# Kingamyambo Musonoi Tailings Project

**Report Prepared for**

## Revision of Environmental and Social Impact Assessment/Environmental and Social management Plan

**387394**

**April 2008**

SRK Consulting
Engineers and Scientists

# Kingamyambo Musonoi Tailings Project

## First Quantum Minerals

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Report No. 387394

**Kingamyambo Musonoi Tailings Project**

**Environmental and Social Impact Assessment**

# 1 Introduction

## 1.1 Project background

**First Quantum Minerals Ltd. (FQM)** is a growing mining and metals company whose principal activities include mineral exploration, development and mining in Africa. The Company produces LME grade A copper cathode, copper in concentrate, gold and sulphuric acid. FQM's common shares are listed for trading on the Toronto Stock Exchange in Canada and the London Stock Exchange in the United Kingdom. The company has interests in several mineral assets in Africa, including the Guelb Mohrein mine in Mauritania and various mining projects on the Copperbelt in the Democratic Republic of Congo (DRC) and Zambia, among which is the Kolwezi cobalt/copper tailings project, known as the Kingamyambo Musonoi Tailings Project.

In 2006, FQM acquired Adastra Minerals Inc (Adastra). It therewith also acquired Congo Mineral Developments (CMD), a wholly-owned subsidiary of Adastra, that had formed the company Kingamyambo Musonoi Tailings SARL (KMT) [1] for the purposes of treating the tailings from the Kingamyambo Tailings Dam. The regional location of the project is shown in Figure 1.1.

KMT is owned by CMD (65 %), Gécamines (12.5 %), Industrial Development Corporation of South Africa (IDC) (10 %), the International Finance Corporation (IFC) (7.5 %) and the Government of the DRC (5 %). KMT plans to re-treat the tailings deposited on the Kingamyambo Tailings Dam and in the Musonoi River. These tailings still contain copper and cobalt at such grades that it will be economically viable to recover the remaining metals from the tailings. The tailings have an average grade of 1.49 % copper and 0.32 % cobalt.

[1] The legal company responsible for undertaking the Kingamyambo Musonoi Tailings Project is Kingamyambo Musonoi Tailings SARL (KMT) registered as 9053-L'SHI with a national identification number of 6-118-N43248S. KMT has a tailings exploitation permit N° PER 652.

## 1.2 Introduction

The Kingamyambo Tailings Dam is a conventional tailings facility which contains 42.3 million tonnes of tailings and covers an area of 3 $km^2$, with an average height of 20 m. The Musonoi River tailings deposit contains over 70.5 million tonnes of tailings over an area 11 km long and up to 2.5 km wide. The proposed Project involves hydraulic mining of the tailings deposited on both the Kingamyambo Tailings Dam and in the Musonoi River using high pressure water monitors. In the first four years, mining of the Musonoi will be by dredging. The location of the Kingamyambo and Musonoi tailings deposits and proposed project infrastructure is shown in Figure 1.2 at a scale of 1:50,000 and in Figure 1.3 at a scale of 1:20,000.

The Project will have environmental and social impacts. It is expected to provide a number of significant benefits to the area both in terms of environmental clean-up of the contaminated river valley and employment opportunities for the economically depressed region. There are also the potential benefits of secondary services that will be required from the area to support the Project and the benefit of taxes paid by the project to the region. The potential economic, social and health benefits of the new mining venture are seen to be considerable for the several villages in the concession area, and the community of approximately 240,000 in the vicinity of Kolwezi.

## 1.3 Regional Setting

Kolwezi town and the mines associated with it are located approximately 240 km west of Lubumbashi, the capital of the Katanga province, at 10°40’ latitude S and 25°30’ longitude E. Over 110 Mt of ore have been processed here during almost a century of mining for primarily copper and cobalt minerals. As a result of mining and metallurgical activities, the area around the town of Kolwezi has numerous open pits, waste rock, ore and slag dumps, tailings dams, concentrators and other mining-related infrastructure, which has led to extensive impacts on the environment. Several mining companies have started activities in the area during the past several years.

