

# MINE CLOSURE PLAN

## 1 INTRODUCTION

Marampa Mines Limited (MML) has developed this mine closure plan (“MCP”) for the MML project in line with the various regulatory requirements of Sierra Leone and aspects of international best practice. MML recognises that integrating mine closure into the overall life of mine planning is critical as decisions made in the development and early operations phases can have profound effects on the ultimate closure plan, its cost, and the resulting sustainability of the created landscapes.

In planning for mine site closure, MML will use the following four guiding principles to drive the overall process:

1. Future public health and safety are not compromised;
2. The site is left in a stable state, both physically and chemically, that prevents deterioration of natural resources;
3. The site should be handed back to landholders in a productive and sustainable state that is both practicable and compatible with the surrounding landscape; and
4. Adverse socio-economic impacts are minimized and benefits are maximized.

This MCP will:

1. provide an outline of the site environment as it currently stands, including the impacts of past activities (i.e. legacy issues);
2. explain the site decommissioning process, potential end land uses and associated costs;
3. provide a description of the rehabilitation process; and
4. outline the post closure monitoring program.
5. This closure plan applies to the Project life of mine (“LOM”).

### *1.1 Plan Ownership and Maintenance*

During the life of mine, there will be iterative modifications to the mining plan reflecting the most current knowledge of market conditions, recovery, costs and forecasts. These modifications will also need to be considered by the MCP. The MCP must be considered a dynamic document that will evolve with time as it is updated to reflect changes in the life of mine plan, additional information is obtained, and practices are updated and take into account the views of stakeholders.

The MML Environmental Manager is the owner of this document and is responsible for its implementation and maintenance. As the project progresses and matures, this MCP will be updated and reissued for use every two years or sooner when:

- Changes or updates to Sierra Leone legislation or regulations occur;
- There have been significant changes to the life of mine plan or other project components that affects mine closure or rehabilitation;
- There is new information to be integrated into the plan based on studies, reviews, monitoring or lessons learned.

## 1.2 *MML Environmental Policy*

MML is an iron ore mining company.

The Company's overall environmental objectives include: a commitment of the board and management to pollution prevention; compliance with all applicable environmental laws and continual improvement to protect the environment.

In particular, the Company will:

- Recognise effective environmental management as a corporate priority and establish policies, programmes and practices to achieve this.
- Assess, design, construct, operate and close facilities, in accordance with sound engineering practice, compliance with Company policies, and all applicable laws providing for the reasonable protection of the environment, our employees contractors and the public.
- In countries where legislation does not meet our standards or is inadequate, the Company will, to the extent reasonable, apply management practices under the Equator Principles and IFC Standards with the objective of advancing environmental protection and managing risks and impacts.
- Develop, design and operate facilities in an environmentally sound manner, striving for protection and where reasonably possible, positive benefits to local bio-diversity, protection of water resources and the efficient use of energy and other resource materials.
- Re-use, recycle and dispose of wastes and by-products in a safe and responsible manner.
- Provide adequate resources, personnel and requisite training so that all employees and contractors are aware of and able to fulfil their environmental responsibilities.
- Develop, implement and continually update our environmental management systems to manage, reduce and where possible prevent environmental pollution relating to our activities, products and services.

### **1.3 STRUCTURE OF MCP**

The Marampa Mines MCP is structured as follows:

1: **Introduction** – An introduction to the Marampa Mines Ltd. MCP and description of the structure and layout of the document.

Section 2: **Reference documents** – A list of legislation, standards, conventions and guidelines that may affect the project closure.

Section 3: **Legacy Issues** – Provides a summary of the legacy issues at the Marampa Mine from previous operators.

Section 4: **Decommissioning** - Lists the infrastructure to be decommissioned upon closure of the mine site, describes the process to be followed and the management of wastes produced by the closure process .

Section 5: **Rehabilitation** – Describes the rehabilitation process and potential end land uses

Section 6: **Human resources and stakeholder engagement** – Describes how MML will engage key stakeholders in the mine closure process including employees and landholders.

Section 7: **Post closure monitoring** – Describes the post closure monitoring program that will be instigated to measure success of the mine closure against key performance indicators.

Section 8: **Estimated costs** – Provides estimates for costs associated with infrastructure decommissioning, site rehabilitation and post closure monitoring.

## 2 REFERENCE DOCUMENTS

This section provides an overview of the Sierra Leone administrative framework and describes the relevant legislation, international treaties and industry standards that the Marampa Mine will comply with. The key documents that directly influence the closure of the Marampa Mine site in terms of regulatory and other commitments include:

1. Environment Protection Act of 2008 and regulations
2. ESIA permitting document on which the EPA-SL approved the project
3. Mines and Minerals Act of 2009 and regulations
4. Marampa Mining lease and lease agreement between Marampa Mines Limited and the Government of Sierra Leone

### 2.1 *National Environmental Policies and Legislation*

#### 2.1.1 *Environment Protection Agency Act, 2008*

The Sierra Leone Environment Protection Agency Act of 2008 establishes the authority, responsibility, structure and funding of the Environmental Protection Agency (“EPA-SL”). Section 12(u) of this Act authorises the EPA-SL to “act as the focal point on all issues concerning the environment”.

Schedule 3 of the Act also requires a proponent to submit the plans for decommissioning of the project to the EPA-SL.

The Environment Protection (Mines and Minerals) Regulations of 2013 sets out the roles and responsibilities for mineral right holders in terms of environmental and social impacts resulting from their activities, and obligates them to prevent, minimise, manage and mitigate these impacts. Part VI and the Ninth Schedule of the regulations outline the requirements for mine closure and mine closure plans. These include the following:

- The mine site must be left stable and free of long term risk (physically, chemically, biologically) that facilitates sustainable end land use and is no burden on communities in terms of environmental or other liabilities;

A closure bond and MCP required before commencement of activities, with an updated version of the MCP submitted every 2 years.

- Progressive rehabilitation is required;
- Prior to closure, license holder must present to EPA-SL and Minerals dept. register of all assets to be removed and all those to be left in-situ:
  - o The register to include any potentially hazardous substances, erections or excavations.
- MCP to include proposed Monitoring and reporting plan that will extend minimum of 3 years post final closure; and

- Once the MCP is fully implemented and EPA-SL satisfied that the site is stable and has sustainable end land uses, then closure certificate may be issued and the bond cancelled.

### 2.1.2 *The Mines and Minerals Act, 2009*

The Sierra Leone Mines and Minerals Act of 2009 establishes the authority and responsibility of the Ministry responsible for mining regulation and management.

In relation to the Marampa Mines MCP, the following parts of the Act have the most relevance:

- Part VII (S50-55) deals with surrender and cancellation of minerals rights. S51 – partial or full surrender of mine lease is possible with 90 days’ notice and complying with conditions on lease (e.g. rehabilitation). Minister will issue certificate of surrender. Section 54; within 90 days of closure, submit plan to Mines Director listing assets to be left and those to be removed. MML must also notify the Mines Department of any hazardous substances (e.g. asbestos, oil, etc), erections or excavations in the area to be relinquished. The Director may direct certain assets to be removed or made safe or kept for ongoing maintenance of area. Also requires any freshwater dam to be left intact.
- S118 – requires MML to provide 12 months’ notice if permanent termination (i.e. closure). Also requires notice if production reduced or temporarily suspended (e.g. care and maintenance)
- S136(2-5) – financial assurance required for performance against any obligations deriving from the ESIA and EMP. Amount of financial assurance will be determined by ESIA/EMP and may vary over time to reflect changing costs. Surety may take form of cash, surety bond, trust fund with pay-in period, insurance policy or annuities

### 2.1.3 *Marampa ESIA*

As required by the Environment Protection Agency Act of 2008, Marampa Mines Limited submitted an environmental and social impact assessment (“**ESIA**”) to the EPASL along with this MCP for the reopening of the Marampa Mines. The key commitments relating to Closure in the MML ESIA is the requirement for MML to develop a MCP that includes:

- Monitoring;
- Consultation with local community;
- The requirement for MML to consider whether existing mine infrastructure, such as roads, buildings and bridges, can be of benefit to local communities post closure;
- Erosion controls, drainage and landscaping;
- End land uses;
- Rehabilitation of the site to prevent erosion and encourage the development of self-sustaining productive ecosystem; and
- Indicative costs.

#### **2.1.4 *The Marampa Mines lease and agreement***

The Mining Lease Agreement is still under negotiation and to be ratified by the Sierra Leone parliament.

