	102

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Page Number : 4 of 9
Client : Albidon Limited
Work Order : EP0600830

ALS Environmental

Analytical Results

Analyte	CAS number	LOR	Units	Test 16 Scar Tailings	Test 42 Scar Tailings	x1003 WASTE ROCK	x1004 WASTE ROCK	x1005 WASTE ROCK
Sample Matrix Type / Description				SOLID	SOLID	SOLID	SOLID	SOLID
Sample Date / Time				4 Apr 2006 15:49	4 Apr 2006 15:49	7 Apr 2006 15:30	7 Apr 2006 15:30	7 Apr 2006 15:30
Laboratory Sample ID				EP0600830-001	EP0600830-002	EP0600830-004	EP0600830-005	EP0600830-006
EG005T: Total Metals by ICP-AES								
Iron	7439-89-6	50	mg/kg	82900	94500	38500	37100	44400
Lead	7439-92-1	5	mg/kg	<5	<5	5	<5	9
Manganese	7439-96-5	5	mg/kg	565	429	247	172	635
Molybdenum	7439-98-7	2	mg/kg	3	3	<2	<2	<2
Nickel	7440-02-0	2	mg/kg	1040	1520	41	205	88
Selenium	7782-49-2	5	mg/kg	<5	7	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	314	265	156	202	208
Zinc	7440-66-6	5	mg/kg	11	10	15	<5	5
Thallium	7440-28-0	5	mg/kg	<5	<5	<5	<5	<5
EG035T: Total Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon		0.02	%	0.05	0.06	0.08	0.04	0.04
EP007: Total Carbon (TC)								
Total Carbon		0.02	%	1.69	1.31	0.07	0.86	1.22

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Page Number : **5 of 9**
Client : **Albidon Limited**
Work Order : **EP0600830**

ALS Environmental

Analytical Results

Analyte	CAS number	LOR	Units	Test 16 Scar Tailings	Test 42 Scar Tailings	2274/45	x1003 WASTE ROCK	x1004 WASTE ROCK
			Sample Matrix Type / Description :	SOLUTION	SOLUTION	SOLUTION	SOLUTION	SOLUTION
			Sample Date / Time :	4 Apr 2006 15:49	4 Apr 2006 15:49	4 Apr 2006 15:49	7 Apr 2006 15:30	7 Apr 2006 15:30
			Laboratory Sample ID :	EP0600830-001	EP0600830-002	EP0600830-003	EP0600830-004	EP0600830-005
EG020T: Total Metals by ICP-MS								
Antimony	7440-36-0	0.001	mg/L	----	----	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L	----	----	<0.001	----	----
Bismuth	7440-69-9	0.1	mg/kg	0.2	0.1	----	<0.1	<0.1
Barium	7440-39-3	0.001	mg/L	----	----	0.017	----	----
Thorium	7440-29-1	0.1	mg/kg	0.9	0.5	----	0.2	0.3
Bismuth	7440-69-9	0.001	mg/L	----	----	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L	----	----	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L	----	----	0.003	----	----
Uranium	7440-61-1	0.1	mg/kg	0.1	<0.1	----	<0.1	0.2
Lead	7439-92-1	0.001	mg/L	----	----	0.003	----	----
Molybdenum	7439-98-7	0.001	mg/L	----	----	0.012	----	----
Selenium	7782-49-2	0.010	mg/L	----	----	<0.010	----	----
Thallium	7440-28-0	0.001	mg/L	----	----	<0.001	----	----
Thorium	7440-29-1	0.001	mg/L	----	----	<0.001	----	----
Uranium	7440-61-1	0.001	mg/L	----	----	<0.001	----	----
Vanadium	7440-62-2	0.01	mg/L	----	----	<0.01	----	----
Zinc	7440-66-6	0.005	mg/L	----	----	<0.005	----	----
Boron	7440-42-8	0.05	mg/L	----	----	0.10	----	----

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Page Number : 6 of 9
Client : Albidon Limited
Work Order : EP0600830

ALS Environmental

Analytical Results

Analyte	CAS number	LOR	Units	Client Sample ID: x1005 WASTE ROCK Sample Matrix Type / Description: SOLUTION Sample Date / Time: 7 Apr 2006 15:30 Laboratory Sample ID: EP0600830-006				
EG020T: Total Metals by ICP-MS								
Bismuth	7440-69-9	0.1	mg/kg	<0.1				
Thorium	7440-29-1	0.1	mg/kg	0.4				
Uranium	7440-61-1	0.1	mg/kg	<0.1				

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Page Number : 7 of 9
Client : Albidon Limited
Work Order : EP0600830

ALS Environmental

Analytical Results

Analyte	CAS number	LOR	Units	Test 16 Scar Tailings	Test 42 Scar Tailings	x1003 WASTE ROCK	x1004 WASTE ROCK	x1005 WASTE ROCK
Sample Matrix Type / Description:				TCLP LEACHATE	TCLP LEACHATE	TCLP LEACHATE	TCLP LEACHATE	TCLP LEACHATE
Sample Date / Time:				1 May 2006 12:00	1 May 2006 12:00	1 May 2006 12:00	1 May 2006 12:00	1 May 2006 12:00
Laboratory Sample ID:				EP0600830-001	EP0600830-002	EP0600830-004	EP0600830-005	EP0600830-006
ED040C: Leachable Major Anions								
Sulphate as SO4 2-	14808-79-8	1	mg/L	39	24	3	4	2
ED093C: Leachable Major Cations								
Calcium	7440-70-2	1	mg/L	333	275	28	821	671
Magnesium	7439-95-4	1	mg/L	135	121	9	8	20
Potassium	7440-09-7	1	mg/L	57	50	2	2	12
EG005C: Leachable Metals by ICPAES								
Aluminium	7429-90-5	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Antimony	7440-36-0	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic	7440-38-2	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Barium	7440-39-3	0.1	mg/L	0.3	0.6	0.4	0.4	0.4
Boron	7440-42-8	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	7440-43-9	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Chromium	7440-47-3	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt	7440-48-4	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Copper	7440-50-8	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Iron	7439-89-6	0.1	mg/L	5.7	6.9	25.3	<0.1	0.7
Lead	7439-92-1	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Manganese	7439-96-5	0.1	mg/L	4.5	4.1	2.3	2.1	4.4
Selenium	7782-49-2	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Vanadium	7440-62-2	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Zinc	7440-66-6	0.1	mg/L	<0.1	0.1	0.1	<0.1	<0.1
Molybdenum	7439-98-7	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Thallium	7440-28-0	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG020C: Leachable Metals by ICPMS								
Bismuth	7440-69-9	0.001	mg/L	0.005	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
EG035C: Leachable Mercury by FIMS								
Mercury	7439-97-6	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
EN60: Bottle Leaching Procedure								
Final pH		0.1	pH Unit	5.7	5.5	5.0	6.5	6.4

A Campbell Brothers Limited Company

Page Number : 8 of 9
Client : Albidon Limited
Work Order : EP0600830

ALS Environmental

Analytical Results

Analyte	CAS number	LOR	Units	2274/45				
			Sample Matrix Type / Description :	WATER				
			Sample Date / Time :	4 Apr 2006 15:49				
			Laboratory Sample ID :	EP0600830-003				
EA005P: pH by PC Titrator								
pH Value	12408-02-5	0.01	pH Unit	8.74				
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C		1	µS/cm	685				
ED040F: Dissolved Major Anions								
Sulphate as SO4 2-	14808-79-8	1	mg/L	125				
Sulphur as S	63705-05-5	1	mg/L	42				
Silicon	7440-21-3	0.10	mg/L	5.47				
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	27				
Magnesium	7439-95-4	1	mg/L	15				
Sodium	7440-23-5	1	mg/L	110				
Potassium	7440-09-7	1	mg/L	18				
EG005T: Total Metals by ICP-AES								
Aluminium	7429-90-5	0.10	mg/L	1.07				
Cobalt	7440-48-4	0.01	mg/L	0.02				
Copper	7440-50-8	0.01	mg/L	0.02				
Iron	7439-89-6	0.05	mg/L	3.27				
Manganese	7439-96-5	0.01	mg/L	0.05				
Sulphur as S	63705-05-5	1	mg/L	41				
EG035T: Total Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001				

APPENDIX VII

ENVIRONMENTAL IMPACT CHARACTERISATION TABLE

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Componen t	Risk to Human Population	Cumulative Effect of Impact
1a. MINE COMPONENT: MUNALI UNDERGROUND MINE – CONSTRUCTION PHASE												
Landscape and Visual Character	1	Alteration of visual character of the area resulting from the removal of vegetation.	Negative	Moderat e	Project Area	Permanent	Pre-Mining	Continuous	Certain	Medium	Low	None
Soils	2	Removal of soils on **1.5ha** for the box-cut resulting in a loss of potential farmland. This soil will be stockpiled for future re-vegetation programs.	Negative	Moderat e	Project Area	Long-term	Pre-Mining	Continuous	Certain	Medium	Low	Future Land Use
	3	Contamination of soils from spilled fuel, oils and lubricants from construction vehicles.	Negative	Moderat e	Project Area	Long-term	Pre-Mining	Occasional	Certain	Medium	Low	Surface Water Flora
Land Use	4	Land Use in and around the mine site area will be restricted to mining (construction) activities only. Existing and potential Land Use such as farming will be permanently lost.	Negative	Low	Project Area	Long-term	Pre-Mining	Continuous	Certain	Medium	Moderate	Population Income
Noise & Vibration	5	Construction vehicles (front end loaders, etc) cause localised noise and vibration disturbances.	Negative	Low	Project Area	Long-term	Pre-Mining	Frequent	Certain	Low	Low	None

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
Air Quality	6	Construction activities will cause dust generation and vehicle exhaust emissions along access roads and within permit.	Negative	Low	Project Area & Regional	Long-term	Pre-Mining	Continuous	Certain	Low	Low	Flora & Fauna
	7	Exhaust fumes from construction vehicles will cause localised air pollution.	Negative	Low	Project Area	Short-term	Pre-Mining	Frequent	Certain	Low	Low	Local Population
Surface water	8	Construction activities (removal of soil and vegetation) causing exposure of topsoil which may lead to siltation of watercourses.	Negative	Low	Project Area	Short-term	Pre-Mining	Continuous	Probable	Low	Low	Aquatic Flora and Fauna
	9	Removal of soil and vegetation will change the nature of the surface water drainage in the project area.	Negative	Low	Project Area	Long-term	Pre-Mining	Continuous	Probable	Low	Low	Aquatic Flora and Fauna
	10	Contamination of water from the accidental release of hydraulic fluid, oil or fuel from construction vehicles.	Negative	Low	Project Area	Short-term	Pre-Mining	Occasional	Probable	Low	Low	Groundwater Soil
Ground water	11	Contamination of groundwater from accidental releases of fuel and oil from construction vehicles.	Negative	Low	Project Area	Medium-term	Pre-mining	Continuous	Certain	Low	Low	None

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
Flora & Fauna	12	Removal of 1.5ha of vegetation causes loss of habitat and the economic benefits arising from the vegetation (fruit, charcoal and timber).	Negative	Moderate	Project Area	Long-term	Pre-Mining	Continuous	Certain	Low	Low	None
	13	Construction and transport vehicles will increase noise levels and frighten away wildlife.	Negative	Moderate	Project Area	Long-term	Pre-Mining	Continuous	Probable	Low	Low	Species Diversity
	14	Deposition of dust on vegetation along access roads.	Negative	Low	Project Area / Region	Long-term	Pre-Mining	Continuous	Certain	Low	Low	Flora & Fauna
Archaeology	15	Disturbance or destruction of cultural or archaeological sites or the discovery of new artefacts.	Negative	Low	Project Area	Long-term	Pre-Mining	Continuous	Unlikely	Low	Low	None
1b. MINE COMPONENT: MUNALI UNDERGROUND MINE - OPERATIONAL PHASE												
Local Geology	16	Underground mine operations will result in the removal of **XMt** of waste rock comprising mainly **X** and **XMt** of mineralised rock.	Negative	High	Project Area	Permanent	Start of Mining	Continuous	Certain	High	Low	Surface Water and Ground water
Soil	17	Contamination of surface soils with metals and dust from mining activities.	Negative	High	Project Area	Long-term	Start of Mining	Continuous	Certain	High	Moderate	Future Land Use

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	**Intensity of Impact**	**Extent of Impact**	**Duration of Impact**	**Timing of Impact**	**Frequency of Impact**	**Likelihood of Impact Occurring**	**Value of Affected Component**	**Risk to Human Population**	**Cumulative Effect of Impact**
Noise & Vibration	18	Plant machinery and vehicles cause localised noise and vibrational disturbances.	Negative	Low	Project Area	Long-term	Start of Mining	Continuous	Certain	Low	Low	Fauna Local Population
	19	Underground operations and blasting will cause localised vibrations that may impact on infrastructure & buildings.	Negative	Low	Project Area	Short-term	Start of Mining	Occasional	Possible	Low	Low	None
Air Quality	20	Vehicle movements and machinery causes localised generation of dust and vehicle exhaust emissions.	Negative	Moderate	Project Area	Short-term	Start of Mining	Continuous	Certain	Low	Low	Flora & Fauna
Surface Water	21	Excess underground mine dewater will be discharged into the Project watercourses, which may have elevations of suspended solids and dissolved metals.	Negative	High	Project Area	Long-term	Start of Mining	Continuous	Possible	High	Moderate	Aquatic Flora and Fauna Downstream water users
	22	Drying up of groundwater-fed watercourses due to underground mine dewatering.	Negative	High	Project Area	Long-term	Start of Mining	Continuous	Possible	High	Moderate	Aquatic Flora & Fauna Downstream water users
	23	Accidental spillage of fuel, oils and lubricants cause contamination of surface runoff.	Negative	High	Project Area	Long-term	Start of Mining	Occasional	Possible	High	Moderate	Aquatic Flora & Fauna Downstream water users

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
Ground water	24	Dewatering of the underground mine will lower the local water table affecting nearby wells and boreholes.	Negative	Low	Project Area	Long-term	Start of Mining	Continuous	Certain	High	Moderate	None
	25	Contamination of local groundwater by oxidizing sulphide rocks exposed through mining activities.	Negative	High	Project Area	Long-term	Start of Mining	Continuous	Unlikely	Medium	Moderate	None
	26	Dewatering of the underground will affect the bore holes which are within the project area.	Negative	High	Project Area	Medium-term	Start of Mining	Continuous	Certain	Medium	Moderate	Downstream water users
Flora & Fauna	27	Mine activities may frighten away wildlife. And mine dewatering will the water table, significantly affecting flora and fauna.	Negative	Low	Project Area	Long-term	Start of Mining	Continuous	Certain	Low	Low	None
Incident /Public safety	28	The underground mine and the activities related to mining are dangerous to workers and public. Subsidence and sink holes will occur around the mine which could pose a problem to the public trespassing the mine.	Negative	Low	Project Area	Long-term	Start of Mining	Continuous	Possible	High	Moderate	None
1c. MINE COMPONENT: MUNALI UNDERGROUND MINE - POST CLOSURE PHASE												

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
Land Use	29	A flooded underground mine could be used as a water reservoir. The water can be used for irrigation and domestic consumption.	Positive	Low	Project Area	Permanent	Post Closure	Continuous	Probable	High	Low	Economic Development
Surface water	30	Cessation of pit dewatering will allow baseline watercourses to be replenished with groundwater.	Positive	Low	Project Area	Permanent	Post Closure	Continuous	Possible	High	Low	Aquatic Flora & Fauna
Ground water	31	Mine dewatering will cease and the underground mine will be allowed to flood. Groundwater may become contaminated by oxidation and hydrolysis of exposed sulphide material. Acid rock drainage may be generated.	Negative	High	Regional	Long-term	Post Closure	Continuous	Possible	High	High	Surface Water Aquatic Flora & Fauna Downstream water users
	32	Contaminated surface runoff entering the underground mine may contaminate groundwater-fed watercourses in the area.	Negative	High	Regional	Long-term	Post Closure	Continuous	Possible	High	High	Surface Water Aquatic Flora & Fauna Downstream water users