The original habitat of the area was Miombo woodland, a form of dry, open gallery woodland common to central and south-central Africa, and dominant in the southern DRC. Today, the concession area consists mostly of severely degraded Miombo, as the land is used for slash and burn and shifting agriculture, criss-crossed by paths, tracks and transmission lines. There are two dambos (seasonal wetlands) in the concession area, and two tributary streams, the larger one being the Kanamwamwa River. Large termitaria are prominent features in the regional and site landscape.

The concession area also contains a few small hamlets or villages. The existing mining infrastructure, Kolwezi town, Gécamines villages and other villages lay largely outside and south and south-west of the concession area.

For many decades, mining has been the mainstay of the economy of Kolwezi town and the Kolwezi District. The decline of Gécamines and the drastic curtailment of mining operations from 1997 onwards brought great hardship to the town and its surrounds, both in terms of job and income losses, and in terms of the erosion of sectors of employment supported by mining. The Ministry of Labour estimated the level of local unemployment at 90% in 1994, and poverty is widespread in Kolwezi town and rural villages in and close to the KMT Concession Area. The ‘greater’ Kolwezi

town has a population estimated at 240 000. The Kolwezi economy currently depends very strongly on informal activities among people seeking to secure livelihoods for themselves and their families. Key informal activities are agriculture, artisanal mining, and small-scale trading.

## 1.4 Purpose of this Report

The purpose of the Environmental and Social Impact Assessment (ESIA) and the Environmental and Social Management Plan (ESMP) and associated appendices is to provide details of the regulatory framework within which the project will operate, describe the project and identify all associated impacts that the project may have on the social and biophysical environment and develop mitigation measures to reduce or prevent these impacts occurring. The ESMP sets out an action plan for the ongoing management of environmental, social and community issues at the site, along with personnel requirements , reporting needs and the approximate costs of this work.

In 2004, Adastra appointed SRK Consulting (SRK), a South African founded global group of consulting engineers and scientists, to undertake the ESIA for the Project. The ESIA and its supporting document, the ESMP, identified impacts that the project might have on the social and biophysical environment and laid out mitigation measures to reduce the negative and enhance the positive impacts identified. The final report was submitted to Adastra in April 2006. It was subsequently submitted to the DPEM and approved.

As FQM have made changes to the initial project, the ESIA and ESMP need to be updated to reflect the new situation. FQM have therefore appointed SRK to update the ESIA and ESMP. SRK is a consultant approved by the Ministry of Mines in the DRC to carry out environmental studies and to submit environmental reports locally. SRK's environmental and water scientists have been involved on projects in Kolwezi since 2002. The team has a well-developed understanding of the socio-economic and environmental issues in Kolwezi and regulatory issues pertaining to mining in the DRC.

The Adastra ESIA and ESMP followed the submission of the Environmental Adjustment Plan (EAP) required by mining operations in possession of an existing, valid mining right. In this case, the licence for tailings exploitation has been transferred from Gécamines to KMT. The EAP was submitted to the Department for the Protection of the Mining Environment (DPEM) on the 27$^{th}$ May 2005 (within twelve months of obtaining the transferred title on 27$^{th}$ May 2004); as specified in the Mining Regulations (Articles 466 to 471). An EAP is required by existing operations in order to provide a plan for bringing those operations into compliance with the Mining Code and Mining Regulations of the DRC. While classified as an operation due to the transfer of a mining licence, the format of the EAP submitted to DEPM followed the requirements of Chapter IX of the Mining Regulations which covers Environmental and Social Impact Assessment.

The EAP followed the submission, in January 2004, of an Environmental Audit and Scoping Study (EASS) for the Project to CMD. This report was submitted to the government of the DRC in relation to the application by Gécamines for a Certificate of Release from its environmental obligations with respect to the perimeter; thus releasing KMT from any responsibilities arising from the condition of the site when the license was transferred, in accordance with Article 405 of the Mining Regulations (this is described in more detail in Chapter 2). This initial investigation formed Phase I of the overall work programme and provided the basis for the original ESIA.