#### **2.1.5 *Ancillary documents***

A number of other documents and regulatory bodies relating to closure have some relevance including:

- The National Environmental Policy of 2013 states that prospecting, exploration, mining and processing of mineral resources on land and water should proceed in an environmentally sound manner;
- The Lands Policy of Sierra Leone provides for the sustainable use of the nation's land and its natural resources. Specifically, Section 4.5 (b) requires restoration of ecology, landscape and productivity on lands following mining or road construction;
- Sierra Leone Roads Authority ("**SLRA**") would be involved in the closure of any public roads; and
- Sierra Leone Port Authority ("**SLPA**") would be involved with the closure of the Thofayim barge loading terminal and removal of any navigation aids installed by LMC.

Although MML is not a member of any professional body, guideline documents produced by the International Council on Mining & Metals ("**ICMM**") and similar industry groups may be referred to as industry best practice. Guidance may also be sought from International standards organisations such as the IFC in areas that Sierra Leone regulations do not cover.

### 3 LEGACY ISSUES

Within the last decade, the Marampa Mine concession license was held by SL Mining Limited (“SLM”) from March 2017 to 2021, Timis Mining Corporation (“TMC”) from November 2014 to March 2017 and London Mining Company (“LMC”) from March 2007 to October 2014. Prior to that the mine was operated by Delco Minerals from 1930 – 1971 and two subsequent operators between 1971 and 1985, namely Marampa Ore Reserve Evaluation Project (1971 – 1975) and Austro Minerals a subsidiary of Voest-Alpine (1982 – 1985).

These previous mining activities within the Marampa Mine Lease have left potential legacy environmental issues including abandoned pits, waste dumps and tailing storage facilities with limited rehabilitation, derelict buildings, and hazardous materials. This section will provide a brief summary of the legacy issues present at the Marampa Mine.

LMC & TMC left several environmental legacy issues at its Marampa and TRT concessions. Some of these legacies will be dealt by the subsequent operator MML due to its activities and they will then be managing the impacts from these legacies. When LMC and subsequently TMC went into administration no funds were made available by the Senior Secured Lenders of TMC for rehabilitation of disturbed areas or decommissioning of facilities such as TSFs or waste dumps.

There was very little rehabilitation conducted and no money was set aside to rehabilitate facilities such as TSFs and waste dumps that had no more capacity. According to the LMC criteria submitted to the EPA as part of the closure plan in 2014, none of the waste dumps or TSFs were properly rehabilitated or decommissioned at the time MML acquired control of the mine concession.

The most environmentally critical legacies are the Hospital Swamp – Southern TSF and the Airstrip waste dump. Both of these legacies have problems with material containment and their potential to damage the environment and negatively impact the surrounding communities is high as a result of material run-off during the rainy season. There is a possibility that the adjacent communities will be significantly affected going forward during each subsequent wet season. Barring interventions by MML, a third party will need to decommission, stabilise and revegetate these two legacies to avert significant negative environmental and social impacts.

A summary of the various legacy issues is provided in the Table 3-1 below for quick reference. Full details are provided in the **Environmental Legacies Report**.



**Table 3-1: Summary of the Marampa Mine Environmental Legacy Issues**

Location:	Legacy item:	Condition:	LMC Decommissioning Criteria:
Tailings Storage	Hospital Swamp -Southern TSF	<p>Material deposition stopped in 2013.</p> <p>Large TSF with inadequate benching and very low levels of vegetative cover.</p> <p>Located next to Batabana River on East side and community swamp lands to the South.</p> <p>Erosion of tailings into creek and surrounding farms lands (swamps) from unprotected slopes and breach in Western side of Southern TSF.</p> <p>TSF is at capacity and meets none of the decommissioning criteria.</p>	<p><i>Stable slopes and surfaces free from significant soil movement, with erosion levels similar to adjacent areas unaffected by mining activities. Slopes battered to not more than 25% (14°) overall slope angle, with benches preferably every 10m of elevation but no more than 15m.</i></p> <p><i>Run-off directed to dedicated drainage ways that effectively prevent erosion and are designed for 1 in 100-year rain events.</i></p>
	Valley B TSF	<p>Facility in use when TMC lost the concession.</p> <p>No significant problems.</p> <p>Has additional capacity for 12 to 18 months depending on rate of production.</p>	
Waste Dumps	Chendatta Waste Dump	<p>Not in use when LMC went into administration.</p> <p>No benches and slopes not battered to less than 25°. No armoured drains for runoff</p>	<p><i>Stable slopes and surfaces free from significant rock and soil movement, with erosion levels similar to adjacent areas unaffected by mining activities. This landform also includes pits that are backfilled to a level equal to or above the general landscape.</i></p> <p><i>Slopes battered to not more than 21° overall slope angle, with face angle of</i></p>
		<p>No significant movement of slopes</p> <p>No installed drainage</p>	<p><i>25° and bench height of 10-12 m and minimum 8 m berm width.</i></p> <p><i>Berms will be shaped to prevent water running over faces.</i></p>

Location:	Legacy item:	Condition:	LMC Decommissioning Criteria:
		Well vegetated with erosion levels similar to adjacent areas unaffected by mining	<i>Drainage along the berm of no more of 2% (1.2°).</i>
	Airstrip Waste Dump	<p>Facility in use when TMC lost the concession.</p> <p>Bordered by village and rice fields to the West and a transport route and farmland to the North.</p> <p>Significant erosion ruts along slope face and some material has escaped containment.</p> <p>Slope faces in excess of 25° and no benching installed. Drainage not installed, levels at top of dump direct water towards slope face instead of towards drains increasing rain runoff erosion.</p> <p>Very little vegetation on walls to help with erosion control</p>	<i>Run-off directed to dedicated armoured drainage ways that effectively prevent erosion and are designed for 1 in 100 year rain events.</i>
	Masaboin Hill Waste Dump	<p>70% of slopes revegetated, have stable slopes and erosion levels similar to adjacent areas unaffected by mining.</p> <p>30% with no vegetation undergoing significant erosion during the rains into vehicle maintenance yard. Portion of eroded material will enter Batabana Creek.</p> <p>No drainage</p>	
	North Swamp Waste Dump	<p>Slopes not vegetated</p> <p>No drainage</p>	
		<p>Not high enough to require benching</p> <p>No significant erosion but erosion will increase over time due to lack of vegetation</p>	

Location:	Legacy item:	Condition:	LMC Decommissioning Criteria:
Weathered Ore Mine Pits	Masaboin Northern Extension Pit	No significant erosion Stable slopes Pit lake formed in lower levels with well terraced walls above the water level	
	Masaboin Central Pit	Situated on a slope Pit walls partially terraced Signs of erosion at pit base, however, due to location eroded material reports to pit lake in Masaboin Northern Extension Pit which acts as a silt trap.	
	Northern Extension Weathered Ore Pit	Well terraced walls with 3m x 3m benches. No significant erosion	
Tailings Mine Pits		Tailings deposits in Valley A, Valley B, Hospital Swamp, Catchment, North Swamp and Golf Course exhausted. Varying amounts of material remains in Batabana, East Swamp and Hamlet Valley D, Chendatta and K&R Swamp were not mined by LMC Batabana Creek borders some tailings deposits leading to generalised tailings intrusion into the creek.	

Location:	Legacy item:	Condition:	LMC Decommissioning Criteria:
Flooding	Batabana Lake (Manonkoh Flooding)	Conflict between LMC and communities surrounding the Batabana Lake and utilising the causeway road especially Manonkoh. LMC was accused of causing flooding of the lake because of their activities downstream.  MML could be blamed for any reoccurrence as the current concession holder and care & maintenance provider for the Marampa Mine	
Abandoned Legacy Buildings	Delco crusher	Collapse risk  Building clad in white asbestos (chrysotile) a material associated with causing lung cancer, mesothelioma and asbestosis	
Facilities	Facilities	Building, offices, labs etc., left behind by TMC at Marampa & TRT  Most could be reused by MML	
TRT	Dredge Spoils	Well vegetated and incorporated into existing land forms.	
	Erosion control	Erosion around shore areas and into dredge spoils	

## 4 DECOMMISSIONING

Decommissioning is the process where fixed plant, buildings and infrastructure are dismantled or removed, and the site is made safe for the general public. Decommissioning includes subsequent site clean-up and appropriate disposal of waste.

For clarity, decommissioning does not include rehabilitation of the site.

### 4.1 *Facilities To Be Decommissioned*

For the purposes of this MCP, it will be assumed that all fixed and portable plant, buildings (e.g. office/accommodation blocks) and infrastructure built by MML or its contractors will be removed from service and completely decommissioned at the end of the project life. Any future agreement to leave facilities in place will be documented.