Table 5.3 Impact Characterisation Table												
			Environmental Impact Characterisation									
Aspect/ Issue	**No.**	**Potential Environmental Impact**	**Positive / Negative Impact**	**Intensity of Impact**	**Extent of Impact**	**Duration of Impact**	**Timing of Impact**	**Frequency of Impact**	**Likelihood of Impact Occurring**	**Value of Affected Component**	**Risk to Human Population**	**Cumulative Effect of Impact**
Incident /Public safety	33	Inadvertent public access to the areas where subsidence and sinkholes develop is dangerous.	Negative	Medium	Project Area	Permanent	Post Closure	Continuous	Possible	Low	Moderate	None
2a MINE COMPONENT: TAILINGS STORAGE FACILITY - CONSTRUCTION PHASE												
Landscape and Visual Character	34	Alteration of visual character of the area due to removal of the vegetation, the top soil and also the construction of earth-fill starter wall.	Negative	Moderate	Project Area	Long-term	Pre-mining	Continuous	Certain	Medium	Low	None
Soils	35	Removal of 40ha of top soil during the re-profiling of the dam basin. The soil will be stockpiled and retained for future re-vegetation programs.	Negative	Moderate	Project Area	Long-term	Pre-mining	Continuous	Certain	Medium	Low	Future Land Use
	36	Contamination of soils from spilled fuel, oils and lubricants from construction vehicles.	Negative	Medium	Project Area	Long-term	Pre-Mining	Occasional	Certain	Medium	Low	Surface Water Flora
Land Use	37	Land Use in and around the Tailings Storage Facility will be restricted to tailings dam (construction) activities only. Existing Land Use such as farming will be	Negative	Low	Project Area	Long-term	Pre-mining	Continuous	Certain	Medium	Moderate	Population Income

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
		lost.										
Noise & Vibration	38	Heavy equipment used during construction (front end loaders, etc) causes localised noise and vibration disturbances.	Negative	Low	Project Area	Long-term	Pre-mining	Frequent	Certain	Low	Low	Flora & Fauna
Air Quality	39	Construction equipment generates dust along access routes and the cleared area for the TSF.	Negative	Low	Project Area	Long-term	Pre-mining	Continuous	Certain	Low	Low	Flora & Fauna
	40	Exhaust fumes from construction vehicles will cause localised air pollution.	Negative	Low	Project Area	Short-term	Pre-Mining	Frequent	Certain	Low	Low	Local Population
Surface water	41	Erosion of exposed topsoil by construction activities (removal of soil and woodland) may increase suspended solids and cause siltation of water courses.	Negative	Low	Project Area	Short-term	Pre-mining	Continuous	Probable	Low	Low	Aquatic Flora & Fauna Downstream water users

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
	42	Removal of soil and vegetation will change the nature of the watershed feeding the project watercourses.	Negative	Low	Project Area	Long-term	Pre-mining	Continuous	Probable	Low	Low	None
	43	Contamination of water from the accidental release of hydraulic fluid, oil or fuel from construction vehicles.	Negative	Low	Project Area	Short-term	Pre-mining	Occasional	Probable	Low	Low	Ground water
Ground water	44	Contamination of groundwater from accidental release of fuel, oil and lubricants from construction vehicles.	Negative	Moderate	Project Area	Medium-term	Pre-mining	Continuous	Certain	Low	Low	None
Flora & Fauna	45	Removal of **40ha** of vegetation from the location site of the tailings dam causes loss of habitat for small mammals, birds and insects.	Negative	Moderate	Project Area	Long-term	Pre-mining	Continuous	Certain	Medium	Low	Surface Water Species Diversity
	46	Dust generated from construction activities may be deposited on the surrounding vegetation.	Negative	Low	Project Area	Short-term	Pre-mining	Frequent	Certain	Low	Low	None
	47	Noise and vibration caused by construction activities frightens away wildlife.	Negative	Low	Project Area	Long-term	Pre-mining	Continuous	Certain	Low	Low	Species Diversity

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
Archaeology	48	Disturbance or destruction of cultural or archaeological sites or the discovery of new artefacts.	Negative	Low	Project Area	Long-term	Pre-mining	Continuous	Unlikely	Low	Low	None
2b MINE COMPONENT: TAILINGS STORAGE FACILITY - OPERATIONAL PHASE												
Soil	49	Contamination of soil due to spill of tailings during transit to the TSF.	Negative	High	Project Area	Long-term	Start of Mining	Continuous	Possible	High	Moderate	Surface Water
	50	Contamination of soil due to dust blow off the tailings dam.	Negative	High	Regional	Long-term	Start of Mining	Continuous	Certain	High	Low	Surface Water Flora & Fauna
Air Quality	51	Air pollution due to dust generation from exposed tailings surfaces.	Negative	Low	Project Area	Long-term	Start of Mining	Continuous	Certain	High	Moderate	Flora & Fauna Local Population
Surface water	52	Contamination of surface watercourses due to release of contaminated runoff off the dam to surface waters.	Negative	High	Project Area	Long-term	Start of Mining	Occasional	Possible	High	Low	Aquatic Flora & Fauna Ground water
	53	Accidental failure of dam walls will result in contamination of nearby water courses.	Negative	Very High	Project Area	Short-term	Start of Mining	Infrequent	Possible	High	Moderate	Aquatic Flora & Fauna Downstream water users Ground water

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
Ground water	54	Contamination of groundwater due to seepage of tailings solution and/or ARD through the base or toe of the dam.	Negative	Very High	Project Area	Long-term	Start of Mining	Continuous	Possible	High	Moderate	Ground water abstractors Soil
Flora & Fauna	55	Dust blown tailings deposited on the surrounding vegetation downwind of the TSF.	Negative	Low	Regional	Long-term	Start of Mining	Continuous	Certain	Medium	Moderate	Soils Surface Water
Incident /Public safety	56	Failure of dam wall and flooding of the surrounding area.	Negative	Very High	Regional	Short-term	Start of Mining	Continuous	Unlikely	High	High	Surface Water Ground Water Soil Flora & Fauna
	57	Danger to the public from drowning due to walking on the TSF.	Negative	Moderate	Project Area	Long-term	Start of Mining	Continuous	Unlikely	Low	Moderate	None
Aesthetics	58	Detraction from the natural beauty of the landscape.	Negative	Moderate	Project Area	Permanent	Start of Mining	Continuous	Certain	Low	Low	None
2c. MINE COMPONENT: TAILINGS STORAGE FACILITY - POST-CLOSURE PHASE												
Air Quality	59	Air pollution due to dust blow from exposed tailings surfaces.	Negative	Low	Project Area	Long-term	Post Closure	Continuous	Certain	Low	Moderate	Local Population
Surface water	60	Contamination of surface watercourses from run-off and erosion of TSF walls.	Negative	High	Project Area	Long-term	Post Closure	Continuous	Possible	Low	Moderate	Aquatic Flora & Fauna Soils

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
Ground water	61	Contamination of groundwater due to acid rock drainage (ARD) seeping under the TSF.	Negative	Very High	Project Area	Long-term	Post Closure	Continuous	Unlikely	High	Moderate	Surface Water
Aesthetics	62	Detraction from the natural beauty of the landscape.	Negative	Moderate	Project Area	Permanent	Post Closure	Continuous	Certain	Low	Low	None
Incident /Public safety	63	Danger to the public from access to open decant towers.	Negative	Moderate	Project Area	Long-term	Post Closure	Continuous	Unlikely	Low	Moderate	None
3a. MINE COMPONENT: WASTE ROCK DUMP - CONSTRUCTION PHASE												
Landscape and Visual Character	64	Alteration of visual character of the area due to removal of Miombo woodland and the top soil.	Negative	Moderate	Project Area	Permanent	Pre-mining	Continuous	Certain	Medium	Low	None
Soil	65	Removal of Xha of top soil during land clearance. The soil will be stockpiled and retained for future re-vegetation programs.	Negative	Low	Project Area	Long-term	Pre-mining	Continuous	Certain	Medium	Low	Future Land Use
	66	Contamination of soils from spilled fuel, oils and lubricants from construction vehicles.	Negative	Low	Project Area	Long-term	Pre-mining	Occasional	Certain	Medium	Low	Surface Water Flora
Land Use	67	Land Use in and around the waste rock dump will be restricted to land clearance for waste rock dump only. Existing Land Use such as	Negative	Moderate	Project Area	Long-term	Pre-mining	Continuous	Certain	Low	Medium	Population Income

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
		farming will be lost.										
Noise & Vibration	68	Heavy equipment used during construction (front end loaders, etc) causes localised noise and vibration disturbances.	Negative	Low	Project Area	Short-term	Pre-mining	Frequent	Certain	Low	Low	Flora & Fauna
Air Quality	69	Construction equipment generates dust along access routes and the cleared area for the waste rock dump.	Negative	Low	Project Area	Long-term	Pre-mining	Continuous	Certain	Low	Low	Flora & Fauna
	70	Exhaust fumes from construction vehicles will cause localised air pollution.	Negative	Low	Project Area	Short-term	Pre-Mining	Occasional	Certain	Low	Low	Local Population
Surface water	71	Erosion of exposed topsoil by construction activities (removal of soil and vegetation) may increase suspended solids and cause siltation of water courses.	Negative	High	Project Area	Short-term	Pre-mining	Infrequent	Possible	Low	Low	Aquatic Flora & Fauna Downstream water users
	72	Removal of soil and vegetation will change the nature of the surface drainage in the project area.	Negative	High	Project Area	Long-term	Pre-mining	Continuous	Certain	Low	Low	None

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
	73	Contamination of water from the accidental release of hydraulic fluid, oil or fuel from construction vehicles.	Negative	Very High	Project Area	Long-term	Pre-mining	Continuous	Probable	Medium	Moderate	Aquatic Flora & Fauna Downstream water users
Groundwater	74	Contamination of groundwater from the accidental release of hydraulic fluid, oil or fuel from the construction vehicles.	Negative	High	Project Area	Long-term	Pre-mining	Continuous	Possible	Medium	Moderate	None
Flora & Fauna	75	Removal of Xha of vegetation from the site of the waste rock dump causes loss of habitat for small mammals, birds and insects.	Negative	High	Project Area	Permanent	Pre-mining	Continuous	Certain	Low	Low	None
	76	Dust generated from construction activities may be deposited on the surrounding vegetation.	Negative	Low	Project Area	Long-term	Pre-mining	Continuous	Certain	Low	Low	Soil Surface Water
	77	Noise and vibration caused by construction activities frightens away wildlife.	Negative	Low	Project Area	Long-term	Pre-mining	Frequent	Certain	Low	Low	Flora & Fauna
Archaeology	78	Disturbance or destruction of archaeological or cultural site or the discovery of new artefacts.	Negative	High	Project Area	Permanent	Pre-mining	Continuous	Unlikely	High	Low	None
3b. MINE COMPONENT: WASTE ROCK DUMP - OPERATIONAL PHASE												

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
Soil	79	Soil contamination from dust from waste rock material in the dump.	Negative	High	Project Area	Long-term	Start of Mining	Continuous	Probable	Low	Low	Surface Water Flora & Fauna
Noise & Vibration	80	Noise and vibration disturbances from heavy plant equipment and dozers operating on the dump.	Negative	Moderate	Project Area	Long-term	Start of Mining	Continuous	Certain	Low	Low	Fauna Local Population
Air Quality	81	Air pollution due to airborne dust generated from the movement of haul trucks and other heavy equipment.	Negative	Moderate	Project Area	Medium-term	Start of Mining	Frequent	Certain	Low	Low	Soil Flora Mine Workers
	82	Contamination of air due to dust blown off the waste rock dumps.	Negative	Moderate	Project Area	Medium-term	Start of Mining	Frequent	Certain	Low	Low	Soil Flora Mine Workers
	83	Localised contamination of air due to release of exhaust fumes from dump trucks etc.	Negative	Low	Project Area	Short-term	Start of Mining	Occasional	Certain	Low	Low	Local Population
Surface water	84	Contamination of surface watercourses due to the release of contaminated runoff off the waste rock dumps .	Negative	High	Project Area	Long-term	Start of Mining	Infrequent	Possible	Medium	Low	Aquatic Flora & Fauna Groundwater
	85	Contamination of surface watercourses through groundwater influx.	Negative	Very High	Project Area	Long-term	Start of Mining	Continuous	Unlikely	High	Moderate	Aquatic Flora & Fauna

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
Groundwater	86	Contamination of groundwater due to Acid Rock Drainage through the base or toe of the dump.	Negative	Very High	Project Area	Long-term	Start of Mining	Continuous	Unlikely	High	Moderate	Soil Groundwater Abstractors
Flora & Fauna	87	Dust generated from movement of haul trucks and heavy equipment deposited on surrounding vegetation.	Negative	Moderate	Project Area	Short-term	Start of Mining	Frequent	Certain	Low	Low	Surface Water Soil
Incident /Public safety	88	Danger to the public from inadvertent access to operational areas.	Negative	Low	Project Area	Long-term	Start of Mining	Continuous	Certain	Low	Moderate	None
3c. MINE COMPONENT: WASTE ROCK DUMP - POST-CLOSURE PHASE												
Air Quality	89	Air pollution due to wind erosion of the waste rock dump walls and material in the dump.	Negative	Low	Project Area	Long-term	Post Closure	Continuous	Possible	Low	Low	Flora & Fauna Surface Water
Surface water	90	Contamination of surface watercourses from run-off and erosion of dump walls.	Negative	Moderate	Project Area	Long-term	Post Closure	Infrequent	Possible	Low	Low	Aquatic Flora & Fauna Soil
Groundwater	91	Contamination of groundwater due to development of ARD and seepage through the base of the waste rock dump.	Negative	High	Project Area	Long-term	Post Closure	Continuous	Unlikely	Low	Low	Surface Water
Aesthetics	92	Detraction from the natural beauty of the physical landscape.	Negative	Low	Project Area	Permanent	Post Closure	Continuous	Certain	Low	Low	None

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
Incident /Public safety	93	Waste rock dump becomes unstable with time and becomes dangerous to the public when accessed.	Negative	Moderate	Project Area	Long-term	Post Closure	Continuous	Probable	Low	Moderate	None
4a. MINE COMPONENT: ROM PAD & PROCESSING FACILITIES - CONSTRUCTION PHASE												
Landscape and Visual Character	94	Alteration of the physical character of the site due to removal of the vegetation and the topsoil.	Negative	High	Project Area	Permanent	Pre-mining	Continuous	Certain	Low	Low	None
Soil	95	Removal of topsoil (21ha for plant area). This soil will be stockpiled and retained for future rehabilitation programs.	Negative	Moderate	Project Area	Long-term	Pre-mining	Continuous	Certain	Medium	Low	Future Land Use
	96	Contamination of soils from spilled fuel, oils and lubricants from construction vehicles.	Negative	Moderate	Project Area	Long-term	Pre-mining	Occasional	Certain	Medium	Low	Surface Water Flora
Land Use	97	Land Use in and around the ROM pad area will be restricted to processing (construction) activities. Existing Land Use such as farming will be lost.	Negative	Moderate	Project Area	Long-term	Pre-mining	Continuous	Certain	Low	Medium	Population Income
Noise & Vibration	98	Construction equipment (front end loaders etc.) generate localised noise and vibration	Negative	Moderate	Project Area	Short-term	Pre-mining	Frequent	Certain	Low	Low	Fauna