The information contained within the three volumes of the updated environmental and social assessment report (Volume 1: Executive Summary, Volume 2: ESIA, Volume 3: ESMP) relates to information provided by FQM on the project changes as well as additional specialist studies undertaken between February and April 2008.

KMT has agreed with the DPEM that any changes to the information submitted in the EAP and original ESIA and ESMP will be presented to the DPEM for their perusal, in addition feedback to all project stakeholders will take place on the information contained within the revised ESIA and associated documentation.

The updated ESIA and ESMP will meet all applicable regulatory requirements of the DRC and has been guided specifically by the Mining Code (Law No 007/2002 of July 11, 2002) and Mining Regulations (Decree No 038/2003 of March 2003) for an Environmental Impact Statement (EIS) and Environmental Management Plan for the Project (EMPP) required in order to obtain an Exploitation Licence. In addition, the ESIA process and public participation are in compliance with the Equator Principles and the International Finance Corporation's (IFC) performance standards.

## 1.5 Structure of this Report

The structure of the ESIA and supporting documentation is described in Table 1.1 below.

**Table 1.1: Report Structure**

| SECTION | TITLE | SUMMARY OF CONTENTS |
|---|---|---|
| VOLUME I: EXECUTIVE SUMMARY | | |
| Provides a concise discussion of significant findings and recommended actions. | | |
| VOLUME II: ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) | | |
| CHAPTER 1 | INTRODUCTION | Provides a brief overview of the project, the company undertaking the project and the consultant responsible for the ESIA;<br>Outlines the regulatory framework of the project;<br>Describes the purpose of the report;<br>Outlines the structure of the report;<br>Describes the assumptions and limitations; and<br>Outlines the methodology used for the Impact Assessment. |
| CHAPTER 2 | REGULATORY FRAMEWORK | Describes the regulatory framework of the Kingamyambo Musonoi Tailings Project which requires the project to comply with the following:<br>the laws and regulations of the host country, Democratic Republic of Congo (DRC);<br>the policies, guidelines and procedures of international lenders/ financial institutions (World Bank Group including the International Finance Corporation and Industrial Development Corporation of South Africa, additional banks who are signatories to the Equator Principles and the African Development Bank); and<br>FQM company policies and codes of practice. |

| SECTION | TITLE | SUMMARY OF CONTENTS |
|---|---|---|
| CHAPTER 3 | PROJECT DESCRIPTION | Provides a detailed description of the following proposed project activities:<br>mining of the tailings deposits,<br>processing,<br>waste management,<br>water management,<br>transport,<br>energy use,<br>Security and communications. |
| CHAPTER 4 | PROJECT ALTERNATIVES | Describes and compares all project alternatives that have been considered by the DFS and ESIA and provides the logic for selecting the preferred option for the following:<br>mining method,<br>plant site selection,<br>treatment options,<br>Process flow sheet options<br>water supply,<br>effluent disposal, |
| CHAPTER 5 | ENVIRONMENTAL BASELINE | Introduces the specialists responsible for undertaking the specialist studies and outlines the methodology used by each specialist.<br>Describes and quantifies (where possible) existing liabilities on the site which KMT is not responsible for including:<br>risks associated with the footprints from the former uranium stockpiles located in the KMT Concession boundary,<br>soil pollution,<br>water pollution, and<br>Air pollution.<br>Describes the following biophysical aspects of the environment prior to the commencement of the KMT Project according to specialist investigations undertaken on site:<br>topography,<br>geology,<br>soils, land use and land capability,<br>climate and air quality,<br>surface water quality and quantity,<br>ground water quality and quantity,<br>noise,<br>traffic,<br>aquatic biodiversity, and<br>Terrestrial biodiversity. |