The exceptions to this approach are:

- Concentrate haul road from Marampa Mine site to Thofayim. The section of haul road from Lunsar to Mammy Nancy is an SLRA road that was upgraded by LMC a previous operator of the mine and will not be decommissioned. The section of road from Mammy Nancy to Thofayim is the only access for communities in this area and will remain in place for their continued use. In addition, the road acts as service access to the SD Steel railway.
- Katik road upgrade. The upgrade has improved access for communities along this section and will be left in place for their use.
- Main access roads through the mine site. Two main access roads that connect Lunsar Town with the communities to the south and east of the lease will be kept intact.

The Sierra Leone Mines and Minerals Act of 2009 also states any freshwater dam should be left intact. MML will seek further clarification on this aspect but at this stage MML do not plan to build any freshwater dams, although lakes will likely be formed in pit voids and a number of silt ponds will need to be created.

As indicated above, the majority of facilities to be decommissioned are located within the general processing plant area. Plant to be decommissioned at the mine site will include:

- Purpose built process plant capable of producing up to 3.25 Mtpa of iron ore concentrate via magnetic separation. The plant includes dump pocket, crushers, two ball mills, conveyors, gravity spirals, process water tanks, magnetic separating system, concentrate dewatering belt filters and thickeners all built on concrete foundations and connected by a series of pipes and cables;
- Water pipe and pump station on the Rokel River;
- Onsite camp to cater for both construction and operations;
- Three administration and office blocks;

- 15MW powerhouse;
- Bulk fuel and lubricants storage facilities;
- Vehicle service centre, including fuel dispensing facilities and wash bays;
- Warehouse facilities plus gravelled laydown;
- Heavy and light vehicle maintenance areas;
- Tyre bay;
- Explosives magazine;
- Sewage and potable water treatment plants;
- Waste management area including incinerator, waste oil tanks and landfill;
- Other infrastructure built for the various phases of operation; and
- Haulage/Mining Contractor allotment including offices and workshop.

In the Thofayim area, the following plant will be decommissioned:

- Single barge loading facility that includes dump pocket to receive concentrate from haul trucks, a conveyor system for loading concentrate onto barges, floating jetty for berthing the barges and a stockpile area all built on concrete foundations;
- 1MW power generator;
- Office and administration buildings (sea containers);
- 20-man camp;
- Fuel and lubricants storage facilities;
- Fuel dispensing facilities;
- Maintenance areas;
- Sewerage and potable treatment plants with water borehole;
- Waste management area; and
- Barge anchorage near to Pepel will need to be removed unless required by the SLPA.

Reference should also be made to *Chapter 2* of the Marampa Mines Limited ESIA that provides a more detailed description of the plant facilities.

The following project facilities and plant are leased and remain the property of the original owners. MML will ensure that they are removed appropriately:

- Transshipment facilities;
- Contract mining and haulage heavy equipment; and
- Tugs and concentrate barges.

## 4.2 ASSET TRANSFER

A process of consultation with stakeholders over the potential to leave certain infrastructure in place for their subsequent use will be undertaken, subject to approval by the Ministry of Mines and Mineral Resources “MMMR” and EPASL. The Sierra Leone Mines and Minerals Act of 2009 also permits the Director of Mines to request that certain assets are kept for ongoing maintenance and sustainable development of the area.

Transfer of company facilities to government or community stakeholders may be agreed by negotiation, and only where the facility in question has demonstrable sustainable use for the stakeholder beyond any short-term scrap value and it can be demonstrated that the stakeholder has the capacity to effectively manage and maintain that asset. Any asset handed over must have a practical, beneficial and sustainable use to the receiving party and would not merely be obtained in order to partially demolish for its scrap metal value, leaving a derelict building behind.

Any asset that poses a potential safety risk or has an associated contamination risk will be removed. MML will only hand over infrastructure in a safe state with waste issues managed.

It will be made clear to any receiving parties that the liability for maintaining and decommissioning the asset once handed over belongs to that party and is no longer the responsibility of MML.

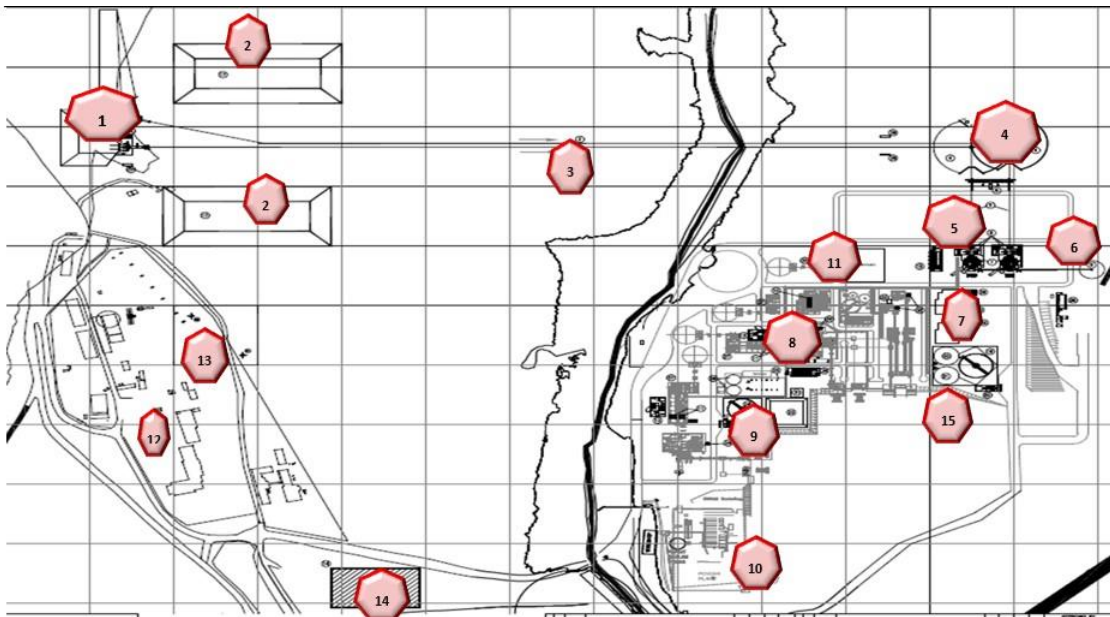
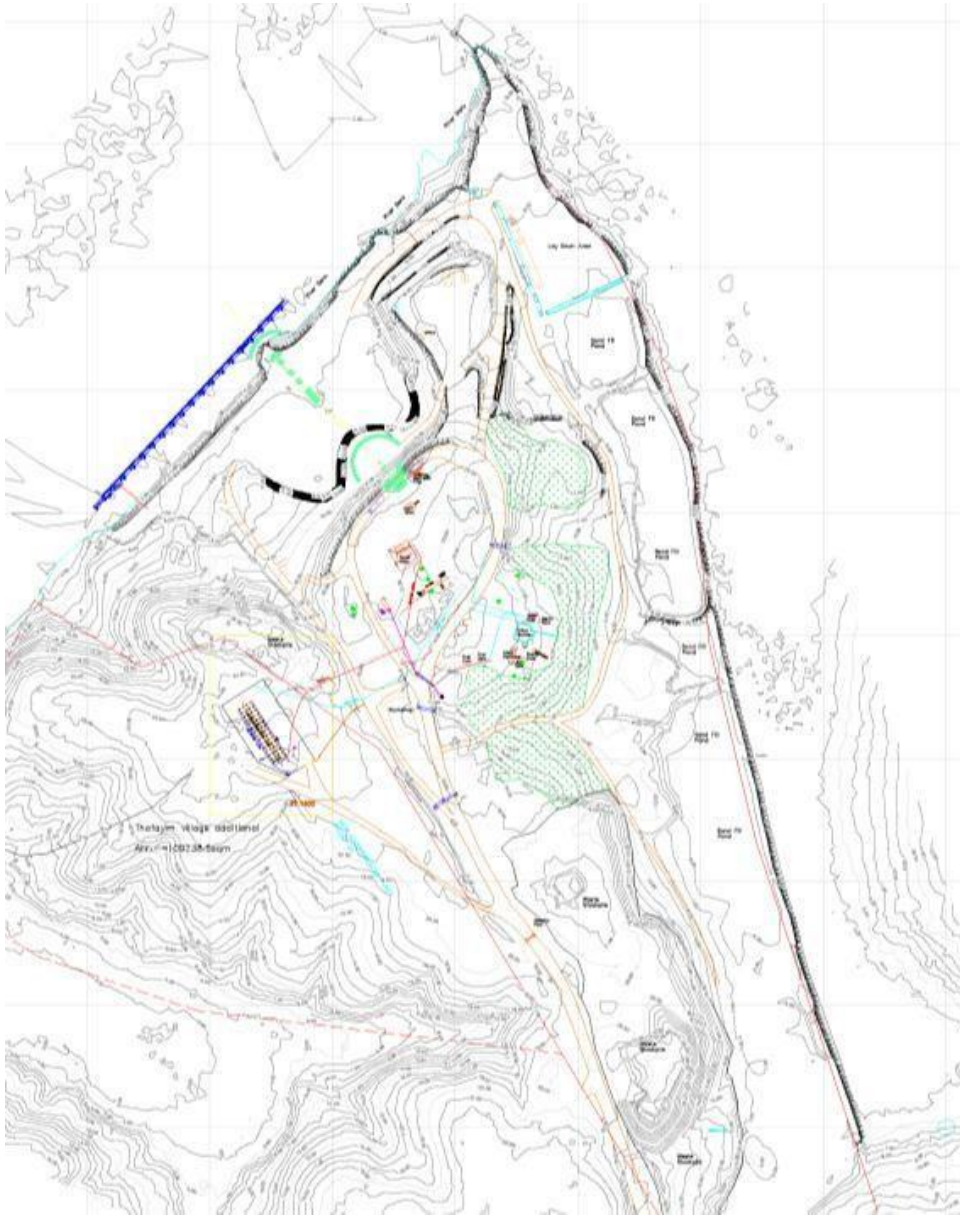