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	**Intensity of Impact**	**Extent of Impact**	**Duration of Impact**	**Timing of Impact**	**Frequency of Impact**	**Likelihood of Impact Occurring**	**Value of Affected Component**	**Risk to Human Population**	**Cumulative Effect of Impact**
		disturbances.										
Air Quality	99	Construction equipment generates airborne dust along access roads and the cleared area for the ROM pad.	Negative	Low	Project Area	Short-term	Pre-mining	Frequent	Certain	Low	Low	Flora & Fauna Soil
	100	Exhaust fumes from construction vehicles will cause localised air pollution.	Negative	Low	Project Area	Short-term	Pre-mining	Frequent	Certain	Low	Low	Local Population
Surface water	101	Erosion of exposed topsoil by construction activities (removal of soil and woodland) may increase suspended solids and cause siltation of water courses.	Negative	High	Project Area	Short-term	Pre-mining	Occasional	Possible	Low	Low	Flora & Fauna Downstream water users
	102	Removal of soil and vegetation will change the nature of the surface drainage of the project area.	Negative	Moderate	Project Area	Long-term	Pre-mining	Continuous	Certain	Low	Low	Aquatic Flora & Fauna Groundwater
	103	Contamination of water from the accidental release of hydraulic fluid, oil or fuel by construction vehicles.	Negative	High	Project Area	Long-term	Pre-mining	Infrequent	Probable	Medium	Moderate	Aquatic Flora & Fauna Groundwater

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
Groundwater	104	Contamination of groundwater due to the accidental release of hydraulic fluid, oil or fuel from construction vehicles.	Negative	High	Project Area	Long-term	Pre-mining	Continuous	Certain	Medium	Moderate	None
Flora & Fauna	105	Removal of vegetation (21ha for process plant area) from the site of the processing facilities causing loss of habitat for small mammals, birds and insects.	Negative	High	Project Area	Permanent	Pre-mining	Continuous	Certain	Medium	Low	None
	106	Dust generated from the construction activities may be deposited on the surrounding vegetation.	Negative	High	Project Area	Short-term	Pre-mining	Frequent	Certain	Low	Low	None
	107	Noise and vibration caused by construction activities will frighten away wildlife.	Negative	Moderate	Project Area	Long-term	Pre-mining	Continuous	Certain	Low	Low	Species Diversity
Archaeology	108	Disturbance or destruction of archaeological or cultural sites or discovery of new artefacts.	Negative	High	Project Area	Permanent	Pre-mining	Continuous	Unlikely	High	Low	None
4b. MINE COMPONENT: ROM PAD & PROCESSING FACILITIES - OPERATIONAL PHASE												

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
Soil	109	Contamination of soil due to inadequate storage, handling or transport of chemicals and reagents.	Negative	High	Project Area	Medium-term	Start of Mining	Occasional	Possible	Low	Low	Surface Water Flora & Fauna
	110	Contamination of soils due to accidental spillage of chemicals and reagents.	Negative	High	Project Area	Short-term	Start of Mining	Occasional	Possible	Low	Low	Surface Water Flora & Fauna
	111	Contamination of soil due to spillage of oils and greases from breakdown vehicles.	Negative	High	Project Area	Long-term	Start of Mining	Occasional	Possible	Low	Low	Surface Water Flora & Fauna
	112	Contamination of soils from spilled flotation tails in transit to the TSF.	Negative	High	Project Area	Short-term	Start of Mining	Infrequent	Possible	Low	Low	Surface Water Flora & Fauna
	113	Contamination of soil from airborne dust blown from the crushing and grinding circuits, ore stockpiles and conveyors.	Negative	Medium	Project Area	Medium-term	Start of Mining	Occasional	Possible	Low	Low	Surface Water Flora & Fauna
Noise & Vibration	114	Noise nuisance from heavy plant equipment, dozers and crusher plant.	Negative	Moderate	Project Area	Long-term	Start of Mining	Continuous	Certain	Low	Low	Fauna Mine Workers
	115	Noise nuisance from mill and truck/tanker movements to and from the plant site.	Negative	Moderate	Project Area	Long-term	Start of Mining	Continuous	Certain	Low	Low	Fauna Mine Workers

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
	116	Vibrations caused by operational heavy equipment in the process plant.	Negative	Moderate	Project Area	Long-term	Start of Mining	Continuous	Certain	Low	Low	Infrastructure
Air	117	Generation of airborne dust from ore stockpile, crushing circuit and ore transfer points.	Negative	Moderate	Project Area	Medium-term	Start of Mining	Continuous	Certain	Low	Low	Soil Flora & Fauna Mine Workers
	118	Air pollution due to blow off dust from the ore stockpiles.	Negative	High	Project Area	Medium-term	Start of Mining	Frequent	Certain	Low	Low	Soil Flora & Fauna Mine Workers
	119	Air pollution due to blow off of concentrates from stockpiles.	Negative	Moderate	Project Area	Medium-term	Start of Mining	Frequent	Certain	Low	Low	Soil Surface Water Mine Workers
Surface water	120	Contamination of water from silt and ore dust in run-off from ROM pad.	Negative	Moderate	Project Area	Medium-term	Start of Mining	Infrequent	Possible	Low	Low	Soil Flora
	121	Contamination of water due to storm water pick-up of process spills.	Negative	High	Project Area	Medium-term	Start of Mining	Infrequent	Possible	Low	Low	Soil Aquatic Flora & Fauna
	122	Contamination of water due to spills caused by equipment failure.	Negative	High	Project Area	Short-term	Start of Mining	Infrequent	Possible	Low	Low	Soil Flora & Fauna
	123	Contamination of water due to wash water from plant maintenance activities.	Negative	Moderate	Project Area	Short-term	Start of Mining	Occasional	Possible	Low	Low	Soil Flora & Fauna

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
	124	Contamination of water due to accidental spills from process equipment, thickeners, agitators, burst pipes etc.	Negative	High	Project Area	Short-term	Start of Mining	Infrequent	Possible	Low	Low	Soil Flora & Fauna
	125	Contamination of water due to spill of flotation tails filter cake.	Negative	High	Project Area	Short-term	Start of Mining	Infrequent	Possible	Low	Low	Soil Flora & Fauna
	126	Contamination of water due to accidental spills of reagents or chemicals caused by inadequate storage, handling or transport.	Negative	High	Project Area	Long-term	Start of Mining	Infrequent	Possible	Low	Low	Soil Air
	127	Contamination of surface watercourses due to discharge of contaminated excess process water.	Negative	High	Project Area	Short-term	Start of Mining	Infrequent	Possible	High	High	Aquatic Flora & Fauna Soil
Groundwater	128	Contamination of groundwater from spillage at the waste water treatment plant.	Negative	High	Project Area	Long-term	Start of Mining	Occasional	Unlikely	High	Low	Aquatic Flora & Fauna
	129	Contamination of groundwater due to leaks from process water ponds.	Negative	High	Project Area	Long-term	Start of Mining	Occasional	Unlikely	Low	Low	Soil
	130	Groundwater contamination from seepage of spills of process chemicals and reagents into the soil.	Negative	High	Project Area	Long-term	Start of Mining	Occasional	Unlikely	Low	Low	Soil Surface Water Downstream water users

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
General Releases	131	Contamination of water due to exposure of concentrate trucks to the elements.	Negative	Moderate	Regional	Short-term	Start of Mining	Occasional	Possible	Low	Low	Soil Air Flora & Fauna
	132	Contamination of air due to exposure of concentrate trucks to the elements.	Negative	Moderate	Regional	Short-term	Start of Mining	Occasional	Possible	Low	Low	Soil Surface Water Flora & Fauna
	133	Contamination of soil due to exposure of concentrate trucks to the elements.	Negative	Moderate	Regional	Short-term	Start of Mining	Occasional	Certain	Low	Low	Surface Water Soil
General Safety	134	Safety hazard for workers working in the ROM pad.	Negative	High	Project Area	Long-term	Start of Mining	Occasional	Possible	Low	High	Mine Workers
4c. MINE COMPONENT: ROM PAD AND PROCESSING FACILITIES POST-CLOSURE PHASE												
Soil	135	Contamination of soil due to erosion and run-off from the old stockpile areas and the old ROM pad site.	Negative	Moderate	Project Area	Long-term	Post Closure	Occasional	Probable	Low	Low	Flora & Fauna
Surface water	136	Contamination of the surface watercourses from run-off and erosion of the former ROM site.	Negative	Moderate	Project Area	Long-term	Post Closure	Continuous	Probable	Medium	Low	Soil Flora & Fauna
Groundwater	137	Long term contamination of groundwater from contaminated soils on the former ROM pad	Negative	Moderate	Project Area	Long-term	Post Closure	Continuous	Probable	Medium	Low	Downstream water users

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
		site.										
Public Safety	138	Safety hazard of old buildings and chemicals.	Negative	Low	Project Area	Long-term	Post Closure	Infrequent	Possible	Low	Medium	Local Population
5a MINE COMPONENT: ORE STOCKPILES - CONSTRUCTION PHASE												
Landscape and Visual Character	139	Alteration of visual character of the area due to removal of vegetation, and the top soil.	Negative	High	Project Area	Permanent	Pre-mining	Continuous	Certain	Low	Low	None
Soils	140	Removal of top soil during clearance of the area. This soil will be stockpiled and retained for future re-vegetation programs.	Negative	Moderate	Project Area	Long-term	Pre-mining	Continuous	Certain	Medium	Low	Future Land Use
	141	Contamination of soils from spilled fuel, oils and lubricants from construction vehicles.	Negative	Moderate	Project Area	Long-term	Pre-mining	Occasional	Certain	Medium	Low	Surface Water Flora & Fauna
Land Use	142	Land Use in and around the stockpiles will be restricted to clearance and construction activities only. Potential Land Use such as farming will be permanently lost.	Negative	Low	Project Area	Long-term	Pre-mining	Continuous	Certain	Low	Medium	Population Income

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
Noise & Vibration	143	Heavy equipment used during construction (bull dozers, front end loaders, etc) will create localised noise and vibration disturbances.	Negative	Low	Project Area	Short-term	Pre-mining	Continuous	Certain	Low	Low	Fauna
Air Quality	144	Equipment used for construction will generate airborne dust which will affect the project area.	Negative	Low	Project Area	Short-term	Pre-mining	Frequent	Certain	Low	Low	Flora & Fauna Soil
	145	Exhaust fumes from construction vehicles will cause localised air pollution.	Negative	Low	Project Area	Short-term	Pre-mining	Frequent	Certain	Low	Medium	Local Population
Surface water	146	Erosion of exposed topsoil by construction activities (removal of soil and vegetation) may increase suspended solids and cause siltation of water courses.	Negative	High	Project Area	Long-term	Pre-mining	Frequent	Probable	Low	Low	Aquatic Flora & Fauna Downstream water users
	147	Removal of soil and vegetation will change the nature of the surface drainage of the project area.	Negative	High	Project Area	Long-term	Pre-mining	Continuous	Probable	Medium	Low	Downstream water users
	148	Contamination of water from the accidental release of hydraulic fluid, oil or fuel from construction vehicles.	Negative	High	Project Area	Long-term	Pre-mining	Infrequent	Probable	Low	Low	Aquatic Flora & Fauna Groundwater

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Groundwater	149	Contamination of groundwater from accidental spillage of fuel, lubricants and oil from construction vehicles.	Negative	High	Project Area	Long-term	Pre-mining	Infrequent	Probable	Low	Medium	None
Flora & Fauna	150	Removal of vegetation from the stockpile site causes loss of habitat for small mammals, birds and insects.	Negative	High	Project Area	Long-term	Pre-mining	Continuous	Certain	Medium	Low	None
	151	Dust generated during the construction activities may deposit on the surrounding vegetation.	Negative	High	Project Area	Short-term	Pre-mining	Frequent	Certain	Low	Low	None
	152	Noise and vibration created during construction activities will frighten away wildlife.	Negative	Moderate	Project Area	Long-term	Pre-mining	Continuous	Certain	Low	Low	Species Diversity
Archaeology	153	Disturbance or destruction of cultural or archaeological sites or the discovery of new artefacts.	Negative	High	Project Area	Permanent	Pre-mining	Continuous	Possible	Low	Medium	None
5b MINE COMPONENT: ORE STOCKPILES - OPERATIONAL PHASE												
Soil	154	Contamination of soil due to fine ore dust windblown off the stockpiles.	Negative	Moderate	Project Area	Long-term	Start of Mining	Frequent	Certain	Low	Low	Surface Water Flora

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Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
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	155	Contamination of soil due to erosion and run-off from the stockpiles.	Negative	Moderat e	Project Area	Long-term	Start of Mining	Occasional	Probable	Low	Low	Flora
Noise & Vibration	156	Operational heavy vehicles (front end loaders, haul trucks etc) will cause localised noise and vibration impacts.	Negative	Low	Project Area	Short-term	Start of Mining	Continuous	Certain	Low	Low	Fauna Mine Workers Local Population
Air	157	Air pollution due to wind blown dust generation from the fine ore dust in the stockpiles.	Negative	Low	Project Area	Medium-term	Start of Mining	Continuous	Certain	Low	Low	Fauna Mine Workers
	158	Localised air pollution from the exhaust fumes of haul trucks, front end loaders etc.	Negative	Low	Project Area	Short-term	Start of Mining	Frequent	Certain	Low	Low	Fauna Mine Workers
Surface water	159	Contamination of surface watercourses due to contaminated surface runoff from the stockpiles.	Negative	High	Project Area	Long-term	Start of Mining	Occasional	Probable	Low	Low	Aquatic Flora & Fauna Downstream water users
	160	Contamination of surface watercourses due to accidental spillage of fuel, oil or lubricants from trucks and front end loaders etc.	Negative	Moderat e	Project Area	Long-term	Start of Mining	Occasional	Probable	Low	Low	Aquatic Flora & Fauna Downstream water users
	161	Contamination of surface watercourses through groundwater influx.	Negative	Very High	Project Area	Long-term	Start of Mining	Continuous	Unlikely	Medium	Low	Aquatic Flora & Fauna

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Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
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Groundwater	162	Contamination of groundwater due to seepage of contaminated water through the stockpiles (acid rock drainage).	Negative	Very High	Project Area	Long-term	Start of Mining	Continuous	Unlikely	Medium	Medium	Groundwater abstractors Soil
Flora & Fauna	163	Dust generated from the activities in the stockpile area may be deposited on the surrounding vegetation.	Negative	Low	Project Area	Short-term	Start of Mining	Frequent	Certain	Low	Low	None
	164	Localised noise and vibrations will scare away wildlife.	Negative	Low	Project Area	Long-term	Start of Mining	Continuous	Certain	Low	Low	Species Diversity
Aesthetics	165	Detraction from the natural beauty of the landscape.	Negative	Moderate	Project Area	Long-term	Start of Mining	Continuous	Probable	Low	Low	None
General Safety	166	Safety concerns for mine workers and public in the stockpile area due to operational heavy vehicles and movement of material on stockpiles.	Negative	High	Project Area	Long-term	Start of Mining	Continuous	Possible	Low	Low	Local Population
5c MINE COMPONENT: ORE STOCKPILES - POST CLOSURE PHASE												
Soil	167	Contaminated soils from operations remain on site and spread contaminates.	Negative	High	Project Area	Long-term	Post Closure	Continuous	Possible	Low	Low	Surface Water Flora