| SECTION | TITLE | SUMMARY OF CONTENTS |
|---|---|---|
| CHAPTER 6 | SOCIAL BASELINE | Contextualises the social environment of the project including:<br>spatial extent;<br>macro-economic environment;<br>institutional arrangements;<br>settlement patterns and settlement types;<br>approach to gathering specific household information;<br>socio-economic status;<br>local economy;<br>business and labour organisations;<br>livelihoods in the project impacted area;<br>social dynamics;<br>perceptions and expectations; ad<br>Development needs and initiatives.<br>Describes all archaeological, cultural heritage and sacred sites occurring in the KMT Concession Area. |
| CHAPTER 7 | ENVIRONMENTAL IMPACT ASSESSMENT | Identifies all potential impacts the project may have on the biophysical environment and provides principles of mitigation for adverse impacts.<br>Describes the characteristics of the impacts (intensity, area, severity, duration, frequency etc).<br>Provides principles of mitigation for each adverse impact.<br>Summarises the significance rating of impacts pre- and post- mitigation and discusses residual and cumulative impacts for the project. |
| CHAPTER 8 | SOCIAL IMPACT ASSESSMENT | As for chapter 7 except that the significance assessment methodology has been slightly adapted to suit the assessment of social impacts. |
| CHAPTER 9 | CUMULATIVE IMPACTS ASSESSMENT | Makes a comparison of the cumulative impacts of the KMT Project along with other potential projects in the Kolwezi area on the biophysical and socio-economic environment, against the Zero Option (no projects developed). Highlights the issues that will need to be addressed by the regional authorities. |
| VOLUME III : ENVIRONMENTAL AND SOCIAL MANAGEMENT PROGRAMME | | |
| CHAPTER 1 | INTRODUCTION | |
| CHAPTER 2 | APPROACH TO ENVIRONMENTAL AND SOCIAL IMPACT MANAGEMENT | Outlines the general principles of management and approach to environmental and social impact mitigation and management. |
| CHAPTER 3 | THE PROPOSED PROJECT | Summary project description |
| CHAPTER 4 | IMPACT MITIGATION AND MANAGEMENT | Details mitigation measures to be applied for each significant impact at each project site, and formulates the management programmes through which mitigation will be implemented. |
| CHAPTER 5 | ORGANISATIONAL STRUCTURE AND HSEC MANAGEMENT | Outlines the corporate organizational structure that will be charged with coordinating and managing environmental and social issues. |
| CHAPTER 6 | ENVIRONMENTAL AND SOCIAL MONITORING | Lays out the programme for monitoring biophysical environmental quality and socio-economic outcomes. |
| CHAPTER 7 | ACTION PLAN, SCHEDULE AND COSTS | Summarizes the costs of implementing the ESMP |

| SECTION | TITLE | SUMMARY OF CONTENTS |
|---|---|---|
| | | |
| ANNEXURES | | |
| ANNEXURE A | LABOUR AND HUMAN RESOURCES PLAN,<br>WORKPLACE HEALTH AND SAFETY PLAN,<br>COMMUNITY HEALTH AND SAFETY PLAN | Describes how KMT will manage labour issues including fair treatment of employees, worker-management relationships, safe and healthy working conditions and prevent unacceptable forms of labour such as child and forced labour.<br>Also describes how KMT will address all aspects of community health and safety during the construction and operational phases of the project. |
| ANNEXURE B | LAND ACQUISITION AND RESETTLEMENT PLAN | Describes how KMT will compensate economically displaced farmers and others in the context of international best practice and DRC policy and legislation. |
| ANNEXURE C | EMERGENCY PREPAREDNESS PLAN | Described how KMT will undertake an APELL type process to involve local agencies and the community in planning for possible emergencies related to mining activities |
| ANNEXURE D | COMMUNITY DEVELOPMENT PLAN | Describes how KMT will establish a sustainable and locally appropriate framework and model for sustained and co-operative socio-economic development in Kolwezi and its surrounds. |
| ANNEXURE E | REHABILITATION AND CLOSURE PLAN | Describes the Closure Management Strategy for Environmental and Social issues and also the rehabilitation plan for restoring the footprint of the mining project post-closure. |
| ANNEXURE F | PUBLIC CONSULTATION AND DISCLOSURE PLAN (“PCDP”) | The PCDP guides and describes the public consultation process and schedules the disclosure of information about the project and opportunities for public inputs, at all stages of project implementation. |
| ANNEXURE G | WASTE MANAGEMENT PLAN | Describes the principles of waste management (excluding tailings) which will be adopted, details the waste streams, methods of treatment and disposal, and management requirements. |
| ANNEXURE H | INFLUX MANAGEMENT STRATEGY | Outlines KMT’s contribution to the mitigation of negative impacts associated with uncontrolled influx of people into a mining area. |
| ANNEXURE I | ARTISANAL MINING STRATEGY | Describes KMT’s strategic options and commitments to address and manage the interface with artisanal miners on and around their concession. |