Figure 4-1: Marampa Process Plant Layout



**Figure 4-2: Thofayim River Terminal Facilities Layout**

### **4.3 Decommissioning Process**

At the end of the mine life, MML will appoint a project team leader to efficiently execute the Marampa Mines decommissioning process. It is likely that MML will employ the services of a specialised external contractor for this work, supported by suitable MML personnel and local contractors. The main objective of the team will be the safe and efficient decommissioning of the facilities with minimum environmental impact.

The following strategy will be applied:

- All buildings, plant, structures, equipment, and facilities will be offered for sale to the highest bidder on the local and international market on a “where-is as-is basis”. The exact items will depend on their condition at the end of mine life and the state of the market at that time. Any and all items sold will be removed from the site unless as part of a pre-existing agreement with landholders or government;



- All buildings, structures, equipment, facilities, signs and infrastructure which have not been sold, and are not to remain in situ for an agreed purpose, will be dismantled/demolished and removed/disposed;
- Where cabling and non-hydrocarbon pipework (e.g. water pipe) are more than 0.6m below the planned final ground surface, they will be cut off and left in situ. Cables and pipework within 0.6 m of the final surface will be removed to ensure they do not interfere with agricultural or other potential activities;
- All pipework (including underground) and tanks that have conveyed/stored hydrocarbon or other chemicals will be removed and the soil checked for contamination regardless of depth;
- All areas that may have been exposed to hydrocarbons, such as fuel farms, powerhouse, warehouse and maintenance areas will be investigated for potential contamination, including soil sampling beneath and around any facility and testing for the presence of total petroleum hydrocarbons. Any contamination identified will be remediated;
- Warehouse inventory including fuels and chemicals. Remaining stocks will either be returned to the supplier or sold and removed from site;
- Mine roads that will provide little benefit to the local community will be decommissioned;
- All sewerage tanks will be pumped out and the tanks broken up and removed;
- MML owned telecommunications and IT equipment will be removed from site and sold or disposed of as electronic waste due to the age of the equipment; and
- MML owned mobile plant (e.g. trucks, excavators, light vehicles) will be sold at market value or scrapped. Leased or contracted equipment will be returned to the owners.
- Facilities will be decommissioned in a phased approach over an eight to twelve month period. This reflects the need to keep support infrastructure, such as accommodation, potable water treatment plants, heavy vehicle maintenance, power house and fuel facilities in place to support ongoing closure and rehabilitation activities. Decommissioning the process plant and related structures (e.g. plant maintenance) plus Thofayim barge loading facility will occur first as they will no longer be required once ore processing is completed. Once the majority of rehabilitation and earthworks are completed, the remaining facilities will be decommissioned. MML will utilise contractors and premises based in Lunsar to finalise rehabilitation of the site and for postclosure monitoring.

#### **4.3.1 Waste Management**

During site decommissioning, the MML Waste Management Plan will apply.

In general, MML have three options for treating wastes; manage on site, utilise in country waste management facilities or export to acceptable waste management companies out of Sierra Leone in compliance with the Basel and Bamako Conventions.

Wherever possible waste will be recycled, although other means of disposal (e.g. incineration) will also be required. It is envisaged that the following wastes will be managed within Sierra Leone; scrap metal, concrete rubble, paper / cardboard, wood (including pallets and furniture), plastics, oil sludges, waste oil, oily sediments, flammable liquids, waste containers, medical wastes, fluorescent tubes and disused containers. Scrap metal will likely be sent for recycling by MML directly or through the use of a contractor.

Although it is assumed that waste management companies will eventually develop within Sierra Leone, MML will proceed on the understanding that it will need to manage the wastes itself. MML owns a dual chamber high temperature incinerator for dealing with the majority of hazardous wastes that will be produced on site and this will also be available during decommissioning of the site.

Approximately 2,500m<sup>3</sup> of non-contaminated, non-salvageable material will require disposal within the lease area. This material will include concrete foundations, miscellaneous building materials, used tyres, old conveyor belt, rubber-lined shutters, etc. This material will be buried within a waste rock dump.

MML may export certain waste types where the available management technology is not available in Sierra Leone or is not practicable. The approval process for the shipment of wastes to other countries is governed by the Bamako and Basel conventions which require approval to be sought from the exporting and importing countries and also those countries through which the waste must transit. The general policy of most governments is that wastes should not be imported for disposal unless the exporting country does not have, and cannot reasonably acquire, the technical capacity and necessary facilities to dispose of the waste in question in an environmentally sound manner. EPA-SL being the focal point of the Basel Convention will facilitate any transport of hazardous waste outside Sierra Leone should the need arise.

Potential wastes for export include electronic wastes (i.e. old computers) and lead acid batteries. MML will have a "Return Of Exported Radioactive Isotopes" agreement in place so that densitometers can be sent to a recognised company for managing these units at closure (Annex A).

Residual chemicals, fuel and lubricants will be returned to the suppliers or run down in the final stages of the plant life.

The Sierra Leone Mines and Minerals Act of 2009 also require that MML notify them of any hazardous substances (e.g. asbestos, oil, etc), erections or excavations. The EPA-SL will also be kept apprised of all hazardous waste in accordance with its mandate enshrined in the 2008 EPA Act.

MML will ensure that an inventory of wastes produced during the decommissioning process is recorded. This will be submitted to the EPASL as part of MML's routine reporting.

## 5 REHABILITATION

Restoration of the pre-impact ecosystem is not a realistic goal for the Marampa Mine site. It has been impacted by both mining activities as well as agriculture over an extensive period of time. It is also generally accepted by restoration ecologists that even with adequate resources (time and money) and extensive research (observational and experimental), complete ecological restoration of a severely perturbed environment to its original state is a formidable, if not unobtainable goal. As a result, MML will implement a rehabilitation strategy that satisfies the landholders in terms of productive end land uses, and would also ensure that environmental requirements are met, such as long-term stability, biodiversity and ecosystem resilience.

MML rehabilitation programme will accomplish this by establishing a diverse variety of species that will recondition the soil, attract other forms of life and provide a diversity of habitats for increased structural and biological complexity. This will take time, commitment and resources.

### 5.1 *Rehabilitation Criteria*

Rehabilitation Criteria provide both guidance in the development and subsequent implementation of the mine site rehabilitation program as well as to allow regulators and other stakeholders to ascertain whether the desired end land use has been achieved for a specific landform. Rehabilitation Criteria are divided into two distinct but equally important subsets: Landscape Criteria and Land Use Completion Criteria.

#### 5.1.1 *Landscape Criteria*

Landscape Criteria describe the final physical attributes for a particular landform type, such as a pit or dump, which must be achieved for successful lease relinquishment. The protection of the local community is the first priority of any closure and decommissioning programme. Therefore, these criteria relate primarily to long-term stability of the landscape, and making safe open pits, waste rock dumps and other engineered landforms.

Environmental issues considered include preserving water quality; eliminating the potential for fugitive materials such as dust and toxicants; and ensuring the site is stable and not eroding in the long term. The proposed Landscape Criteria for the Marampa Mine site are presented in Table 5-1.