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Air	168	Air pollution due to wind erosion of contaminated soils.	Negative	Moderat e	Project Area	Long-term	Post Closure	Occasional	Possible	Low	Low	Soil Surface Water
Surface water	169	Contamination of surface water due to erosion of remaining stockpiles.	Negative	Moderat e	Project Area	Long-term	Post Closure	Occasional	Possible	Low	Low	Aquatic Flora & Fauna Downstream water users
	170	Long term contamination of surface water from contaminated soils left on site.	Negative	Moderat e	Project Area	Long-term	Post Closure	Occasional	Possible	Low	Low	Aquatic Flora & Fauna Downstream water users
Groundwater	171	ARD through the base of the stockpiles if they remain after mine closure.	Negative	Very High	Project Area	Long-term	Post Closure	Frequent	Unlikely	Medium	Medium	Groundwater abstractors
	172	Long term contamination of groundwater from contaminated soils on the former stockpile area.	Negative	High	Project Area	Long-term	Post Closure	Frequent	Possible	Low	Low	Groundwater abstractors
6a. MINE COMPONENT: ENGINEERING WORKSHOPS: CONSTRUCTION PHASE												
Landscape and Visual Character	173	Alteration of visual character of the area due to removal of vegetation and the laying of foundations for the workshop.	Negative	High	Project Area	Permanent	Pre-mining	Continuous	Certain	Medium	Low	None

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Soil	174	Removal of topsoil. This soil will be stockpiled and retained for future rehabilitation programs.	Negative	Moderate	Project Area	Long-term	Pre-mining	Continuous	Certain	Medium	Low	Future Land Use
	175	Soil contamination due to accidental spillages of oil, fuel and lubricants from construction equipment.	Negative	Low	Project Area	Long-term	Pre-mining	Occasional	Probable	Medium	Low	Surface Water Flora
Land Use	176	Land Use in and around the engineering workshop area will be restricted to workshop (construction) activities only. Potential Land Use such as farming will be lost.	Negative	Moderate	Project Area	Long-term	Pre-mining	Continuous	Certain	Low	Medium	Population Income
Noise & Vibration	177	Construction equipment will create localised noise and vibration disturbances.	Negative	Low	Project Area	Long-term	Pre-mining	Frequent	Certain	Low	Low	Fauna
Air	178	Equipment used for construction activities will generate dust which will affect the project area.	Negative	Moderate	Project Area	Long-term	Pre-mining	Frequent	Certain	Low	Low	Flora & Fauna Soil
	179	Localised air pollution from the exhaust fumes of construction equipment.	Negative	Low	Project Area	Long-term	Pre-mining	Frequent	Certain	Low	Low	Local Population

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			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
Surface water	180	Erosion of exposed topsoil by construction activities (removal of soil and vegetation) may increase suspended solids and cause siltation of water courses.	Negative	High	Project Area	Long-term	Pre-mining	Frequent	Possible	Low	Low	Aquatic Flora & Fauna Downstream water users
	181	Removal of soil and vegetation will change the nature of the surface drainage of the project area.	Negative	High	Project Area	Long-term	Pre-mining	Continuous	Probable	Medium	Low	Downstream water users
	182	Contamination of surface watercourses from the accidental release of hydraulic fluid, oil or fuel from construction vehicles.	Negative	Moderate	Project Area	Long-term	Pre-mining	Occasional	Probable	Low	Low	Aquatic Flora & Fauna Downstream water users
Groundwater	183	Contamination of groundwater from accidental releases of fuel and oil from construction vehicles.	Negative	Moderate	Project Area	Long-term	Pre-mining	Occasional	Probable	Medium	Low	Groundwater abstractors
Flora & Fauna	184	Removal of vegetation from the stockpile site causes loss of habitat for small mammals, birds and insects.	Negative	High	Project Area	Long-term	Pre-mining	Continuous	Certain	Medium	Low	None
	185	Dust generated during construction activities will be deposited on the surrounding vegetation.	Negative	Moderate	Project Area	Long-term	Pre-mining	Frequent	Certain	Low	Low	None

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	186	Noise and vibration generated during construction will frighten away wildlife.	Negative	Moderate	Project Area	Long-term	Pre-mining	Frequent	Certain	Low	Low	Species Diversity
Archaeology	188	Disturbance or destruction of cultural or archaeological sites or the discovery of new artefacts.	Negative	High	Project Area	Permanent	Pre-mining	Continuous	Possible	Low	Medium	None
6b. MINE COMPONENT: ENGINEERING WORKSHOPS: OPERATIONAL PHASE												
Soils	189	Soil contamination due to accidental spillages of oil/fuel, greases, battery acid etc from equipment used in the workshop and vehicles in for maintenance.	Negative	High	Project Area	Long-term	Start of Mining	Occasional	Probable	Medium	Low	Surface Water Groundwater Flora
	190	Soil contamination due to poor storage and disposal of waste generated.	Negative	Moderate	Project Area	Long-term	Start of Mining	Occasional	Possible	Low	Low	Surface Water Groundwater Flora
	191	Chemical contamination of soils by wash chemicals used to clean equipment.	Negative	High	Project Area	Long-term	Start of Mining	Occasional	Possible	Low	Low	Surface Water Groundwater Flora
	192	Soil contamination from oil contaminated surface run-off from the workshops.	Negative	High	Project Area	Long-term	Start of Mining	Occasional	Probable	Medium	Low	Surface Water Groundwater Flora

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Surface water	193	Contamination due to carry over of oil, fuel or lubricants with storm water into site drainage system.	Negative	High	Project Area	Long-term	Start of Mining	Occasional	Possible	Medium	Low	Aquatic Flora & Fauna Downstream water users Soil
	194	Contamination of water due to poor management, storage and handling of oils, fuel and lubricants.	Negative	High	Project Area	Long-term	Start of Mining	Occasional	Probable	Medium	Low	Aquatic Flora & Fauna Downstream water users Soil
	195	Contamination of water from dirt and dust deposits on vehicles during servicing and cleaning.	Negative	Moderat e	Project Area	Medium-term	Start of Mining	Frequent	Certain	Low	Low	Aquatic Flora & Fauna Downstream water users Soil
	196	Contamination of water from fuel spills from above ground fuel storage tanks.	Negative	High	Project Area	Long-term	Start of Mining	Occasional	Probable	High	Low	Aquatic Flora & Fauna Downstream water users Soil

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	197	Contamination of surface water by spilled battery acid from inadequate handling and storage of new and used batteries.	Negative	High	Project Area	Medium-term	Start of Mining	Occasional	Possible	Medium	Low	Aquatic Flora & Fauna Downstream water users Soil
Groundwater	198	Contamination of groundwater from accidental spillages of fuel, oil and lubricants due to inadequate handling and storage practices.	Negative	Very High	Project Area	Long-term	Start of Mining	Occasional	Possible	Low	Low	Groundwater abstractors
	199	Contamination of groundwater due to rupture of underground storage tanks.	Negative	Very High	Project Area	Long-term	Start of Mining	Infrequent	Possible	High	Low	Groundwater abstractors
	200	Contamination of groundwater due to seepage of run-off through contaminated soils in the workshop area.	Negative	High	Project Area	Long-term	Start of Mining	Occasional	Possible	Low	Low	Groundwater abstractors
Aesthetics	201	Detraction from the natural beauty of the landscape.	Negative	Moderate	Project Area	Long-term	Start of Mining	Continuous	Certain	Low	Low	None
General Safety	202	Health and safety concerns for mine workers using oils, lubricants and acids in the workshop.	Negative	High	Project Area	Long-term	Start of Mining	Continuous	Certain	Low	Medium	Local Population

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
	203	Health and safety concerns for mine workers operating equipment in the engineering workshops.	Negative	High	Project Area	Long-term	Start of Mining	Continuous	Certain	Low	Medium	Local Population
6c. MINE COMPONENT: ENGINEERING WORKSHOPS - POST CLOSURE PHASE												
Aesthetics	204	Old buildings and foundations detract from the natural beauty of the landscape.	Negative	Low	Project Area	Long-term	Post Closure	Continuous	Probable	Low	Low	None
General Safety	205	Old buildings and foundations cause safety concern for public.	Negative	Moderate	Project Area	Long-term	Post Closure	Continuous	Possible	Low	Medium	Local Population
7a. MINE COMPONENT: TRANSPORT INFRASTRUCTURE - CONSTRUCTION PHASE												
Landscape and Visual Character	206	Alteration of visual character of the area due to removal of Miombo woodland and the top soil.	Negative	High	Project Area	Permanent	Pre-mining	Continuous	Certain	Medium	Low	None
Soil	207	Removal of topsoil. This soil will be stockpiled and retained for future rehabilitation programs.	Negative	Moderate	Project Area	Long-term	Pre-mining	Continuous	Certain	Low	Low	Future Land Use
	208	Soil contamination due to accidental spillages of oil, fuel and lubricants from construction equipment.	Negative	Low	Project Area	Long-term	Pre-mining	Occasional	Probable	Low	Low	Surface Water Flora

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Componen t	Risk to Human Population	Cumulative Effect of Impact
Land Use	209	Land Use in and around the offices, and car park will be restricted to construction of the necessary infrastructure. Potential Land Use such as farming will be lost.	Negative	Moderat e	Project Area	Long-term	Pre-mining	Continuous	Certain	Low	Medium	Population Income
Noise & Vibration	210	Construction equipment will create localised noise and vibration disturbances.	Negative	Low	Project Area	Long-term	Pre-mining	Frequent	Certain	Low	Low	Fauna
Air	211	Construction equipment will generate localised dust impacts.	Negative	Low	Project Area	Short-term	Pre-mining	Frequent	Certain	Low	Low	Flora & Fauna Soil
	212	Exhaust fumes from construction equipment will create localised air pollution.	Negative	Low	Project Area	Short-term	Pre-mining	Frequent	Certain	Low	Low	Local Population
Surface Water	213	Erosion of exposed topsoil by construction activities (removal of soil and woodland) may increase suspended solids and cause siltation of water courses.	Negative	High	Project Area	Long-term	Pre-mining	Continuous	Possible	Low	Low	Aquatic Flora & Fauna Downstream water users
	214	Removal of soil and vegetation will change the nature of the watershed feeding the project watercourses.	Negative	High	Project Area	Long-term	Pre-mining	Continuous	Certain	Medium	Low	Aquatic Flora & Fauna Downstream water users

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
	215	Contamination of surface watercourses from the accidental release of hydraulic fluid, oil or fuel from construction vehicles.	Negative	Moderate	Project Area	Long-term	Pre-mining	Occasional	Probable	Low	Low	Aquatic Flora & Fauna Downstream water users
Groundwater	216	Contamination of groundwater from accidental spillages of fuel, oil and lubricants from construction vehicles.	Negative	Moderate	Project Area	Long-term	Pre-mining	Occasional	Unlikely	Low	Low	Groundwater abstractors
Flora & Fauna	217	Removal of Miombo woodland results in the loss of habitat for small mammals, birds and insects.	Negative	High	Project Area	Long-term	Pre-mining	Continuous	Certain	Medium	Low	None
	218	Construction equipment generates airborne dust which will be deposited on surrounding vegetation.	Negative	Moderate	Project Area	Short-term	Pre-mining	Frequent	Certain	Low	Low	None
	219	Noise and vibration generated during construction will frighten away wildlife.	Negative	Moderate	Project Area	Long-term	Pre-mining	Continuous	Certain	Low	Low	Species Diversity
Aesthetics	220	Detraction from the natural beauty of the landscape.	Negative	Moderate	Project Area	Long-term	Pre-mining	Continuous	Certain	Low	Low	None
Archaeology	221	Disturbance or destruction of cultural or archaeological sites or the discovery of new artefacts.	Negative	High	Project Area	Permanent	Pre-mining	Continuous	Possible	Low	Medium	None

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Componen t	Risk to Human Population	Cumulative Effect of Impact
Migration	222	Influx of people to the Munali Mina in Zambia to find jobs with the mine or to sell produce.	Negative	High	Regional	Long-term	Pre-mining	Continuous	Certain	Low	Medium	Local Population
	223	Migration of young population and skills away from rural areas.	Negative	High	Regional	Long-term	Pre-mining	Continuous	Certain	Low	Medium	Local Population
7b. MINE COMPONENT: TRANSPORT INFRASTRUCTURE - OPERATIONAL PHASE												
Noise & Vibration	224	Heavy equipment and movement of transport vehicles will create localised noise and vibration disturbances.	Negative	Low	Project Area	Short-term	Start of Mining	Frequent	Certain	Low	Low	Fauna Mine Workers
Air	225	Mining equipment and transport vehicles operating on dirt roads will generate dust affecting the project area.	Negative	Moderat e	Project Area	Short-term	Start of Mining	Frequent	Certain	Low	Low	Flora & Fauna Soil
	226	Exhaust fumes from mining equipment and transport vehicles will cause localised air pollution.	Negative	Low	Project Area	Short-term	Start of Mining	Frequent	Certain	Low	Low	Mine Workers
Surface Water	227	Contamination of surface water from accidental releases or spills of fuel, oil, chemicals, acids, reagents or concentrates from	Negative	High	Project Area	Long-term	Start of Mining	Occasional	Probable	Low	Low	Aquatic Flora & Fauna Downstream water users

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Componen t	Risk to Human Population	Cumulative Effect of Impact
		trucks etc										
	228	Contamination of water due to poor management and disposal of domestic and mine waste.	Negative	High	Project Area	Long-term	Start of Mining	Occasional	Probable	Low	Low	Aquatic Flora & Fauna Downstream water users
Groundwater	229	Contamination of groundwater due to accidental spillages of fuel, oil and lubricants from trucks and cars in car park.	Negative	High	Project Area	Long-term	Start of Mining	Occasional	Possible	Medium	Low	Groundwater abstractors
	230	Contamination of groundwater from untreated domestic and mine waste.	Negative	High	Project Area	Long-term	Start of Mining	Occasional	Possible	Medium	Low	Groundwater abstractors
Flora & Fauna	231	Localised noise and vibration created during operations will frighten away wildlife.	Negative	Low	Project Area	Long-term	Start of Mining	Continuous	Certain	Low	Low	Species Diversity
	232	Airborne dust generated by mine equipment and transport vehicles will be deposited on surrounding vegetation.	Negative	Moderat e	Project Area	Short-term	Start of Mining	Frequent	Certain	Low	Low	None

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
Existing Infrastructure	233	Use of the main Lusaka – Livingstone road, by heavy trucks may result in additional pressure exerted onto existing infrastructure	Negative	Low	Regional Area	Long-term	Start of Mining	Continuous	Certain	Low	Medium	Regional Population
Traffic	234	Levels of traffic along the main road between Lusaka and Mazabuka will increase	Negative	Low	Regional Area	Long-term	Start of Mining	Continuous	Certain	Low	Medium	Regional Population
7c. MINE COMPONENT: TRANSPORT INFRSTRUCTURE - POST CLOSURE PHASE												
Aesthetics	235	Detraction from the natural beauty of the landscape by old buildings and car park area.	Negative	High	Project Area	Long-term	Post Closure	Continuous	Certain	Low	Low	None
General Safety	236	Safety concerns to the public entering old buildings and foundations after closure of mine.	Negative	High	Project Area	Long-term	Post Closure	Continuous	Probable	Low	Low	Local Population
8. MINE COMPONENT: WASTE MANAGEMENT												
Soil	237	Unnecessary accumulation of scrap metals and materials that can be sold, reused or recycled.	Negative	High	Project Area	Long-term	Start of Mining	Continuous	Possible	Low	Low	Surface Water

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
	238	Contamination of soil due to inadequate handling, storage or disposal of hazardous waste.	Negative	High	Project Area	Long-term	Start of Mining	Continuous	Probable	Low	Low	Surface Water Flora
	239	Contamination of soil due to inadequate disposal of medical waste.	Negative	High	Project Area	Long-term	Start of Mining	Continuous	Probable	Medium	Low	Surface Water Flora & Fauna
Surface Water	240	Contamination of surface water due to inadequate handling, storage or disposal of hazardous waste.	Negative	High	Project Area	Long-term	Pre-mining	Continuous	Probable	Medium	Low	Aquatic Flora & Fauna Downstream water users
Groundwater	241	Contamination of groundwater due to inadequate handling, storage or disposal of hazardous waste.	Negative	High	Project Area	Long-term	Pre-mining	Continuous	Probable	Medium	Low	Groundwater abstractors
9. MINE COMPONENT: MATERIALS HANDLING & STORAGE												
Soil	242	Contamination of soil due to leak or rupture of below ground fuel storage tanks.	Negative	Very High	Project Area	Long-term	Start of Mining	Infrequent	Unlikely	High	Low	Groundwater
	243	Contamination of soil due to spills of greases, oils and/or chemicals during handling and storage.	Negative	Moderate	Project Area	Long-term	Pre-mining	Occasional	Probable	Low	Low	Surface Water