It should be noted that in this document FQM is used in the context of discussing activities relating to the parent company; CMD is used to refer to activities taking place prior to the decision to go ahead with the project and KMT refers to the company responsible for all implementation activities once the decision to go ahead with the project has been taken.

## 1.6 Assumptions and Limitations

A set of limitations regarding the information and time available for the revision to the ESIA and ESMP need to be taken into account when reading the documentation.

The revision is based on information provided either verbally or in writing by FQM; it has not all been verified. At the time of writing, SRK had not had input to the project re-engineering process

and the environmental and social implications thereof were thus assessed on completion of the re-engineering.

The time available (3 months) for the revision of the ESIA and ESMP was dictated by FQM's and IFC's development schedule and the work activities undertaken as part of the revision were tailored to this time. Much of the information required to update the project description was not available from FQM in sufficient detail to replace the information which was used in the original impact assessment. Some information included in the original project description has not been updated since it has not been made available (for example, a list of reagents and consumables, details of the lime slaking plant, details of changes to the process from cobalt hydroxide to cobalt metal and resulting effluents).

All specialist inputs to the revision, as well as the additional traffic study, were undertaken on a desktop basis. Furthermore the study period did not allow for sufficient technical liaison between the specialists and the FQM design team. No remodelling was undertaken by the air, noise and water specialists and no observations or measurements of existing traffic flows were undertaken in support of the traffic study. Instead, existing baseline data from neighbouring mining projects was used. The revision of the impact assessment for the aquatic assessment was based on a review of the available spatial plans and it was assumed that biotic integrity in the associated systems has not changed since the conduct of the baseline studies during 2005.

The surface water aspects assumed the following: the tailings dam includes a tailings decant pond; the tailings dam remains outside the flood line; the decant from the tailings dam and plant enters the Kasobantu dam, and water from the decant dam is re-used in the plant when available. No information was available regarding the routing of the proposed river diversion so this was not included as part of the revised assessment.

As regards the social environment, the lack of detail of certain activities, especially the mining of the Musonoi and the possibility of a diversion channel, has made it difficult to predict all social significant impacts which may result from the project.

The revision has not been informed by additional baseline data since social and environmental baseline data gathering was not continued after mid-2006 when FQM acquired Adastra. Data relating to monitoring of a Land Acquisition and Compensation Plan (LACP) implementation, complaints management, stakeholder consultation, air quality, water flows and quality were thus not available for the revision.

## 1.7 Impact Assessment Methodology

The Impact assessment is discussed in Chapters 7 and 8 of the ESIA. The approach adopted for assessing the significance of impacts identified follows the methodology required by the DRC Mining Regulations and using a model accepted by SRK Consulting and the World Bank Group.

### Impact Assessment (prior to implementation of mitigation commitments)

Table 1.2 provides a summary of the assessment criteria to be used in determining the significance of impacts. Each impact discussed in this chapter will have a significance rating assigned to it prior to the implementation of mitigation measures if the impact is negative.