#### 5.1.2 *Land Use Criteria*

Land Use Completion Criteria define the desired end land use to which a particular landform will be suited once the site has been successfully rehabilitated. It is important to match each particular landform unit with the appropriate end land use to avoid later degradation of the site once “normal” (i.e. pre-mining) activities resume. To be considered successful, the final landform must be resilient to perturbation and be self-sustaining so that further

“intervention” (i.e. fertiliser, planting, weeding) by MML is not required. The proposed Land Use Completion Criteria for MML are presented in Table 5-2.

It should be noted that although end land uses have been assigned to each of the principal landscapes, it will not be possible for this aspect to be finalised until MML has undergone extensive consultation with its principal stakeholders. However MML will be undertaking progressive rehabilitation of its site to minimise potential impacts. This approach is recognised as being Good Practice and a requirement of the EPA-SL.

Whilst provisional planning has allowed for a mixture of these options, consultation with stakeholders will be required to identify the final end land use.

**Table 5-1: Landscape criteria for the principal landforms**

Landform:	Landscape Criteria:
Pits - free draining	<p>Any residual pit void that is free draining with no lake formed. This also applies to any pit void that is only partially backfilled and remains below the level of the general landscape.</p> <p>The drainage-way reports to a natural waterway, via a silt trap, and is stable and free of bed/bank erosion. Designed for 1 in 100 year rain events.</p> <p>Pit slopes are stable, free from significant rock fall or soil movement. In weathered zone, the overall pit slope does not exceed 30 ° and is stable. In areas with harder rock, the overall slope should not exceed 60 °.</p> <p>Drainage complies with Sierra Leone Environmental Effluent Quality Guidelines except where affected by upstream impacts or where baseline/reference site water quality parameters exceed those guidelines.</p> <p>Establishment of a protective zone around the pit, with features such as signs or perimeter bunds, to warn community of slopes.</p>
Pit Lakes and Water Bodies	<p>This landform is one where the pit void is not free draining and a lake forms. An overflow/drainage channel should connect pit lakes/water bodies with a natural waterway to prevent overtopping and potential flooding. Designed for 1 in 100 year rain events.</p> <p>Seasonal water level fluctuation is minimised as far as practicable.</p> <p>Any drainage channel should be stable and free of bed/bank erosion.</p> <p>Exposed slopes above the lake level are stable, free from significant rock fall or soil movement.</p> <p>In weathered zone, the overall pit slope does not exceed 30 °. In areas with harder rock, the overall slope should not exceed 60 °.</p> <p>Water discharge complies with Sierra Leone Environmental Effluent Quality Guidelines except where affected by upstream impacts or where baseline/reference site water quality parameters exceed those guidelines.</p> <p>Establishment of a protective zone, with features such as signs or perimeter bunds, around the pit to warn community of slopes and pit lake.</p> <p>Water levels reduced to minimum practical elevations.</p> <p>Safe community access to the water surface to be maintained.</p>

Landform:	Landscape Criteria:
Waste Rock Dumps and Borrow Pits	<p>Stable slopes and surfaces free from significant rock and soil movement, with erosion levels similar to adjacent areas unaffected by mining activities. This landform also includes pits that are backfilled to a level equal to or above the general landscape.</p> <p>Slopes battered to not more than 21° overall slope angle, with face angle of 25 ° and bench height of 10-12 m and minimum 8 m berm width.</p> <p>Berms will be shaped to prevent water running over faces.</p> <p>Drainage along the berm of no more of 2% (1.2 °).</p> <p>Run-off directed to dedicated armoured drainage ways that effectively prevent erosion and are designed for 1 in 100 year rain events.</p> <p>Leachate and runoff from dumps comply with Sierra Leone Environmental Effluent Quality Guidelines.</p>
Tailings Storage Facility - dry	<p>Stable slopes and surfaces free from significant soil movement, with erosion levels similar to adjacent areas unaffected by mining activities.</p> <p>Slopes battered to not more than 25% (14°) overall slope angle, with benches preferably every 10m of elevation but no more than 15m.</p> <p>Run-off directed to dedicated drainage ways that effectively prevent erosion and are designed for 1 in 100 year rain events.</p> <p>Leachate and runoff from dry stacked tailings comply with Sierra Leone Environmental Effluent Quality Guidelines.</p>
Tailings Storage Facility - wet	<p>Embankments stable with erosion levels similar to adjacent areas unaffected by mining activities.</p> <p>No steep slopes (&lt;30 °) or faces leading into storage facility.</p> <p>Protected access to unconsolidated tailings storage facility.</p> <p>Provision of a 1 m embankment freeboard.</p> <p>Overflow spillway designed and constructed for 1 in 100 year rain event.</p>
Fixed plant and buildings, e.g. offices, fuel storage, camp, process plant and warehouses.	<p>Soils stable with erosion levels similar to adjacent areas unaffected by mining activities.</p> <p>Run-off managed effectively to control erosion.</p> <p>All facilities, pipelines, concrete not required by local community/government removed or at least 0.6m below final surface.</p> <p>Soils will be free of contaminants (e.g. hydrocarbons).</p> <p>Free from all hazards, hazardous materials and waste</p>
Haul roads and access tracks	<p>Soils stable with erosion levels similar to adjacent areas unaffected by mining activities.</p> <p>Water run-off managed effectively to control erosion.</p> <p>Soils will be free of contaminants (e.g. hydrocarbons).</p>

**Table 5-2: Final land use completion criteria for the principal landforms**

End Land Use:	Completion Criteria:
Forest Resource	<p>Use of indigenous species not less than 80% and any introduced species used already present in region and are not considered a pest in Sierra Leone.</p> <p>Tree density of between 250 to 1000 stems per hectare (species dependant).</p> <p>Qualitative and/or quantitative analysis of vegetative cover confirms progression of forest regrowth.</p> <p>System complexity develops, creating conditions favourable for the natural influx of fauna.</p>
Plantation Timber	<p>Establishment of plantation species normally used for commercial plantations in Sierra Leone and planted at the spacing recommended by Forestry Department.</p>
Water Resource	<p>Fresh water inflow assured.</p> <p>Water quality complies with Sierra Leone Environmental Quality Guidelines except where affected by upstream impacts or where baseline/reference water quality parameters in adjacent areas exceed those guidelines.</p> <p>Self-sustaining population of aquatic fauna has been established, including species of use to local community.</p> <p>Creation of a littoral zone using species typically found in the area</p> <p>Creation of a riparian zone using species typically found in the area</p>
Agriculture	<p>Appropriate soil cover suited to agricultural production exists to a minimum depth of 0.25 m on flat landscapes and 0.1m on slopes greater than 5%.</p> <p>Soils stable with erosion levels similar to adjacent areas unaffected by mining activities.</p> <p>Soil macro-nutrient levels similar to adjacent areas unaffected by mining activities.</p> <p>Crop productivity levels similar to adjacent areas unaffected by mining activities.</p> <p>Completion of three years growth for tree crops.</p> <p>Planting of sustainable cash crop(s) suited to the local conditions.</p>
Aesthetic	<p>Use of appropriate vegetation cover to maintain the aesthetic integrity of the area.</p> <p>Use of indigenous species not less than 60% and any introduced species used already present on site or are not considered a pest in Sierra Leone.</p> <p>Soils stable with erosion levels similar to adjacent areas unaffected by mining activities.</p> <p>This end land use shall only apply to those landscapes (e.g. pit walls) not suited to the above listed land uses.</p>

## 5.2 Rehabilitation Process

MML will implement a three-stage rehabilitation programme to create the conditions necessary to form a productive landscape once mining activities are finished. These three stages are Landscaping, Phase 1 planting and Phase 2 planting.

### 5.2.1 Landscaping

Landforms will be designed and constructed so that they are safe and stable, allowing for the terrain, soil/rock types and high rainfall of the area. Significant earthworks are required to reshape landforms in order to lessen any steep slopes, re-profile surfaces and construct drains to control and direct the runoff water before discharge into the natural drainage system.

Waste rock dumps will be constructed using a combination of end dumping and area dumping, having first removed the vegetation. A degree of compaction is achieved through haul truck and dozer movements. Dumps will be built up in 10-12m lifts with a bench between each lift. Benches are 15m wide and bench faces are at angle of repose (approximately 35°). The resultant overall slope angle is ~25°. Benches will be sloped well back from the crest to ensure water cannot flow over the face, which is helped by leaving a 1-2m safety berm in place along the crest. An initial slope of 10-15% for the first 3-5m back from the crest aids in ensuring water does not flow over the face or along the outer area of the bench where it can infiltrate into the dumps through cracks caused by slumping. The slope should then be reduced to a maximum of 2% for the remainder of the bench. Water from benches is controlled so that it flows to either natural or formed rock armoured drains that can handle the volumes of water involved.