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
Surface Water	244	Contamination of water due to fuel spills.	Negative	High	Project Area	Medium-term	Pre-mining	Occasional	Probable	Medium	Low	Downstream water users
	245	Contamination of water due to handling spill or leak/rupture of fuel tank/tanker.	Negative	Very High	Project Area	Long-term	Start of Mining	Infrequent	Unlikely	Medium	Low	Flora & Fauna Soil
	246	Contamination of water due to untreated run-off from fuel storage area entering site drainage system.	Negative	High	Project Area	Medium-term	Start of Mining	Occasional	Possible	Low	Low	Soil
	247	Contamination of water due to run-off of area where chemicals and reagents are stored.	Negative	High	Project Area	Medium-term	Start of Mining	Occasional	Probable	Low	Low	Flora & Fauna Soil
10. MINE COMPONENT: RESETTLEMENT OF CHINKOMBA VILLAGE												
Landscape and Visual Character	248	Alteration of visual character of the resettlement area due to removal of Miombo woodland and the top soil.	Negative	High	Resettled Site	Permanent	Pre-mining	Continuous	Certain	Medium	Low	None
Soil	249	More intensive agricultural demand on the land surrounding the new village may lead to soil erosion.	Negative	Moderate	Resettled Site	Permanent	Pre-mining	Continuous	Certain	Low	Low	Surface Water Flora & Fauna

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
	250	Removal of 10ha of Miombo woodland causes exposure of topsoil to the elements and loss of fertile topsoil.	Negative	High	Resettled Site	Permanent	Pre-mining	Continuous	Certain	Low	Low	Flora & Fauna
Land Use and Settlement	251	Land Use in and around the relocation site will be limited to resettlement of the village and its fields. Existing Land Use will be lost.	Negative	High	Resettled Site	Permanent	Pre-mining	Continuous	Certain	Low	Low	Population Income
	252	Resettlement of indigenous peoples directly affected by mining activities.	Negative	High	Project Area	Permanent	Pre-mining	Continuous	Certain	Low	Medium	None
	253	Destruction of crops to make way for mine development.	Negative	Moderate	Project Area	Permanent	Pre-mining	Continuous	Certain	Low	Low	Population Income
Surface water	254	Lack of nearby sources of surface water at the relocation site.	Negative	Moderate	Resettled Site	Permanent	Pre-mining	Continuous	Certain	Low	Low	Local Population
	255	Removal of soil and vegetation will change the nature of the local watercourses.	Negative	High	Resettled Site	Permanent	Pre-mining	Continuous	Certain	Medium	Low	None
Groundwater	256	Potentially a necessity to abstract groundwater for use in relocated village.	Negative	Moderate	Resettled Site	Permanent	Pre-mining	Continuous	Certain	Low	Low	Groundwater Abstractors

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
Flora & Fauna	257	Removal of 10ha of Miombo woodland causes loss of habitat for small mammals, birds and insects.	Negative	High	Resettled Site	Permanent	Pre-mining	Continuous	Certain	Medium	Low	Soil
	258	Dust generated from exposed topsoil may be deposited on surrounding vegetation.	Negative	Low	Resettled Site	Long-term	Pre-mining	Frequent	Probable	Low	Low	None
	259	Cutting down of trees in new area for charcoal production and timber for new housing.	Negative	High	Resettled Site	Long-term	Pre-mining	Continuous	Certain	Low	Low	Species Diversity
Economic diversification	260	Development of new business due to proximity to the Zambia railway and road network.	Positive	High	Resettled Site	Long-term	Pre-mining	Continuous	Probable	Low	Medium	Local Population
11. MINE COMPONENT: SOCIO-ECONOMIC & CULTURAL IMPACTS (MUNALI)												
Local employment	261	Project development will generate job opportunities for the local population.	Positive	High	Regional	Long-term	Pre-mining	Continuous	Certain	Low	Low	Economic Development
	262	Influx of people into the Munali area looking for work.	Negative	Moderate	Regional	Long-term	Pre-mining	Continuous	Certain	Low	Low	Local Population
	263	Improved quality of labour and employee competency by implementation of training & development	Positive	High	Regional	Long-term	Start of Mining	Continuous	Certain	Low	Low	Local Population

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
		programmes.										
Contractor employment	264	Increased competency and managerial capacity of local contractors.	Positive	High	Regional	Long-term	Pre-mining	Continuous	Certain	Low	Low	Local Population
	265	Influx of skilled contractors to Munali, where there is little economic potential at present.	Positive	High	Regional	Long-term	Pre-mining	Continuous	Probable	Low	Low	Local Population
Employee housing	266	Materials and some aid provided by the mine for construction of some mine employee housing in Chinkomba.	Positive	High	Regional	Long-term	Pre-mining	Continuous	Certain	Low	Low	Local Population
Employee retrenchment	267	Retrenchment packages to promote sustainable livelihoods. Counselling of employees prior to retrenchment.	Positive	High	Regional	Long-term	Start of Mining	Continuous	Certain	Low	Low	Local Population
Power Supply	268	Supply of electricity will be from ZESCO and excess will be supplied to the businesses and residents in Chinkomba.	Positive	High	Regional	Long-term	Start of Mining	Continuous	Certain	Low	Low	Local Population Economic Development
Water Supply	269	Provision of clean water via small network of standpipes from a water storage tank filled by settled dewatering water.	Positive	High	Regional	Long-term	Start of Mining	Continuous	Certain	Low	Low	Local Population

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
11.1. LOCAL & REGIONAL ECONOMIC DEVELOPMENT												
Local business enhancement	270	Improvement of business multipliers and reduction of unemployment through local procurement.	Positive	High	Regional	Long-term	Pre-mining	Continuous	Certain	Low	Low	Economic Development
	271	Improved access to electricity through liaisons with ZESCO creates possibility for expansion of business opportunities in Chinkomba.	Positive	High	Regional	Long-term	Start of Mining	Continuous	Certain	Low	Low	Economic Development
Housing	272	Improved housing as a result of the resettlement process which awards Chinkomba Village residents compensation worth 150% more than a generous estimate of their current land	Positive	High	Local	Long-term	Pre-mining	Continuous	Certain	High	Low	Economic Development
Economic diversification	273	Expansion of opportunities for alternative economic activities in the Project area and surrounding areas.	Positive	High	Regional	Long-term	Pre-mining	Continuous	Certain	Low	Low	Economic Development
11.2 LAND USE AND SETTLEMENT												

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Componen t	Risk to Human Population	Cumulative Effect of Impact
Land use and settlement	274	Danger to the general public from access to the areas of mining operations.	Negative	High	Project Area	Permanent	Post Closure	Continuous	Probable	Low	Medium	Local Population
	275	Dewatering from the mine workings may cause the drying up of the boreholes within the project area, which is the source of water for Villagers.	Negative	High	Regional	Medium-term	Start of Mining	Continuous	Probable	Medium	Medium	Local Population
	276	Felling of the Miombo woodland by the local community.	Negative	High	Regional	Long-term	Pre-mining	Continuous	Certain	Low	Low	Flora & Fauna
	277	Danger from supernatant, open pit water, effluent streams and mine site run-off if used by local communities for potable water or farming.	Negative	High	Project Area	Long-term	Start of Mining	Continuous	Possible	Low	Low	Local Population
11.3 HEALTH PLAN												
Healthcare for employees	278	Provision of basic healthcare, sanitation and clean water for employees and their immediate dependents.	Positive	High	Project Area	Long-term	Start of Mining	Continuous	Certain	Low	Low	Local Population
	279	Prevention of the spread of HIV/AIDS amongst employees and their families.	Positive	High	Regional	Long-term	Start of Mining	Continuous	Certain	Low	Low	Local Population

Table 5.3 Impact Characterisation Table

Aspect/ Issue	No.	Potential Environmental Impact	Environmental Impact Characterisation									
			Positive / Negative Impact	Intensity of Impact	Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Value of Affected Component	Risk to Human Population	Cumulative Effect of Impact
	280	Reduction of the incidence of Malaria amongst workers and their families and the community through malaria rollback programs.	Positive	High	Regional	Long-term	Start of Mining	Continuous	Certain	Low	Low	Local Population
Healthcare for Munali and Nearby towns	281	Health facilities in Munali and nearby towns will be upgraded to treat the employees of the mine by drug provision etc.	Positive	High	Regional	Long-term	Start of Mining	Continuous	Certain	Low	Low	Local Population
11.4 PUBLIC CONSULTATION												
Consultation with the public	282	Building of a relationship between ALBIDON and all stakeholders based on communication and transparency.	Positive	High	Regional	Long-term	Pre-mining	Continuous	Certain	Low	Low	Local Population

APPENDIX VIII

MUNALI MINE ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN

Table 7.1 Albidon Environmental Management Plan

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions?	
				Start	End
1. MINE COMPONENT:- ENVIRONMENTAL MONITORING PROGRAM					
Surface Water Monitoring	To assess the quality of surface water in the project area quantify the level of contamination caused by discharges into receiving waters and to determine if the final discharge is in compliance with statutory limits.	1	Surface Water will be monitored at 8 locations outlined in table 7.3. Sampling will be carried out on a weekly and monthly basis as defined in table 7.4.	2007	Ongoing
		2	Field Water Quality Measurements will be carried out for EC and pH in conjunction with weekly monitoring.	2007	Ongoing
		3	Flow Rate measurements will be carried out at the final discharge point, mine dewatering channel and flow between the tailings storage facility and process plant.	2007	Ongoing
Groundwater monitoring	To assess the quality of groundwater in the project area and quantify the level of contamination caused by underground operations and to determine if groundwater quality is in compliance with statutory limits. .	4	Groundwater will be monitored at 6 locations (as defined in table 7.6). Sampling will be carried out on a weekly and monthly basis for the parameters outlined in table 7.7	2007	Ongoing
Dust monitoring	To assess the air quality at strategic areas of the mine which are prone to produce dust and quantify the level of dust exposure to workers and ensure compliance with air quality (dust) standards	5	Dust monitoring will be undertaken at the crushing plant, concentrate stockpiles, Tailings Dam and Waste Rock Dump on a monthly basis. Dust will be analysed for respirable dust and heavy metal content. Dust masks will be provided to employees in designated dusty areas.	2007	Ongoing
Noise Monitoring	To assess noise levels in and around the project area, to quantify noise levels and designate noisy areas which require workers to wear hearing protection	6	Noise monitoring will be undertaken on an annual basis at strategic work places. Areas above 75dBA will be designated noisy areas where hearing protection must be worn.	2007	Ongoing
Vibration Monitoring	To quantify the level of vibration caused during blasting at sensitive areas.	7	Vibration monitoring during blasting will be carried out on an annual basis at Chinkomba and Mugoto Villages and evaluated against the US Bureau of Mines (USBM) vibration standards.	2007	Ongoing
Soil Monitoring	To assess soil quality in and around the vicinity of the project area and determine the level of soil contamination.	8	An annual soil monitoring program will be implemented to evaluate the levels of soil contamination at the waste rock dump, tailings storage facility, stockpiles and processing facilities (8 samples will be collected from the perimeter of each facility and analysed for pH SO_4 and Ni)	2007	Ongoing
Environmental Monitoring Reports	To collate and manage all environmental monitoring data for easy access and review.	9	All environmental monitoring data (surface water, groundwater, air quality, noise, vibration and soil) will be stored in a database and an annual report produced summarising monitoring carried out, results and possible amendments to the monitoring plan.	2007	Ongoing
Post Closure Environmental	To assess the condition of the environment after the cessation of	10	Post-closure (Monthly) environmental monitoring will include the following tasks:- • Surface water sampling across the mine site; and	End of Operations	5 Years Post

<table>
<tr><th rowspan="2">What needs to be managed?</th><th rowspan="2">Why does it need to be managed?</th><th rowspan="2">Item No.</th><th rowspan="2">How should it be managed?</th><th colspan="2">Timing of management actions?</th></tr>
<tr><th>Start</th><th>End</th></tr>
<tr><td>Monitoring</td><td>operations.</td><td></td><td>• Groundwater sampling at the plant area, TSF and workshop.
Surface water samples will be collected at the following sites: -
1. Drainage from the former process plant area;
2. Drainage from the former ROM Pad;
3. The flooded underground;
4. Drainage from the waste rock dump;
5. Drainage from the TSF;
6. Drainage from the workshop and former ore stockpile area; and
7. local Streams

Surface water samples will be submitted to an independent accredited laboratory and analysed for the key parameters pH, EC, TSS, TDS, SO_4 and Ni.

Groundwater samples will be collected from the 6 piezometer boreholes located at the disused TSF, former process plant and workshop. The groundwater samples will be submitted to an independent accredited laboratory and analysed for the key parameters pH, EC, TDS, SO_4, and Ni.</td><td></td><td>Closure</td></tr>
<tr><td colspan="6">2. MINE COMPONENT: UNDERGROUND MINE WASTE ROCK DUMP
2.1 WASTE ROCK DUMP - PRE-CONSTRUCTION PHASE</td></tr>
<tr><td>Removal of commercial timber.</td><td>To ensure that the timber resource is not wasted and its commercial value is realised.</td><td>11</td><td>Albidon will liase with the Forestry Department to have any commercial timber that will be affected by expansion of the existing overburden dump, surveyed and valued. A timber merchant will be employed to selectively fell and remove all commercial timber from the overburden dump site.</td><td>2007</td><td>2007</td></tr>
<tr><td>Removal of non-commercial timber.</td><td>To ensure that non-commercial timber benefits the local community.</td><td>12</td><td>Non-commercial timber will be felled and the local community allowed to collect it at no charge.</td><td>2007</td><td>2007</td></tr>
<tr><td>Stripping and storing of vegetation and topsoil.</td><td>To provide organic material and soil to assist in rehabilitation of the mine site.</td><td>13</td><td>The mine will in so far as it is practicable to do so, strip and remove vegetation and topsoil from the overburden dump sites and access haul road areas to a dedicated storage area.</td><td>2007</td><td>Ongoing</td></tr>
<tr><td>Releases to</td><td>To prevent contamination of the Kimfwi</td><td>14</td><td>Vegetation and topsoil will only be stripped from specified dumping areas.</td><td>2007</td><td>Ongoing</td></tr>
</table>

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions? Start	End
surface water.	River as a result of soil erosion.				
		15	A perimeter storm drain will be constructed around the overburden dump to collect and manage surface runoff.	2007	Ongoing
		16	Run-off from the overburden dump area will be treated in settling ponds prior to release to surface water.	2007	Ongoing
Public safety.	To prevent inadvertent access by the public into work areas.	17	Albidon will inform the public of the dangers of entering areas of mining operations through public consultation, liaison with local community leaders and erection of warning signs. Mine security will remove intruders from operational areas.	2007-	Ongoing
2. MINE COMPONENT: MUNALI UNDERGROUND WASTE ROCK DUMP 2.2 WASTE ROCK DUMP - OPERATIONAL PHASE					
Releases to surface water.	To control runoff and sediment from dump walls and minimise erosion.	18	Albidon will develop a dumping strategy whereby weathered overburden materials are identified and dumped in central areas of the dump. More competent waste materials will be used to construct outer walls and to dress dump slopes.	2007	Ongoing
		19	Dump walls will be constructed with overall slope angles of 1:4, inter-berm slope angles of 1:3, 10 metre wide berms and 10 metre vertical lifts.	2007	Ongoing
		20	Overburden dumps will be of terrace construction i.e. no end-dumping will be carried out.	2007	Ongoing
Releases to surface water.	To control runoff and sediment from dump walls and minimise erosion.	21	Dumps construction will be regularly monitored to check that construction is as per design.	2007	Ongoing
		22	All silt traps and dump perimeter drains will be regularly monitored and maintained. Silt traps and drains will be cleared of solids in October prior to the start of the wet season and as necessary. Solids removed from the silt traps will be dumped on the overburden dumps.	2007	Ongoing
	To monitor and assess the quality of dump wall surface runoff and any	23	The quality of dump wall runoff and seepage (if any) will be monitored as specified in the Munali Mine Environmental Monitoring Plan.	2007	Ongoing