The methodology used in identifying and assessing environmental impacts and the recommendations for mitigation measures where the impact is negative has been undertaken based on the following guidelines:

The first stage of impact assessment is the identification of environmental aspects[2], impacts[3], target receptors[4] and target resources[5] for the construction and operational phases and, where relevant, for decommissioning/closure and post-closure. The current project initially plans to mine an average of 2.4 million tonnes of tailings per year and produce 35000 tpa of copper and up to 7 000 tpa of cobalt as cobalt hydroxide. In the first year this will increase to 70 000 tpa of copper and 14 000 tpa of cobalt hydroxide, and after a further year a cobalt purification and electro winning plant will be added to produce 14 000 tpa of cobalt metal. A further expansion would increase production to 105 000 tpa copper, 15 000 tpa of cobalt metal and 5 000 tpa of cobalt hydroxide. At these production rates the mine life will be around 20 years. The identification of target receptors and resources allows an assessment of the sensitivity of the environment to change induced by the project.

The significance of the impact[6] is then assessed by rating each variable[7] numerically according to defined criteria as outlined in Table 1.2. The frequency of the activity and the frequency of the impact together comprise the likelihood of the impact occurring and this can be assigned a maximum value of 10. The severity, duration and spatial scope of the impact together comprise the consequence of the impact and when summed can produce a maximum value of 15. The values for likelihood and consequence of the impact are then multiplied and the product read off a significance rating matrix as shown in Table 1.3.

'Natural' mitigation measures are included in the *pre-mitigation* assessment of significance. 'Natural' mitigation comprises natural conditions, aspects built into the project design and operational protocols to which the company has already committed itself, that will alleviate (control, moderate, curb) negative impacts. In other words, 'natural' mitigation reduces the significance of *potential* negative impacts. Mitigation is then taken to mean *additional* measures which must be implemented to reduce the significance of *actual* negative impacts and enhance positive impacts. So, for instance, the inclusion of sulphur scrubbers in the acid plant stack design has been declared by the project engineers: this constitutes 'natural' mitigation, which brings the significance of the actual air quality impact of emissions down to acceptable levels.

[2] An **environmental aspect** is defined as a predicted change to the baseline environment attributable to the project, for example, levels of noise and concentration of atmospheric pollutants.

[3] **Environmental impacts** are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality.

[4] **Receptors** comprise people or human-made systems, such as local residents, communities and social infrastructure.

[5] **Resources** comprise components of the biophysical environment such as aquifers, flora and palaeontology.

[6] **Significance of impact**: - the significance of the unmanaged and managed impacts has been assessed through the consideration of the likelihood of the impact occurring and the consequence of the impact.

[7] **Variable**: A factor used to identify the significance of an impact including the frequency of the proposed activity, frequency of the impact, severity, duration and spatial scope as outlined in Table 5.1.

It is extremely difficult to be entirely consistent in applying such an impact rating model, because impacts in different environmental parameters may have different criteria of significance. The model is subjective and, due to the choice of factors that go into the assessment, some negative impacts rated Low will still attract management/mitigation measures. In some instances, any occurrence of the impact will still attract management action. This applies, for instance, to impacts on graves and graveyards which, although infrequent and few in this project, will still have to be properly managed.

A tabular summary of rated impacts per project phase is provided at the start of Chapter 7 and is followed by a discussion of the key significant impacts thus evaluated. Because of the large number of impacts of a project of this size and complexity, the focus in the discussion is on those negative impacts attracting higher significance ratings and/or which will attract mitigation/management attention.

Although in this analysis all project activities at each project development site (plant, tailings dam, linear infrastructure, hydraulic mining areas (Kingamyambo Tailings Deposit and Musonoi River Tailings) were considered, the impact assessment considers the overall impact on each environmental parameter, or the cumulative effect of the entire project activities on the resource. However, where specific installations will have specific negative impacts that need to be managed, these will be highlighted in the ESMP in Volume 3.