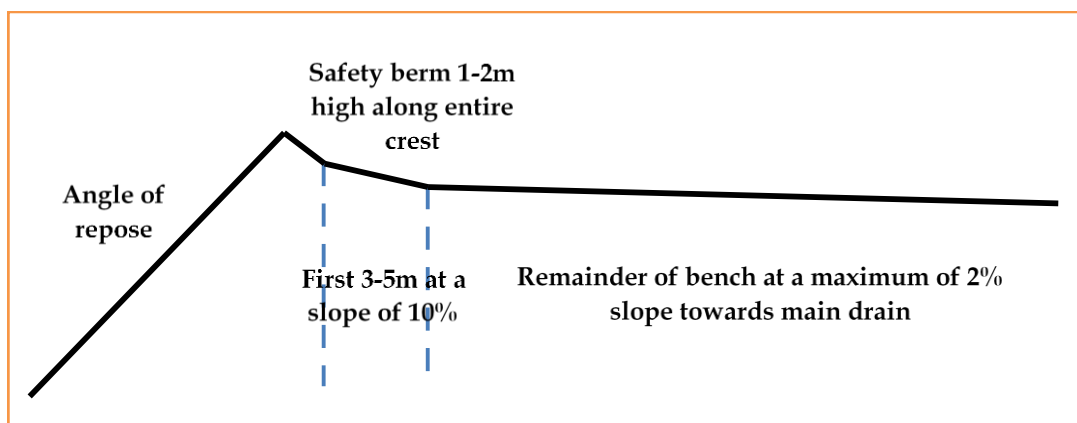


Figure 5-1: Typical waste dump bench cross-section

Once a landform is shaped, topsoil (where available) or other weathered material suited to vegetative growth will be spread over the site. Due to the lack of topsoil on the Marampa Mine lease, a lateritic soil cover sourced from the project area will be used where necessary.

On flat landforms with appropriate sub-soil (i.e. weathered material), 0.1-2m of topsoil (where available) or lateritic soils will be placed and 0.1m on faces to facilitate revegetation. On landforms with a lack of appropriate sub-soil, 0.5m of lateritic soil cover will be used to facilitate revegetation on flat surfaces and 0.2m on slopes.



Once the final soil cover has been placed, the soil will be ripped to a depth of at least 0.3m where it is safe for the machinery to do so (i.e. not on bench faces). All ripping must be orientated so that it goes against the main slope of the bench to reduce erosion potential.

For haul roads, the majority will only need to be deep ripped as they have been built with lateritic materials. Where non-lateritic materials have been used for the haul road, the road will first be deep ripped across the slope and then 0.3m of laterite will be used as cover. Finally, the soil will be tilled or shallow ripped.

For safety reasons, loose material cannot be placed on pit benches during mining. However, at the end of the mine life, weathered material will be end dumped on the crest of the pit high wall and pushed over the face so that some oxide rests on the benches below where safe to do so. Where the highwall is located in oxide material and thus deemed more suited to planting, this will not be required.

On waste dumps and similar landforms with an overall slope greater than 5%, or where the base of a slope is less than 15 meters from a water body, slope breakers will be used to control runoff. Slope breakers shall also be used wherever required to control and direct runoff, such as on landforms with a fetch >100m even though the slope may be less than 5%. Slope breakers are installed to reduce runoff velocity and divert water from the landscape to adjacent established vegetation or fixed drains. The minimum depth of a slope breaker, from the drain to the top of the berm shall be an absolute minimum of 0.3m and preferably be 0.5m. The slopes of the berm will be 2(H):1(V) or flatter. The slope along the drain shall not exceed 3% and preferably be 1.5-2%.

The outlet of each slope breaker is to be located either in a stable, well-vegetated area, in an energy-dissipating device (e.g. properly sized riprap), or into a drain. The outfall of each slope breaker should be positioned to prevent sediment discharge into wetlands, water bodies, or other sensitive resources.

**Table 5-3: Typical spacing to be used for slope breakers**

Slope (%)	Slope (degrees)	Typical Spacing (m)
<15	<9	100
15-20	9-11	60
20-30	11-17	35
30-40	17-22	25
40-60	22-31	20
60-70	31-35	15

Where required, drains will be used to direct runoff from landforms in a controlled manner. Drains will have a slope of approximately 1-2% so that runoff velocity can be kept to a minimum. Any main drain that has a slope greater than 3% will be armoured. The degree of armoring will depend on both the catchment volume as well as the slope. As a minimum, rip rap of 50100mm diameter and 150mm deep on drains with a slope >3% <10% should be

used. For drains with a slope >10% armouring should be via either stone pitching (i.e. cobbles cemented in place) or placed riprap (100-150mm, single layer) with an underlay of either geotextile or stone filter (25-50mm diameter, 150mm thick).

All sediment laden runoff will be either diverted to settling ponds before reporting to waterways or passed through silt fences to ensure that courses sediments are entrapped and will not affect streams.

Erosion matting is a woven mesh that provides protection to soils against surface erosion. It also has the added advantages of protecting seed until such time as it germinates and develops a strong root system, conserving soil moisture, adding organic matter where coir or hessian is used and increasing water infiltration. MML will use erosion matting as required to facilitate rehabilitation of the site.

### 5.2.2 *Phase 1 Planting*

Phase 1 planting will be completed using a range of plant species and growth forms to:

- protect the soil from the impacts of rain and runoff, the major causes of erosion in the tropics.
- aid in the re-establishment of the natural soil profile by producing large quantities of organic matter and, as most are leguminous, also nitrogen.
- rebuild the soil characteristics (e.g. nitrogen, organic matter, soil nutrient cycle, soil structure); and
- provide suitable habitat for insects and other small animals (reptiles, birds, mammals), essential for successful rehabilitation of the mine site.

The ultimate goal of this phase of work is to rebuild the soil and create a soil/landscape that allows a range of final land uses, including agriculture and forestry, to be implemented.

In order for this phase of the site rehabilitation to proceed, MML needs to identify a range of suitable plant species. As there has been little work in this field undertaken locally, MML cannot simply copy work previously completed. As a result, MML will have to award a contract to a Sierra Leone team having a wide range of experience in landscape ecology, botany, forestry and agriculture. The aim of the assignment is to identify a range of suitable plant species to aid in this initial stage of site rehabilitation; including tree, shrubs, for and groundcover species (decumbent vines and grasses). In the process, the consultant is expected to pay particular attention to indigenous species which will be more adaptive to the local ecology. Attention will also be paid to species that have been or will be introduced in the agriculture and forestry sectors. The identified plant species will be procured e.g. Ministry of Agriculture or from a nursery developed by MML for the purpose of rehabilitation.

The practice of using exotics (i.e. introduced) for rehabilitation is not considered Good Practice, so preference will be given to species native to Sierra Leone and specifically endemic to the Marampa Mine area. Introduced species will be considered by MML where they are not considered a nuisance (i.e. weed) species, will contribute to the site rehabilitation program, and are already present or are approved for use by the Government of Sierra Leone

(e.g. Forestry Department of the Ministry of Agriculture Forestry & Food Security). For groundcover species, the use of introduced agricultural species is common and may provide suitable alternatives. It has been noted that there are a number of species on site (e.g. *Pueraria phaseoloides*) that may be suitable.

MML will use mineral and organic fertiliser during this stage to help build up the soil nutrients.

### 5.2.3 Phase 2 Planting

Phase 1 planting will allow soil profiles and nutrient cycles to be re-established. It will also allow the ecosystem to develop to such an extent that natural resilience to perturbation will be established. Prior to this time, no forest extraction for timber and fruit, or slash-and-burn agriculture should be undertaken on rehabilitated lands.

The purpose of phase 2 planting is to establish the final land use (Table 6.2) as agreed with the landholders. Agreement on the final land use will be reached with landholders well before this phase of work will be started.

It is expected that agriculture will be a significant end land use identified by landholders. Where tree crops are requested, MML will use improved varieties of oil palm, mangoes or other species as identified by the Ministry of Agriculture at the time. Where the landholders identify annual crops as the required end land use, MML will establish Phase 1 planting only but will maintain it, including application of fertiliser, for 36 months to allow the soil nutrient cycle to establish and the vegetation to mature sufficiently.