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions? Start	End
	seepage.				
Releases to groundwater	To monitor and assess the quality of water percolating through the WRD and potentially contaminating the groundwater environment.	24	Groundwater in the vicinity of the WRD will be monitored inline with the Munali Mine Environmental Monitoring Program	2007	Ongoing
Releases to air.	To control/minimise the generation of dust from the movement of haul trucks and other heavy equipment on the overburden dumps.	25	Active areas of the overburden dump will be routinely sprayed with water in order to suppress dust during tramming and placement of waste material.	2007	Ongoing
Waste generation.	To prevent contamination of soil and water as a result of inadequate handling and disposal of non-hazardous waste.	26	Non-hazardous waste will not be stored on the overburden dumps unless done in accordance with the Albidon Waste Management Policy and then only in dedicated areas.	2007	Closure
Noise / vibration.	To minimise noise levels resulting from the operation and movement of heavy equipment.	27	If necessary, 24 hr noise monitoring will be conducted and the results used to develop appropriate mitigation measures.	2007	Ongoing
Public safety.	To prevent the public from entering mine dump areas.	28	Albidon will erect warning signs around the dumps. Mine security will patrol the area and remove intruders.	2007	Ongoing
2. MINE COMPONENT: WASTE ROCK DUMP **2.3 WASTE ROCK DUMP: CLOSURE PHASE**					
Environmental Impact	To reduce the impact of the Waste Rock Dump on the Environment at Closure	29	Albidon will investigate ways of using the waste rock for alternative uses such as road aggregate. In the vent that no alternative can be found the WRD will be re-habilitated with vegetation.	End of Operations	5 Years Post Closure
		30	Albidon will continue monitoring the condition of the environment around the vicinity of the WRD for a minimum of 2 years post closure. Any identified contamination will be cleaned up.	End of Operations	5 Years Post Closure
3. MINE COMPONENT: ROM PAD & PROCESSING FACILITIES **3.1 ROM PAD & PROCESSING FACILITIES - CONSTRUCTION PHASE**					
Stripping and storing of vegetation and topsoil.	To provide organic material and soil to assist in rehabilitation of the mine site.	31	The mine will in so far as it is practicable to do so, strip and remove vegetation and topsoil from the plant and ROM pad areas to a dedicated storage area.	2007	2007
Releases to	To prevent contamination of water as a	32	Storm water cut-off drains will be constructed around the perimeter of the plant and ROM	2007	Ongoing

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions?	
				Start	End
surface water.	result of soil erosion.		pad area. The storm water drains will discharge into the site drainage channel and eventually the local water courses.		
Management of contractors.	To prevent the general disturbance of the environment through waste generation, excavation, tree felling, unauthorised construction etc...	33	Environmental management requirements will be incorporated into all contract documents between the contractor and Albidon.	2007	Ongoing
		34	Contractors will be monitored and audited against environmental requirements specified in the contract.	Start of Contract	End of contract
Management of contractors.	To prevent the general disturbance of the environment through waste generation, excavation, tree felling, unauthorised construction etc...	35	The principal contractor will submit a construction environmental management plan to be approved by the Albidon Environmental Officer. Albidon will provide relevant information and environmental policies to the contractor to assist in preparation of this plan e.g. general waste management, hazardous materials, water use and sewage management.	Start of Contract	Start of Contract
		36	The principal contractor (all employees and sub-contractors) will attend an induction course on Safety, Health and Environment before being allowed on site.	Start of Contract	Start of Contract
		37	Contractors will provide their own temporary accommodation, kitchen and ablution facilities. Responsibility for the removal of all temporary facilities and rehabilitating areas back to their original state will rest with the contractor.	Start of Contract	End of contract
Public safety.	To prevent inadvertent access by the public into work areas.	38	Albidon will inform the public of the dangers of entering site construction areas and erect warning signs.	2007	Ongoing
3. MINE COMPONENT: ROM PAD & PROCESSING FACILITIES **3.2 (a) ORE CRUSHING & TRANSFER - OPERATIONAL PHASE**					
Releases to surface water.	To prevent soil and water contamination due to silt in surface runoff from the ROM pad and transient ore stockpiles.	39	Surface runoff from the ROM pad and transient ore stockpiles will be collected in silt traps or sedimentation ponds. Clear water will be discharged into the main site drain and local streams. The sedimentation ponds will be regularly maintained and cleared of solids. The solids will be returned to the plant process.	2007	Closure

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions? Start	End
Releases to air.	To minimise the release of dust from ore stockpile, crushing circuit and bulk crushed ore transfer points.	40	Water carts will operate on the ROM pad to suppress dust.	2007	Ongoing
		41	Water sprinkler systems will operate in the crushing circuit and at bulk ore transfer locations to suppress dust.	2007	Ongoing
	To assess the performance of dust suppression systems.	42	Air quality control equipment will be installed in critical areas and an air quality monitoring programme implemented to assess system performance.	2007	Ongoing
Noise / vibration.	To minimise noise levels resulting from the operation of the crusher circuit and movement of heavy equipment.	43	If necessary, 24 hr noise monitoring will be conducted and the results used to develop appropriate mitigation measures.	2007	Ongoing
Public safety.	To prevent inadvertent access by the public into work areas.	44	Albidon will inform the public of the dangers of entering areas of operations and erect warning signs.	2007	Ongoing
3.2 (b) Concentrator - OPERATIONAL PHASE					
Releases to surface water.	To prevent the contamination of water resulting from plant process spills.	45	All plant process spills will be collected in drainage sumps and returned to the process circuit.	2007	Ongoing
	To prevent the contamination of water due to wash water from plant maintenance activities.	46	All wash water produced from the maintenance of storage tanks and process equipment washing will be collected and introduced into the process circuit.	2007	Ongoing
	To prevent the contamination of water resulting from the contact between process spills, acid spills, concentrate or leach residue and storm water i.e. to prevent carry over of spillages into plant site drainage system.	47	Storm water drains will be kept clear of debris to prevent overflow of drains into processing areas.	2007	Ongoing
		48	Plant spills of process solution, concentrate and/or leach plant residue will be collected in sumps and pumped back to the process.	2007	Ongoing

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions? Start	End
Seepage to groundwater.	To prevent the contamination of groundwater due to leaks from process water ponds and process spills.	49	All process water pipes and storage areas will be regularly maintained to prevent leakage.	2007	Ongoing
		50	Groundwater quality around the process plant will be monitored from boreholes equipped with piezometers.	2007	Ongoing
Soil.	To prevent the contamination of soil resulting from leaks.	51	The floors of the process plant will be fitted with impervious surfacing and have containment to prevent seepage of any spill into underlying soils or surface water. Spills or leaks will be collected in sumps and returned to the process.	2007	Ongoing
Releases to air.	To ensure that the dust concentration in air, complies with Zambian environmental regulations on dust emissions.	52	Albidon will regularly monitor dust concentrations in and around the process plant area and down wind of the mine site as part of its ongoing environmental monitoring programme.	2007	Ongoing
Spills and/or accidental releases.	To prevent contamination of soil and water resulting from overflow of oil traps.	53	Oil traps installed around machinery in the mill to capture spills will be regularly serviced and maintained. Oily residues will be stored in drums in a designated area awaiting collection by recycling company.	2007	Ongoing
	To prevent contamination of soil and water due to spillage caused by equipment failure.	54	Process tanks, pipes, pumps and other equipment will be subject to a preventative maintenance programme aimed at reducing spill in the event of equipment failure. Equipment and containment areas will regularly inspected. Inspection reports will be used to identify areas of concern and in need of repair.	2007	Ongoing
	To prevent contamination of soil, water or air resulting from accidental spills or releases of process reagents or chemicals caused by inadequate handling, storage or transport thereof.	55	Handling and storage of reagents will be done according to procedures on materials handling outlined in Section 9.	2007	Ongoing
		56	Process reagents and chemicals will be moved around the site in accordance with the	2007	Ongoing

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions?	
				Start	End
			materials handling procedures.		
		57	Regular inspections of reagent storage and containment areas, and containers will be conducted.	2007	Ongoing
		58	In the event of a spill, spilled materials will be removed and the area cleaned-up as soon as possible. If appropriate, soil and/or water samples will be taken to confirm effectiveness of the clean-up.	2007	Ongoing
	To prevent contamination of soil, water or air resulting from accidental spills or releases of process reagents or chemicals caused by inadequate handling, storage or transport thereof.	59	An inventory control procedure will be implemented to track and document the flow of process chemicals and reagent through the process facility.	2007	Ongoing
Spills and/or accidental releases.	To minimise the risk of spillage of tailings residue during transfer by pipeline to the TRSF	60	The pipe line transferring the tailings residue to the RSF will be subject to a preventative maintenance programme. The operation will be closely controlled to prevent over loading of trucks and minimise the risk of an accident.	2007	Ongoing
		61	The pipeline from the process plant to the RSF will be inspected daily for spilled material.	2007	Ongoing
		62	In the event of a spill, spill response procedures and measures as outlined in the Spill Response Plan will be followed.	2007	Ongoing
	To prevent contamination of water and soil due to leaks and spills from process equipment, thickeners, agitators clarifiers, burst pipelines and accidental releases from various locations in the plant.	63	In the event of a spill, spilled materials will be removed and the area cleaned-up as soon as possible. If appropriate, soil and/or water samples will be taken to confirm effectiveness of the clean-up.	2007	Ongoing
		64	A preventative maintenance programme will be implemented for pipelines, valves, pumps, storage tanks, thickeners, clarifiers, agitators and all process plant infrastructure as well as drains and containment structures/areas. This will include a visual inspection programme.	2007	Ongoing

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions? Start	End
		65	Spill containment areas will be cleaned on a regular basis to ensure adequate storage capacity.	2007	Ongoing
General releases.	To prevent the contamination of water, soil and air due to exposure of concentrate trucks to rain.	66	Tarpaulins will be used on open top bulk concentrate transport trucks to provide protection from the elements.	2007	Ongoing
Water consumption.	To control, optimise and efficiently utilise raw water in the mill and concentrator.	67	Water input and output in the mill and leach plant (major streams) will be monitored and the data used to update the plant and site water balance.	2008	Ongoing
Public safety.	To prevent inadvertent access by the public into the plant area.	68	Albidon will erect a security fence around the process plant site and warning signs. Access will be via a security gate.	2007	Ongoing
3. MINE COMPONENT: ROM PAD & PROCESSING FACILITIES **3.3 CLOSURE PHASE**					
Surface Water	To ensure that impacts to surface water are removed during post closure	69	All ore on the ROM Pad and transient ore stockpiles will be processed. The area will be re-profiled to establish the natural drainage pattern.	End of Operations	5 Years Post Closure
Infrastructure	To ensure that the area is returned to its natural condition and recover some value of the remaining facilities	70	The following plant and equipment dismantling and disposal practices will be applied to the crusher plant, mill, process plant and workshops, provided there are no demands on them from the local businesses or people. :- 1. Removal of all brick buildings; 2. Breaking out and removal of all concrete foundations; 3. Removal of steel frames; 4. Demolish reinforced concrete structures and dispose of on site; 5. Remove HDPE liners and backfill all process ponds; 6. Remove electrical equipment, pumps, motors, and other fixed equipment; 7. Remove all above and below ground fuel storage tanks; 8. Cut up and remove all steel tanks and vessels;	End of Operations	5 Years Post Closure

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions? Start	End
			9. Remove all pipelines; 10. Dig up and remove all below ground electricity cables; 11. Remove conveyor belting; 12. Remove all mechanical equipment; 13. Materials handling areas will be cleared of all raw materials; 14. General site clean up; 15. Site levelling and profiling to re-establish the natural drainage pattern across the site; and 16. Re-distribution of the stockpiled soils and re-vegetation of the site with indigenous grasses and trees. 17. Plant machinery, steel, HDPE liners, pipelines will be auctioned off or sold		
		71	Concrete foundations will be retained for use as foundations for future buildings if required.	End of Operations	5 Years Post Closure
Waste Disposal	To ensure that all waste is removed and re-used recycled, sold, or disposed of in a responsible manner.	72	Scrap metals and equipment will be sorted and sold to the local community, businesses and scrap metal merchants. The company will remove all equipment and materials that cannot be reused, recycled or sold, to an approved non-hazardous disposal site.	End of Operations	5 Years Post Closure
		73	Septic tanks will be emptied and filled in and the sludge dried for use in the re-vegetation process.	End of Operations	5 Years Post Closure
Flora	To return the area to Baseline vegetation levels.	74	A re-vegetation program will be implemented by Albidon across the mine area. An experienced ecologist will be contracted to manage this process during operations and post closure	2008	5 years post closure
Public Safety	To ensure the safety of the public during post closure activities	75	Access will be restricted to the mine until a time when it is certified safe by the Mines Safety Department and Environmental Council of Zambia	End of Operations	5 Years Post Closure
4. MINE COMPONENT: TAILINGS STORAGE FACILITY **4.1 TAILINGS STORAGE FACILITY - CONSTRUCTION PHASE**					
Removal of commercial timber.	To ensure that the timber resource is not wasted and its commercial value is realised.	76	Albidon will liase with the Forestry Department to have any commercial timber affected by site clearance for the residue storage facility surveyed and valued. A timber merchant will be employed to selectively fell and remove all commercial timber from the overburden dump site.	2007	2007

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions? Start	End
Removal of non-commercial timber	To ensure that non-commercial timber benefits the local community.	77	Non-commercial timber will be felled and the local community allowed to collect it at no charge.	2007	2007
Stripping and storing of vegetation and topsoil.	To provide organic material and soil to assist in rehabilitation of the mine site.	78	The mine will in so far as it is practicable to do so, strip and remove vegetation and topsoil from the residue storage facility to a dedicated storage area.	2007	2007
Releases to surface water.	To prevent contamination of the local streams as a result of soil erosion.	79	A perimeter storm drain will be constructed around the residue storage facility to collect and manage surface runoff.	2007	Ongoing
		80	Run-off from the residue disposal area will be treated in settling ponds prior to release to surface water.	2007	2007
4. MINE COMPONENT: TAILINGS STORAGE FACILITY 4.2 RESIDUE STORAGE FACILITY - OPERATIONAL PHASE					
Releases to surface water.	To prevent the contamination of the local stream due to discharge of effluent with elevated levels of suspended solids, sulphate or metals.	81	The leach residue will be pressure filtered and the filtrate recycled in the leach plant. The 'dry' filter cake waste (82% solids) will be transported to the RSF by truck.	2007	Ongoing
		82	There will be no drainage from the RSF during the dry season. During the wet season, rainfall will be pumped from the RSF to the plant and used as process water.	2007	Ongoing
		83	The quality surface run-off from the perimeter of the RSF will be regularly monitored.	2007	Ongoing
Groundwater	To prevent the local contamination of groundwater resulting from seepage through the base of the residue storage facility.	84	The tailings will be neutralised with lime prior to deposition at the TRSF.	2007	Ongoing
Releases to air.	To prevent dust generation from exposed residue surfaces, which may result in localised air pollution and soil contamination adjacent to the residue storage facility.	85	Dust blow will be prevented during the dry season in active dumping areas by sprinkling water in a controlled manner.	2007	Ongoing
		86	Dust generation will be assessed during operations and if necessary, dust levels will be monitored.	2007	Ongoing