The impacts of the project construction and operational activities as well as impacts that persist post-closure were considered for the following parameters:

- Geology
- Soils, Land Use and Land Capability
- Air Quality
- Surface Water
- Ground Water
- Noise
- Traffic
- Aquatic Biodiversity
- Terrestrial Biodiversity (Fauna and Flora)
- Socio-Economics
- Archaeological and Cultural Heritage Resources

**Table 1.2: Framework for assessing environmental impacts**

| FREQUENCY OF ACTIVITY | RATING | FREQUENCY OF IMPACT | RATING |
|---|---|---|---|
| Annually or less | 1 | Almost never / almost impossible | 1 |
| 6 monthly | 2 | Very seldom / highly unlikely | 2 |
| Monthly | 3 | Infrequent / unlikely / seldom | 3 |
| Weekly | 4 | Often / regularly / likely / possible | 4 |
| Daily | 5 | Daily / highly likely / definitely | 5 |

| SEVERITY[8] | RATING | SPATIAL SCOPE[9] | RATING | DURATION[10] | RATING |
|---|---|---|---|---|---|
| Insignificant / non-harmful | 1 | Activity specific | 1 | one day to one month | 1 |
| Small / potentially harmful | 2 | Area specific | 2 | one month to one year | 2 |
| Significant / slightly harmful | 3 | Whole site / plant / mine (project site) | 3 | one year to ten years | 3 |
| Great / harmful | 4 | Regional (neighbouring areas) | 4 | life of operation | 4 |
| Disastrous / extremely harmful | 5 | National | 5 | post closure (permanent) | 5 |

| SIGNIFICANCE RATING OF IMPACT | TIMING[11] |
|---|---|
| Negligible | Construction |
| **Low** (Very low = 1-25; Low = 26-50)) | Operation |
| **Medium** (Medium-Low = 51-75; Medium-high = 76-100) | Decommissioning |
| **High** (High = 101-125; Very high = 126-150) | |

[8] **Severity**: refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact(increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.

[9] **Spatial scope**: refers to the geographical scale of the impact.

[10] **Duration**: refers to the length of time over which the stressor will cause a change in the receptor.

[11] **Timing**: refers to the point in time at which a particular impact is expected to occur.

**Table 1.3: Significance rating matrix**

| CONSEQUENCE OF IMPACT (Severity + Duration + Spatial scale) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LIKELIHOOD (Frequency of activity + frequency of occurrence) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 |
| | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 | 30 | 33 | 36 | 39 | 42 | 45 |
| | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40 | 44 | 48 | 52 | 56 | 60 |
| | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 |
| | 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 | 66 | 72 | 78 | 84 | 90 |
| | 7 | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 | 70 | 77 | 84 | 91 | 98 | 105 |
| | 8 | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 | 80 | 88 | 96 | 104 | 112 | 120 |
| | 9 | 18 | 27 | 36 | 45 | 54 | 63 | 72 | 81 | 90 | 99 | 108 | 117 | 126 | 135 |
| | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 |

**Table 1.4: Positive/negative mitigation rating**

| Colour Code | Significance Rating | Value | Negative Impact Management Recommendation | Positive Impact Management Recommendation |
|---|---|---|---|---|
| | Very high | 126-150 | Improve current management | Maintain current management |
| | High | 101-125 | Improve current management | Maintain current management |
| | Medium-high | 76-100 | Improve current management | Maintain current management |
| | Medium-low | 51-75 | Maintain current management | Enhance current management |
| | Low | 26-50 | Maintain current management | Enhance current management |
| | Very low | 1-25 | Maintain current management | Enhance current management |

**Figure 1.1: Regional Location of KMT Concession Area**

**Figure 1.2: Location of the Kingamyambo and Musonoi tailings deposits and proposed project infrastructure (1:50 000 scale)**

**Figure 1.3: Location of the Kingamyambo and Musonoi tailings deposits and proposed infrastructure (1:20 000 scale)**