The reforested and plantation timber/forest resource area will both have a similar approach. After 2-3 years, the Phase 1 trees will form a dense canopy under which Phase 2 planting of forest trees can commence. Most forest trees cannot be planted earlier as they are unable to compete with the faster growing groundcover species that are essential for erosion control. The establishment of a dense canopy by the shade trees kills the sun loving groundcover plants, thereby reducing competition and providing space for forest trees to grow.

The seedlings of some forest trees do not tolerate direct sunlight very well. This is to be expected as they normally grow under the filtered light of a rainforest canopy, waiting for an adult tree to fall and thus clear some space in which they can grow. The strategy is therefore to create the natural environmental conditions necessary to allow forest seedlings to survive and grow. In addition, by growing the forest trees under shade, this will promote the tall straight trunk typical of forest trees. Eventually the developing canopy of the mature forest trees will in turn shade out the much smaller Phase 1 trees. Further forest seedlings will then be able to grow, waiting for adult forest trees to fall and provide them with a chance to grow. The structural complexity created by having multiple canopies will also aid in recruitment of fauna.

Where the aesthetic land use is identified, the final species will be phase 1 species that are capable of living in the relatively harsh environment of pit faces. Over time, these systems will develop and recruitment of additional species will occur via a number of pathways (i.e. wind-borne, runoff, seed-dispersing fauna).

MML will work with established crops/forestry departments and authorities to identify and obtain species suited to the phase 2 rehabilitation requirements.

#### **5.2.4 *Progressive rehabilitation***

MML will undertake progressive rehabilitation of the site wherever possible. As with any mine development, the site impact footprint increases in the first years of the project as the infrastructure, pits and waste facilities are developed. With a useful life of many years, these areas cannot be totally rehabilitated until they have been completed or exhausted. This limits the ability to rehabilitate certain areas such as the pits.

It must also be noted that Much of the current impact and future impact footprints including waste dumps, tailings areas and pits will be incorporated into the programme. Most of these areas will only be available for rehabilitation at a much later date. Areas that will be available for rehabilitation include the Phase 1 TSFs (i.e. Hospital Swamp TSF and Southern TSF). MML will also be able to progressively undertake rehabilitation of the four Marampa 3.25 TSFs (i.e. Valley B, Valley D, Hamlet Swamp & the LOM TSF) as they are developed and sequentially decommissioned over the thirty year life of this project.

Progressive rehabilitation can normally occur on waste dumps. As each bench is completed, they are separated by a berm allowing safe access to the area for rehabilitation crews. Rehabilitation of facilities built to their final landform early in the project life will also be able to occur early in the project life.

MML will stabilise areas around the general mine site with vegetation. This is not considered full rehabilitation as the stabilisation planting will not generally meet all of the success criteria outlined in Table 5-2.

MML will undertake trials to identify the best species and methods for site rehabilitation. MML will have areas available from Phase 1 that will be used for these trials. It is important that trials are undertaken to ensure the optimal species (e.g. groundcovers, forest species, and crop trees) and methods (e.g. fertiliser, timing, transplant vs. direct seeding, etc.) are used for successful site rehabilitation. These will also help as demonstration plots to aid in the consultation process with landholders.

## 6 HUMAN RESOURCES AND STAKEHOLDER ENGAGEMENT

MML recognises that early engagement with stakeholders enables their requirements to be established and agreed and considered in the closure plan development. Submission of this document to the regulators of Sierra Leone is the first stage in this process, which will continue until MML successfully complete the closure process and relinquish the lease.

### 6.1 STAKEHOLDER CONSULTATION

Key areas of consultation with stakeholders regarding closure will include:

- Keeping stakeholders informed about the life of the mine. MML recognises that stakeholders need to understand there is a finite life to the Marampa Mine and how long the site will remain active so that planning by individuals, businesses and administrators can be undertaken. MML will keep stakeholders informed of its expected mine life.
- Discussions on the potential for transferring ownership of mine infrastructure such as buildings and roads. Consultation will be undertaken with local, provincial and national government agencies; local landowners and communities; and other stakeholders to ascertain what buildings, structures, equipment and facilities may be of sustainable benefit and could therefore be sold or left behind under agreed terms. This will include the clear communication that:
  - MML shall only hand over infrastructure or assets that have a practical, beneficial and sustainable use to the receiving party and would not merely be transferred in order to partially demolish for its scrap metal value, roofing or fittings, leaving a derelict building behind.
  - MML will have no liability for the infrastructure once handed over;
  - Maintenance and decommissioning will be the responsibility of the receiving party;
  - The recipient has the financial, technical and other resources necessary to adequately manage, operate and maintain the item, both in the short and long term;
  - A request to leave infrastructure behind is not automatically granted as approval is required from a number of groups on this, including MMR, EPA-SL, District Council and landholders; and
  - There will be restrictions on the type of infrastructure that MML will be willing to transfer given the potential for legacy issues. Any such agreement would only be considered by MML where public safety and environmental health is not compromised.
- To agree on an end land use (i.e. garden, economic trees, natural forest, etc) for each area that is to be rehabilitated.
  - MML must communicate restrictions to any landform (i.e. cannot grow rice on top of waste dump) but also opportunities such as planting oil palm or

other cash crop using improved varieties, planting trees for building materials, preparing land for subsistence crops, forest lands.

- It is important that landholders understand that rehabilitated land needs time to recover before it can be used for agriculture and that they will not be able to start using rehabilitated land until there has been a formal handover to them.

Preliminary consultations were held with stakeholders in Lunsar to apprise them of issues related to the MCP. They were very pleased that the company was contemplating these issues and though they understood the principles on which the MCP will be based, they nevertheless expressed a desire for most of the infrastructure to be left in place. They were very pleased that the MCP would consider issues related to the welfare of communities even after closure.

Further consultation with immediate stakeholders about the closure of the Marampa Mine site will be conducted primarily through MML established mechanisms of stakeholder engagement. Meetings with individual communities and other local stakeholders will be undertaken on a regular basis by Community Relations department. These meetings fit within an overall structure that brings together the mine's major local stakeholders round a table in regular discussion. These stakeholders are expected to form a stakeholder steering committee and include the following:

- Traditional authorities (with the Marampa Paramount Chief serving as chair of the meeting);
- Members of Parliament who represent their constituencies in the
- National parliament;
- Councillors (who represent their wards on the Port Loko District Council);
- Landowners of the concession site;
- Religious authorities;
- Youth;
- Women; and
- The Ministry of Mines (through its local Mines Monitoring Officer).

The purpose of this Committee is to act as the primary high-level channel of communication between Marampa Mine and its stakeholders in the chiefdoms of Marampa and Maforkie, Port Loko District. Its three specific functions should be to:

1. To deliberate on issues of mutual concern to Marampa Mine and the stakeholders.
2. To oversee the work of sub-committees that may be set up, such as the Social Investment Committee.
3. To agree / accept the Community Development Action Plan (eventually to be superseded by the Community Development Agreement), which is the policy framework document for LMC's Marampa Mines Limited programme of social investment.

Within this framework, it is expected that the stakeholders will establish a Closure Sub-Committee, to look at detailed aspects of closure planning.

There are several villages identified as holders of the Marampa Mine lease land. These villages are represented in the steering committee. Boundaries between village land holdings are established by custom, and maintained under the guardianship of the Paramount Chief of Marampa Chiefdom. The location of these boundaries will enable the same surface area to be transferred back to the control of the villages post closure.

Through the Steering Committee, the landowners executive committee, and the chiefs and elders of the land-owning villages, MML will engage with land owners about the future end land use of the rehabilitated mine site. MML will communicate any restrictions that may exist on land use in particular areas, as well as opportunities for particular agricultural uses. For example, the former Slimes Pond of the previous DELCO mine subsequently became swamp farmland for the village of Rogbanneh which was used for rice growing. Postclosure this land use will not be viable; however alternative land uses will be viable, presenting opportunities for cash crops such as oil palm or other dryland crops for food production.

As part of closure planning, it is expected that increased emphasis will be placed on the creation of alternative livelihoods, to compensate for reduced employment on the mine site.

Consultation with government agencies will be an ongoing process that will primarily be undertaken using this Mine Closure Plan (and subsequent updates) as the basis for discussion. MML will include updates on mine closure activities, primarily rehabilitation, in its annual report to the EPASL and Director of Mines. Prior to the start of site decommissioning, MML will submit a list of infrastructure, buildings and structures to be removed and those where requests have been made to leave them in place. MML will include in this list whether we believe that this request should be complied with or not and the rationale behind this recommendation.