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions? Start	End
Spills and/or accidental releases.	To prevent contamination of soil and water and accumulation of leach residue filter cake along the transport route between the leach plant and the RSF due to spills and accidental releases.	87	The pipe line transporting the filter cake to the RSF will be of a suitable type for transporting such material and be regularly maintained. The pipe line will be monitored to prevent overloading and speeding. The route will be regularly checked for spills.	2007	Ongoing
		88	Residue spill material will be removed to the residue storage facility.	2007	Ongoing
Incident/safety risk.	To prevent failure of the residue storage facility due to overtopping or erosion.	89	The RSF will be operated in accordance with the procedures in the designer's operating manual.	2007	Ongoing
		90	Under normal operating conditions, water will not be allowed to accumulate in the RSF.	2007	Ongoing
		91	In the event of a 1: 100 year 24 hr storm event, excess water will be attenuated in the dam and subsequently discharged via the decant and recycled in the plant.	2007	Ongoing
		92	The dam wall, decant, sump and return pumping system, and perimeter toe drain will be inspected weekly and an inspection record kept at the mine.	2007	Ongoing
		93	In an emergency, procedures laid down in the Emergency Response Plan will be followed.	2007	Ongoing
	To ensure public safety and discourage people from walking on the residue storage facility.	94	Signs will be erected around the residue storage facility to warn people of the dangers of drowning or drinking water.	2007	Ongoing
4. MINE COMPONENT. TAILINGS STORAGE FACILITY 4.3 CLOSURE PHASE					
Releases to Surface Water	To assess the quality of water being discharged into the surface water regime.	95	Surface water monitoring will be undertaken monthly from the tailings discharge point (when discharging) up to 5 years post closure or until water quality results indicate that contamination of surrounding surface water is unlikely. In the event the contamination is	End of Operations	5 Years Post Closure

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions? Start	End
			recognized actions to address the situation will be developed and implemented.		
Releases to Groundwater	To assess the quality of water being discharged into the groundwater regime.	96	Groundwater monitoring will continue monthly at the remaining boreholes situated around the vicinity of the tailings dam for 5 years post closure or up until a time when no contamination of the groundwater regime is evident. In the event of contamination of groundwater Albidon will investigate methods to treat the groundwater or restrict access to the groundwater resource.	End of Operations	5 Years Post Closure
Flora and Fauna	To re-establish vegetation and possible habitats on affected areas	97	A re-vegetation program will be implemented on closed areas of the tailings dam during operations. This process will be managed by a experienced ecologist.	2008	5 Years Post Closure
5. MINE COMPONENT: MINE WORKSHOPS **5.1 MINE WORKSHOPS - OPERATIONAL PHASE**					
Release to surface water.	Contamination of water due as a result of carry over of oil with storm water and entry into site drainage network.	98	Washing of mobile equipment and machine parts will be done in designated wash bays equipped with impervious floor and containment. All drainage from wash bays will pass through an oil trap prior to release into the site drainage network. Oil traps will be regularly inspected to monitor condition and performance. Oil traps will be regularly serviced. Oil residue will be collected in drums and stored in an approved area awaiting collection by a re-cycling company. Sludge accumulated in the oil traps will be treated as a hazardous material and disposed of at an approved disposal site.	2007	Ongoing
		99	Oil traps will be installed in drains at all oil handling and storage areas to capture and recover all oily residue present in site drainage. This will prevent carry over of oil with storm water.	2007	Ongoing
	Poor housekeeping, handling spills etc...	100	Regular inspections of the workshop areas will be conducted as part of a preventative	2007	Ongoing

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions?	
				Start	End
	Can result in contamination of surface runoff.		maintenance programme to monitor potential sources of contamination.		
Release to soil.	Contamination of soil due to inadequate handling and storage of new and used oil.	101	All new and used oil will be stored in designated areas; oil handling and storage areas will have impervious surfaces, containment, impact and fire protection; protection against sun and rain; drains from handling and storage areas will be equipped with oil traps; waste oil will be re-cycled and quantities of stored waste oil will be kept to a minimum.	2007	Ongoing
		102	Oil handling and storage areas will be subject to regular inspection. Inspection results will determine service, maintenance and repair requirements.	2007	Ongoing
		103	Workshop mechanics and operators will receive training on oil handling and disposal. The programme will focus on environmental awareness, safe handling procedures, spill reporting and spill response/action.	2007	Ongoing
Release to soil	Contamination of soil due to inadequate handling and storage of new and used batteries.	104	All new batteries will be handled and stored in designated areas. Storage areas will be equipped with impervious floors and containment, impact and fire protection and protection against sun and rain. All spills will be treated as contaminated waste. Used batteries will be stored in a dedicated area awaiting collection by the supplier for re-cycling. Quantities of used batteries in storage will be kept to a minimum.	2007	Ongoing
Spills and/or accidental releases.	Contamination of soil and water due to accidental release of oils.	105	Spills will be handled in accordance with procedures outlined in the Albidon Emergency Response Plan. The procedures detail measures to be effected in the event of a spill. These include: people to be notified; emergency equipment to be used; corrective actions; rehabilitation requirements; and handling and disposal of any contaminated wastes.	2007	Ongoing

<table>
<tr><th rowspan="2">What needs to be managed?</th><th rowspan="2">Why does it need to be managed?</th><th rowspan="2">Item No.</th><th rowspan="2">How should it be managed?</th><th colspan="2">Timing of management actions?</th></tr>
<tr><th>Start</th><th>End</th></tr>
<tr><td colspan="6">5. MINE COMPONENT: MINE WORKSHOPS
5.2 MINE WORKSHOPS – CLOSURE PHASE</td></tr>
<tr><td>Surface Water</td><td>To ensure that impacts to surface water are removed during post closure</td><td>106</td><td>All areas will be subjected to a soil monitoring program to identify potentially contaminated areas. These areas will be cleaned up and the area re-profiled to establish the natural drainage pattern.</td><td>End of Operations</td><td>5 Years Post Closure</td></tr>
<tr><td rowspan="2">Infrastructure</td><td rowspan="2">To ensure that the area is returned to its natural condition and recover some value of the remaining facilities</td><td>107</td><td>The following plant and equipment dismantling and disposal practices will be applied to the crusher plant, mill, process plant and workshops, provided there are no demands on them from the local businesses or people. :-
1. Removal of all brick buildings;
2. Breaking out and removal of all concrete foundations;
3. Removal of steel frames;
4. Demolish reinforced concrete structures and dispose of on site;
5. Remove electrical equipment, pumps, motors, and other fixed equipment;
6. Remove all above and below ground fuel storage tanks;
7. Cut up and remove all steel tanks and vessels;
8. Dig up and remove all below ground electricity cables;
9. Remove all mechanical equipment;
10. Materials handling areas will be cleared of all raw materials;
11. General site clean up;
12. Site levelling and profiling to re-establish the natural drainage pattern across the site; and
13. Re-distribution of the stockpiled soils and re-vegetation of the site with indigenous grasses and trees.
14. Plant machinery, steel, HDPE liners, pipelines will be auctioned off or sold</td><td>End of Operations</td><td>5 Years Post Closure</td></tr>
<tr><td>108</td><td>Concrete foundations will be retained for use as foundations for future buildings if required.</td><td>End of Operations</td><td>5 Years Post Closure</td></tr>
<tr><td rowspan="2">Waste Disposal</td><td rowspan="2">To ensure that all waste is removed and re-used recycled, sold, or disposed of in a responsible manner.</td><td>109</td><td>Scrap metals and equipment will be sorted and sold to the local community, businesses and scrap metal merchants. The company will remove all equipment and materials that cannot be reused, recycled or sold, to an approved non-hazardous disposal site.</td><td>End of Operations</td><td>5 Years Post Closure</td></tr>
<tr><td>110</td><td>Septic tanks will be emptied and filled in and the sludge dried for use in the re-vegetation process.</td><td>End of Operations</td><td>5 Years Post Closure</td></tr>
<tr><td>Flora</td><td>To return the area to Baseline vegetation levels.</td><td>111</td><td>A re-vegetation program will be implemented by Albidon across the mine area. An experienced ecologist will be contracted to manage this process during operations and post closure</td><td>2008</td><td>5 years post closure</td></tr>
</table>

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions? Start	End
Public Safety	To ensure the safety of the public during post closure activities	112	Access will be restricted to the mine until a time when it is certified safe by the Mines Safety Department and Environmental Council of Zambia	End of Operations	5 Years Post Closure
6. MINE COMPONENT: MUNALI UNDERGROUND MINE 6.1 MUNALI UNDERGROUND MINE - OPERATIONAL PHASE					
Releases to surface water.	To prevent contamination of water as a result of pumping dirty water from the underground operations into the local water courses.	113	Mine drainage water will be pumped from the open underground to a settling pond where solids will settle. Treated water will be used as process water or discharged to the streams.	2007	Ongoing
	To prevent contamination of water as a result of equipment repair and maintenance underground.	114	Washing of equipment will only take place on surface at the mine workshop in dedicated wash-bay areas equipped with impervious surfacing, containment and oil traps. Treated effluent will be discharged to the mine site drainage system.	29-Jun	Ongoing
		115	Oil traps will be regularly monitored and emptied to prevent overflowing.	29-Jun	Ongoing
		116	Residue from the oil traps will be stored in a dedicated area awaiting disposal at an approved site. Oil trap supernatant will be integrated into the waste oil recycling programme.	2007	Ongoing
Soil Contamination.	To prevent contamination of soils at the mine workshop.	117	With the exception of breakdowns, the service, repair and maintenance of open pit equipment will be restricted to dedicated areas specifically designed for the purpose.	2007	Ongoing
Releases to air.	To control/minimise the generation of dust from the movement of haul trucks and other heavy equipment on the haul roads within the mine area.	118	Haul roads will be routinely sprayed with water in order to suppress dust during mine operations.	2007	Ongoing
	To minimise dust generation from ore handling.	119	Transient ore stockpiles and the ROM pad will be routinely sprayed with water to suppress dust.	2007-	Ongoing
	To assess the potential impact of blasting on air quality outside the mine perimeter.	120	Dust emissions from blasting will be visually assessed to determine whether or not dust blow beyond the mine perimeter is an issue of concern. If observations indicate that dust is a nuisance, an ongoing monitoring programme will be implemented to quantify dust levels and the results used to develop appropriate mitigation measures	2007	Ongoing

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions?	
				Start	End
	To assess the impact, if any, of dust emissions from mine operations on the local community.	121	A complaints register will be set up. All complaints will be investigated to determine the cause and identify appropriate corrective action.	2007	Ongoing
Accidental releases.	To prevent contamination of soil and water caused by an accidental release of fuel or oil.	122	Procedures will be developed for the movement of mobile fuel tankers.	2007-	2007-
Accidental releases.	To prevent contamination of soil and water caused by an accidental release of fuel or oil.	123	All mine equipment using hydraulic fluid, oil, fuel or any other substance that has the potential to contaminate surface water; groundwater or soil if released into the environment will be subject to a preventative maintenance programme.	2007	Ongoing
		124	Procedures laid down in the Emergency Response Plan will be followed in the event of a spill.	2007	Ongoing
Mine stability.	To prevent mine failure as a result of water pressure, erosion, overbreak and/or inadequate mine design	125	Erosion protection/control measures and storm water management infrastructure such as perimeter drainage channels, bund walls and perimeter slope profile will be monitored and maintained to minimise the inflow of water into the mine.	2007	Ongoing
		126	The underground will be de-watered to prevent build-up and accumulation of water.	2007	Ongoing
Waste generation.	To prevent soil and water contamination as a result of inappropriate waste disposal practices.	127	Waste generated from the repair, maintenance or service of mine equipment will be handled, stored and disposed of according to Albidon's Waste Management Policy.	2007	Closure
Noise / vibration.	To minimise noise levels and noise nuisance resulting from the operation and movement of heavy equipment.	128	If necessary, noise levels will be monitored over 24 hrs and the results used to develop appropriate mitigation measures.	2007	Ongoing
Public safety.	To prevent inadvertent access by the public into work areas.	129	Albidon will inform the public of the dangers of entering areas of mining operations through public consultation, liaison with local community leaders and erection of warning signs. Mine security will remove intruders from operational areas.	2007	Closure

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions? Start	End
6. MINE COMPONENT: MUNALI UNDERGROUND MINE 6.2 UNDERGROUND MINE - POST CLOSURE PHASE					
Infrastructure	To ensure that all underground infrastructure is removed.	130	All underground infrastructure will be removed and either re-used sold or subjected to Albidon's, waste management plan.		
Waste Disposal	To ensure that all waste is removed and re-used recycled, sold, or disposed of in a responsible manner.	131	Scrap metals and equipment will be sorted and sold to the local community, businesses and scrap metal merchants. The company will remove all equipment and materials that cannot be reused, recycled or sold, to an approved non-hazardous disposal site.	End of Operations	5 Years Post Closure
Public Safety	To ensure the safety of the public during post closure activities	132	Access will be restricted to the mine until a time when it is certified safe by the Mines Safety Department and Environmental Council of Zambia	End of Operations	5 Years Post Closure
Surface water.	To monitor the post closure quality of water in the flooded mine and assess its suitability for irrigation farming or other sustainable land use.	133	Standing water in the underground mine will be monitored at regular intervals as part of the post closure environmental monitoring plan.	2010	2015
Underground Mine stability.	To prevent mine failures and maintain long-term mine wall stability.	134	Underground mine will be designed with adequate factors of safety. The mine perimeter will be profiled to prevent surface run-off flowing into the mine or saturating the underground wall.	2010	2010
Public safety.	To warn the public of the danger of falling into or drowning in the flooded pit.	135	At closure, Albidon will erect warning signs around the mine perimeter and on all approach roads to the mine site.	2010	2010
7. MINE COMPONENT: TRANSPORT INFRASTRUCTURE 7.1 TRANSPORT INFRASTRUCTURE - OPERATIONAL PHASE					
Spills and/or accidental releases.	To prevent soil, air and water contamination as a result of accidental releases or spills of chemicals, sulphuric acid, organic solvent, reagents, fuel, oils and concentrate due to inadequate transport procedures.	136	The transport of hazardous materials to, from, in and around the mine site will be done in accordance with laid down procedure. Requirements will include: documentation and inventory control through chain-of-custody; emergency response training for all drivers (contractors and mine employees); tracking and notification of shipment location and condition; carrying of onboard emergency equipment; vehicle pre-checks and preventative maintenance programme; and random unannounced en route safety checks/inspections. All outside contractors will adopt the above procedures which will be integrated into contract agreements.	2007	Ongoing

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions? Start	End
		137	Only designated transport routes will be used to transport chemicals, sulphuric acid, reagents, fuel, oil and concentrates.	2007	Ongoing
		138	Trucks carrying explosives will be accompanied by an escort and all vehicles will be appropriately flagged.	2007	Ongoing
		139	Tarpaulins will be used on open top bulk concentrate transport trucks to provide protection from the elements.	2007	Ongoing
Spills and/or accidental releases	To prevent soil, air and water contamination as a result of accidental releases or spills of chemicals, sulphuric acid, reagents, fuel, oils and concentrate due to inadequate transport procedures.	140	Contracts with transport companies will include clauses on Zambian and relevant regional/international standards relating to the transport of hazardous materials. These will cover packaging, appropriate type of vehicle and compatibility of materials that are transported together.	2007	Ongoing
	To prevent soil, air and water contamination as a result of accidental releases due to accidents caused by defective or damaged infrastructure.	141	A preventative maintenance programme will be implemented on all mine roads, bridges, and culverts to ensure that they are kept in good condition. This will minimise the occurrence of accidents caused by defective or damaged infrastructure.	2007	Ongoing
Releases to air.	To prevent contamination of air due to dust emissions from vehicles and trucks operating on dirt roads and in the plant area.	142	Water spraying will be conducted on all mine dirt roads.	2007	Ongoing
Industrial waste generation.	Scrap metal, empty containers etc will be generated continuously from normal mine operations.	143	Industrial waste will be disposed of according to the company's Waste Management Policy and Scrap Sales Procedures.	2007	Ongoing
8. MINE COMPONENT: CONSTRUCTION ACTIVITIES (CONTRACTORS) **8.1 CONTRACTORS CAMP**					
Releases to	To prevent the contamination of soil and	144	Hazardous substances/materials will be stored in areas designated by the mine. Temporary	Start of	End of

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions? Start	End
surface water.	water due to poor storage practices.		stores i.e. transport containers will be approved by the mine.	Contract	contract
	To prevent the contamination of soil and water from contaminated surface runoff.	145	Surface runoff from construction sites will be directed into the mine's storm water system. This will enable runoff to be settled prior to release into the environment.	Start of Contract	End of contract
Site clearing.	To prevent the loss of topsoil and disturbance of vegetation.	146	Topsoil will be removed and stockpiled in areas designated by the mine for future use in rehabilitation.	Start of Contract	End of contract
		147	Measures will be taken to prevent soil erosion.	Start of Contract	End of contract
Hazardous waste generation.	To prevent the contamination of soil and water due to inadequate storage and disposal practices.	148	Hazardous waste will be handled, stored and disposed of in accordance with the mine's Waste Management Policy.	Start of Contract	End of contract
		149	The contractor will be responsible for placing hazardous waste in areas designated by the mine for such waste.	Start of Contract	End of contract
General waste generation.	To prevent the contamination of soil and water due to inadequate storage and disposal practices.	150	The contractor will not be permitted to burn or bury waste materials. General waste materials must be handled, stored and disposed of in accordance with the mine's Waste Management Policy.	Start of Contract	End of contract
		151	The contractor will be responsible for placing general waste in areas designated by the mine for such waste.	Start of Contract	End of contract
Water consumption.	To prevent the inefficient use and wastage of water.	152	Usage of water by the contractor will be monitored by the mine to ensure water is not wasted.	Start of Contract	End of contract
Contractor's traffic.	To ensure public and worker safety due to increased levels of traffic in and around the mine site.	153	Transport routes will be approved by the mine regular inspections/checks will be conducted.	Start of Contract	End of contract
		154	The contractor will be monitored in terms of vehicle road worthiness, safe driving practices and driving tests.	Start of Contract	End of contract
Construction waste generation.	To prevent the contamination of soil and water due to construction waste.	155	Waste batches of concrete and other construction materials will be disposed of in areas designated by the mine.	Start of Contract	End of contract

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions? Start	End
Security/safety of construction site.	To ensure public safety.	156	Construction sites will be clearly demarcated and with restricted access. Warning signs will be erected in dangerous areas.	Start of Contract	End of contract
		157	The contractor will implement good housekeeping practices. The Environmental Department and Projects Department will monitor the contractor's performance in this regard.	Start of Contract	End of contract
9. MINE COMPONENT: MATERIALS HANDLING AND STORAGE **9.1 MINE STORES - OPERATIONAL PHASE**					
Spills and/or accidental releases.	To prevent fuel spills from contaminating soil, surface water and/or groundwater.	158	Statutory containment (110% of storage capacity) and concrete surfaces will be provided to all fuel storage tanks.	2007	Ongoing
		159	In the event of a spill, procedures outlined in the Spill Response Plan will be followed. The procedures include: clean-up action; clean-up materials; and disposal of contaminated soil and clean-up materials.	2007	Ongoing
	To prevent fuel spills from contaminating soil, surface water and/or groundwater.	160	Spills will be dealt with in accordance with the mine's Spills Prevention, Control and Clean-up Plan.	2007	Ongoing
	To ensure that underground fuel storage tanks do not leak or rupture resulting in contamination of soils and groundwater.	161	Fuel delivery and usage records will be kept by mine stores for determination of fuel losses/leaks. A fuel tank leak detection programme will be implemented.	2007	Ongoing
	To prevent the spill of oils, greases and chemicals during handling and storage this may result in the contamination of soil and/or water.	162	Spills of oils, grease or chemicals will be immediately cleaned-up in accordance with the mine's Spills Prevention, Control and Clean-up Plan.	2007	Ongoing
		163	Operators handling or using chemicals and reagents will receive training. Training will focus on potential risks, hazards, safe handling procedures, safety precautions, first aid, emergency response and appropriate disposal procedures.	2007	Ongoing
Release of hazardous substances.	To prevent/minimise the risk of chemical spills.	164	Material Data Safety Sheets (MDSS'S) will be obtained for all chemical substances used on the mine. The MDSS's will specify hazards, compatibility with other substances and special handling, storage or disposal requirements. End users will have copies of relevant MDSS's	2007	Ongoing

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions? Start	End
			and will receive training on hazardous substances used in their area of operations.		
9.2 FUEL HANDLING AND STORAGE - OPERATIONAL PHASE					
Fuel handling spills & leaks.	To prevent the contamination of soil and/or water as a result of a handling spill or leak/rupture of fuel tank.	165	Regular inspections of containment walls around fuel tanks will be conducted. Below ground fuel tanks will be monitored to ensure any leaks are quickly determined. Oil traps will be regularly maintained and drains kept clean.	2007	Ongoing
		166	Fuel stocks will be reconciled regularly to identify possible leaks from fuel tanks located below ground.	2007	Ongoing
	To ensure drainage from fuel storage areas does not directly enter the site drainage system without prior treatment and contaminate soil or water.	167	Drainage from fuel storage areas will be isolated from the site drainage systems and passed through an oil trap prior to release.	2007	Ongoing
10. MINE COMPONENT: WASTE MANAGEMENT **10.1a INDUSTRIAL WASTE MANAGEMENT - OPERATIONAL PHASE**					
Industrial waste generation.	Scrap metals and equipment should be recycled to reduce the amount of waste generated.	168	Secure storage areas for scrap metal and equipment will be identified. Materials will be sorted to assist recovery and reuse/recycling. Scrap metal merchants and used equipment dealers will be encouraged to take away waste materials.	2007	Ongoing
	Reusable materials should be reused or re-cycled to reduce the amount of waste generated.	169	Secure storage areas for reusable materials will be identified. Reusable materials include empty drums, timber, etc. These will be reused by the mine, sold or given away.	2007	Ongoing
		170	Used tyres will be painted fluorescent colours and used by the mine to mark out the edges of roads, bends and accident black spots.	2007	Ongoing
Hazardous waste	To prevent hazardous waste from contaminating soils and water.	171	Hazardous waste will be stored in a secure area. The storage area for hazardous waste will be covered, have a concrete floor and containment (110% of maximum storage volume).	2007	Ongoing

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions?	
				Start	**End**
generation.			Non-compatible hazardous wastes will be stored at separate sites.		
Hazardous waste generation.	To prevent contamination of soil and water with used oils and greases.	172	Used oil will be sold to a recycling company. Greases (lubricants) will be returned to the supplier, recycled or incinerated.	2007	Ongoing
10.1b MEDICAL WASTE MANAGEMENT - OPERATIONAL PHASE					
Medical waste generation.	To prevent the contamination of soil, surface water and/or groundwater due to the inadequate disposal of medical waste from the mine clinic.	173	The disposal of medical waste will be done in accordance with the mine's Waste Management Policy. In practice all medical waste will be incinerated in an approved furnace.	2007	Ongoing
11 MINE COMPONENT; ENVIRONM,ENTAL REPORTING **11.1 ENVIRONMENTAL REPORTING – OPERATIONAL AND CLOSURE PHASE**					
Environmental Reporting	To ensure that all environmental activities are recorded and the success of mitigation measures assessed.	174	Albidon will compile annual environmental monitoring reports which will address all the management actions outlined in the EMP, and review all environmental monitoring data. An independent environmental audit will be conducted once every 2 years and submitted to ECZ for review.	2007	Ongoing
		175	Albidon will contract an independent consultant to produce annual post-closure environmental monitoring reports at the end of years 1 and 2 and a final post closure environmental report at the end of year 5. Reports will include environmental monitoring results, site walkover reports, photographic records, details of the management plan and recommended measures. Reports will be submitted to MSD and ECZ for review and recommendations on achieving a closure certificate.	End of Operations	5 Years Post Closure

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions?	
1. MINE COMPONENT: SOCIO-ECONOMIC & CULTURAL PLAN **1.1 MAXIMISING LOCAL EMPLOYMENT AND ECONOMIC OPPORTUNITIES DURING MINE OPERATIONS**					
Local employment.	Local employment is very important in order to optimise and maximise the benefits of the mine for the local economy.	1	Albidon will implement a local employment strategy that focuses on the employment of people from the Munali and surrounding areas.	Project Start	Mine Closure
		2	Albidon is an 'equal opportunity' employer. In practice, the best applicant for the jobs will be offered employment.	Project Start	Mine Closure
		3	Local people will be given priority in employment subject to qualifications and experience.	Project Start	Mine Closure
		4	Albidon will offer its employees salaries and conditions of service commensurate with other mining companies operating in Zambia.	Project Start	Mine Closure
	Improving the quality of labour and employee competency.	5	Albidon will implement a training and development programme for its employees so that they can carry their skill elsewhere during the life of the mine or at closure.	Project Start	Mine Closure
Contractor employment.	Increase competency and managerial capacity of local contractors.	6	Albidon will implement a contractor engagement strategy that ensures local contractors are employed in preference to foreign contractors, subject to their ability to carry out the work.	Project Start	Mine Closure
Contractor employment.	Increase competency and managerial capacity of local contractors.	7	Albidon will define conditions and safety standards that its employees and contractors will have to comply with so as to promote a safer working environment. These conditions will include an HIV/AIDS awareness and prevention campaign amongst workers, contractors and the public.	Project Start	Mine Closure
Employee retrenchment.	Retrenchment packages need to be properly designed to promote sustainable livelihoods. Adequate counselling should be given to every employee before retrenchment.	8	Albidon will implement a retrenchment-training programme for its employees.	Project Start	Mine Closure
		9	Albidon will implement a counselling plan for its workers going through retrenchment.	Project Start	Mine Closure
1.2 LOCAL & REGIONAL ECONOMIC DEVELOPMENT					

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions?	
Local business enhancement.	To improve business multipliers and reduce unemployment.	10	Albidon will implement a procurement strategy that supports local economic development.	Project Start	Mine Closure
		11	Albidon will distribute information material through its procurement office, explaining procedures on how to do business with Albidon, supplies & contracts etc...	Project Start	Mine Closure
Expand opportunities for alternative economic activities in the Munali area.	In order to reduce the economic dependency on mining and promote the concept of sustainable development independent of the mining sector.	12	Albidon will engage relevant government ministries and departments, non-governmental organisations NGO's and donor agencies to encourage the development of an Economic Diversification and Development Plan based on diversification away from mining and its related activities.	Project Start	Mine Closure
1.3 LAND USE & SETTLEMENT					
Resettlement	To ensure that the resettlement process is conducted in a fair and responsible manner	13	Albidon will compile a detailed Resettlement Action Plan, profiling the affected population and determining fair compensation packages agreeable to the local community through extensive public consultation. (This report will be made available as an addendum to this EIA)	2006	2007
Tracks and pathways crossing the mine area.	To prevent inadvertent access by the general public into hazardous / dangerous areas.	14	Albidon will liase with the Chief and local community to establish safe pathways around the mine site.	Project Start	Mine Closure
Demarcation and communication.	Local communities may encroach on the mine site for both settlement and livelihood activities. Communities and local stakeholders should be discouraged from using the mine site for both settlement and to support their livelihoods	15	The mine site will be clearly demarcated and Albidon's land use and settlement policy communicated to local communities and stakeholders.	Project Start	Mine Closure
		16	The mine site boundary will be marked on site using beacons and warning signs, and shown on all mine plans.	Project Start	Mine Closure
Agriculture and informal settlement on the mine site.	To adequately compensate local people for the loss of crops due to mine development.	17	An independent survey of any crops affected by mine development will be conducted to determine the value and amount of compensation to be paid by Albidon to the farmer.	Project Start	Mine Closure
	To discourage traditional settlements and agriculture on the mine site and surrounds.	17	Albidon will regularly inspect and monitor the mine site and surrounds, to identify any new settlement and/or agriculture.	Project Start	Mine Closure
Utilisation of	People utilise the natural woodland for	19	Albidon will engage in natural resource management at the local community level to assist in	Project	Mine

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions?	
the Miombo woodland outside hazardous areas by the local community.	many purposes. It is Albidon's aim to conserve environmental resources within the mining permit area that have not been disturbed by previous mining operations and demonstrate active stewardship of the land and bio-diversity.		the conservation of trees. This will involve the prevention and discouragement of further deforestation in accordance with Albidon's Environmental Policy. The programme will be conducted in cooperation with the Forestry Department.	Start	Closure
		20	Albidon will carry out regular patrols to prevent the clearance of woodland for cultivation and charcoal burning.	Project Start	Mine Closure
The protection of communities from the direct hazards of mining operations.	Mine operations can be hazardous to people.	21	Albidon will ensure that all mine hazards are mapped and clearly marked on site.	Project Start	Mine Closure
		22	Albidon will raise awareness and provide general information on mine hazards through an ongoing public consultation process.	Project Start	Mine Closure
		23	Albidon will evict settlers and/or cultivators from hazardous areas.	Project Start	Mine Closure
The protection of communities from the direct hazards of mining operations.	Mine operations can be hazardous to people.	24	Albidon mine security will patrol hazardous areas throughout the year to prevent people from entering them.	Project Start	Mine Closure
Use of mine surface water by local communities.	Surface water on the mine permit includes the residue storage facility, effluent streams, mine site drainage, and the local streams. These water bodies should be used in a safe and sustainable manner.	25	Albidon will promote awareness concerning the quality of water in its effluent streams and the risks of drinking water from the residue storage facility.	Project Start	Mine Closure
		26	Signs in the local language/symbols will be erected alerting people to the potential dangers, e.g. sickness, drowning etc...	Project Start	Mine Closure
1.4 HEALTH PLAN					
Healthcare for Albidon employees.	To ensure employees and their immediate dependents receive quality basic healthcare.	27	Albidon will operate a clinic at Munali for its employees and their immediate dependents, for the life of the mine.	Project Start	Mine Closure
HIV/AIDS awareness and	To prevent the further spread of infections and reduce deaths amongst	28	Albidon in consultation with local HIV/AIDS organisations and government initiatives will implement a HIV/AIDS awareness and prevention campaign.	Project Start	Mine Closure

What needs to be managed?	Why does it need to be managed?	Item No.	How should it be managed?	Timing of management actions?	
prevention amongst workers, contractors and the public.	workers and their families.				
Malaria 'Roll Back' Campaign.	To reduce the incidence of malaria amongst workers and their families, and the community.	29	Albidon will conduct malaria spraying at the mine site and Mugoto, and assist local Health Services to spray villages close to the mine.	Project Start	Mine Closure
1.5 PUBLIC CONSULTATION					
Developing a relationship between Albidon and the public.	To build a relationship with stakeholders and communicate Albidon policy on social and environmental policy/management to the public.	30	Albidon will continue the public consultation process throughout the life of the mine and hold consultative meetings with stakeholders at regular intervals.	Project Start	Mine Closure