## **6.2 HUMAN RESOURCES**

Equally important to MML will be the engagement with the workforce as the mine approaches closure. This includes:

- Keeping employees informed about the life of the mine;
- Ensuring employees are prepared for working in a competitive workplace after closure; and
- MML will comply with all with legal and statutory requirements of Sierra Leonean Labour Law during the closure of the mine and fulfil all its obligations to the workforce in line with MML work place contracts.

During the operational phase of the mine, MML will invest heavily in its workforce, through the provision of Apprenticeships/Traineeships and Skills Based Training. This commitment to developing staff throughout the mine life will ensure greater employability for outgoing staff once the mine closes. MML's presence in Sierra Leone will also provide opportunities and sustainable economic development in the Lunsar area and Port Loko District. This development will provide additional workforce opportunities in other industry sectors for staff affected by the mine site closure.

Although it is acknowledged that closure only provides a small number of jobs, it should also be noted that the process itself creates jobs. The work involved in mine closure provides specialized business and employment opportunities that can often be applied to other sites and industries. The main jobs available are for Trades personnel – to dismantle equipment; Equipment operators and mechanics – to complete the earth-moving work necessary for rehabilitation; Inspectors – to inspect, sample and audit the closure activities as part of the safety and environmental plan; and Security and first aid personnel – in accordance with applicable laws and management plans. Typically, arrangements are made to contract qualified personnel for decommissioning activities and MML will require some staff to both oversee decommissioning as well as to undertake mine site rehabilitation and post-closure monitoring.

MML will minimise the impact of the closure on its workforce and nearby community by staggering any layoffs. In the event of redundancies, MML will provide adequate and competitive severance pay adhering strictly to the requirements of Sierra Leonean Labour Laws. With regard to contract staff and in consultation with regulatory authorities, adequate notice will be given to all workers on site of the intention to close the mine, thereby minimising the impact of the closure.

Upon confirmation of the layoffs, the MML Human Resources Department shall invite all the affected employees to a meeting at which a final decision will be taken on whether to issue notice of termination on the grounds of redundancy. This meeting will be convened by Heads of Department in liaison with the Human Resources Department and/or Workers' Representative to determine a redundancy decision by evaluating and considering an employee's knowledge, skills and work experience. At the meeting, the Employees shall be given the opportunity to ask questions, clarify their situation and suggest any further options for mitigating their circumstances.

Each employee will receive a letter from MML confirming the end of his/her employment and setting out the details of any redundancy payment as appropriate, to include accrued holiday allowance(s), insurance cover and any other benefits. Following notice of the layoff a written letter shall be delivered to the affected employees in person several months in advance to enable job search activities. MML will comply with the requirements of the Collective Bargaining Agreement in place at the time as well as Sierra Leone labour laws.

In the event of layoffs, Department Managers will provide the HR Office with a list designating the class, position, and names of employees to be laid off. It shall be the responsibility of each Department Manager to provide the rationale for selecting particular employees within the same job class for layoffs. The Human Resources Department will review the list for conformance with employment law.

During mine closure, employees whose jobs may be affected will be notified of the situation and what options within the company may be available to them. Efforts will be made, whenever possible, to integrate affected employees into other (if they exist) employment. Options such as part-time work schedules, job sharing, or reductions in class or pay may be used in lieu of layoffs if approved by Management as feasible and consistent with the company's employment policy.



## 7 POST CLOSURE MONITORING

Post-closure monitoring is required to assess three main areas:

1. Physical stability – The landscape must be stable so as to eliminate any hazard to public health and safety. Erosion must be similar to background levels for the region and the quantity of sediments being mobilised into any receiving environment should not be at concentrations that are harmful. Engineered structures such as the TSF overflow must not deteriorate and fail.
2. Geochemical stability – Metals, hydrocarbons and other contaminants must not leach and/or migrate into the receiving environment at concentrations that are harmful. Surface waters and groundwater must be protected against adverse environmental impacts resulting from mining and processing activities.
3. Land use - rehabilitated areas should be capable of fulfilling the identified end land use and be self-sustaining without requiring ongoing maintenance and intervention.

Data from the monitoring program will be used for ongoing management of the site post closure and allow MML to identify where additional resources are required so as to meet the rehabilitation objectives of each end land use. It will also enable MML to address stakeholder issues regarding the success of the reinstatement program. Please see Environmental Monitoring Plan for full details of post closure monitoring requirements.

MML will maintain its environmental team for three years after decommissioning of the site has been completed to undertake post-closure monitoring.

The operations phase monitoring program will be continued during the decommissioning phase. Once the site has been fully decommissioned and all earthworks have been completed, the monitoring program will be reduced, in line with EPA-SL requirements, to focus on success indicators, i.e. those indices that demonstrate MML has successfully completed its closure process.

### 7.1.1 *Surface Water*

The main parameters to be monitored routinely during the post-closure period will include TSS, pH, turbidity, EC/TDS, Hardness, Fe and Mn. MML will also undertake multi-element (e.g. Cd, As, Cu, Hg, Zn, Ni, Co, SO<sub>4</sub>, etc) and total petroleum hydrocarbons analysis of surface waters on a periodic basis in the first 12 months post closure to prove that other issues potentially associated with mining are not an issue and comply with closure requirements.

Monitoring will concentrate on: Runoff from the plant site, waste dumps and TSF, and water quality in the Batabana and Baki creeks.

Water flow in the Batabana and Baki creeks as well as flow originating from TSF's will be monitored too.

### **7.1.2 Groundwater**

MML will undertake multi-element (e.g. Fe, Mn Cd, As, Cu, Hg, Zn, Ni, Co, SO<sub>4</sub>, etc), pH, EC/TDS, hardness and total petroleum hydrocarbons analysis of ground waters on a periodic basis in the first 12 months post closure to prove that issues potentially associated with mining are not an issue and comply with closure requirements. Groundwater monitoring will concentrate on:

- fuel farms; heavy fuel oil for the powerhouse and diesel fuel for vehicles; and
- TSF water quality.

### **7.1.3 Dust**

Dust levels will be monitored for the first 12 months post-closure within the mine site to verify that dust potentially associated with mining activities has reduced to background levels.

### **7.1.4 Soil contamination**

Total petroleum hydrocarbon levels in soils surrounding the maintenance and fuel farm areas will be undertaken immediately post closure and periodically until any potential contamination has been remediated. Note: The landfarm (contaminated soil bioremediation) will need to be operated (occasional tilling for aeration) for some time after mine closure until a time when the contaminated soil is no longer regarded as contaminated.

### **7.1.5 Rehabilitation Success - Soils**

Rehabilitation is aimed, first of all, at the restoration of soil properties that facilitate long-term stability and reduce erosion potential.

- Soil nutrient status (NPK, Organic carbon) will be assessed in rehabilitated areas and compared to analogous sites to ascertain whether additional fertiliser applications are required.
- The presence and extent of surface erosion (i.e. rills, failures, and gullies) will be monitored on rehabilitated areas and compared to analogous sites until it can be demonstrated that the site is in a stable state similar to background levels.
- Sedimentation in watercourses will be monitored to assess the potential impacts of erosion on surface waters.
- Physical characteristics of the soil profile.

### **7.1.6 Rehabilitation success - flora and fauna**

The success of any reinstatement program can only be determined by how well it fulfils its original objectives.

- Monitor vegetation cover and diversity.
- Monitor growth of tree crops in rehabilitated areas and compare with analogous sties.
- Monitor crop yield on rehabilitated areas and compare to analogous sites.

- Compare herpetofauna or avifauna in analogous sites with rehabilitated areas as indicators of overall fauna recruitment and biodiversity.
- Monitor identified criteria listed in Table 6.1 (Landscape criteria) and Table 6.2 (Land use completion criteria).

#### *7.1.7 Rehabilitation success – Photographic records*

MML will maintain photographic records of the site post-closure as part of the monitoring program to provide evidence/verification of works undertaken or status of the site. Photography can also aid in vegetative cover assessment and the presence of erosion.

Unless a particular issue is identified during the first 12 months post-closure, only those parameters identified as routine above will be monitored throughout the three years of the post-closure monitoring program.

MML will continue to report monitoring data to the EPA-SL and Mines Director.

## 8 ESTIMATED COSTS

The work for estimating closure costs for the Marampa Mine site is complicated by the fact that it is a brownfield development with pre-existing impacts and liabilities. Obviously, MML shall be responsible for rehabilitation work relating to mining activities and for any pollution, risk, claim or other environmental damage arising during the term of MML's Mining Licence.

This mine plan is to be renewed every two years and financial liabilities can be calculated at that stage along with projected liabilities for the following 2 years.