Waste Management Plan for Sierra Rutile Limited, Sierra Leone

Sierra Rutile Limited

Sierra Rutile Limited

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List of abbreviations

EHS	Environmental, Health and Safety
ESHIA	Environmental, Social and Health Impact Assessment
ESHMP	Environmental, Social and Health Management Plan
ESIA	Environmental and Social Impact Assessment
GHG	Greenhouse Gasses
GIIP	Good International Industry Practice
HCB	Hexachlorobenzene
IFC	International Finance Corporation
IMO	International Maritime Organisation
MARPOL	International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 [MARPOL Convention (MARPOL 73/78)]
MEPC	Marine Environment Protection Committee
MSP	Mineral Separation Plant
NOx	Nitrogen Oxides
OEM	Original Equipment Manufacturer
PCBs	Polychlorinated biphenyls
POP	Persistent Organic Pollutant
PPE	Personal Protective Equipment
EPA-SL	Sierra Leone Environmental Protection Agency
SRK	SRK Consulting (South Africa) (Pty) Ltd
SRL	Sierra Rutile Limited
WBG	World Bank Group
WMP	Waste Management Plan

Terms and Definitions

Term	Definition
Building / construction and demolition waste	Waste, excluding hazardous waste, produced during the construction, alteration, repair or demolition of any structure and includes rubble, earth, rock and wood displaced during that construction, alteration, repair or demolition.
Business waste	Waste generated related to business premises, such as paper, stationary, printer cartridges, general domestic waste, and so forth.
Domestic waste	Domestic waste is waste that is generated as a result of the ordinary day-to-day use of a domestic premise.
General waste	Waste that does not pose an immediate hazard or threat to health or to the environment. It may, however, with decomposition, infiltration and percolation, produce leachate with pollution potential. General waste comprises of both biodegradable and non-biodegradable waste, including: • Domestic waste; • Green and food waste; • Building and demolition waste; • Business / WWEE waste; and • Inert waste (non-biodegradable).
Biodegradable waste	Biodegradable waste consisting of green waste (garden cuttings; foliage; grass etc) and domestic food wastes.
Hazard rating	A system for classifying and ranking hazardous wastes according to level of risk. Hazardous waste can be classified into: • Hazard Rating 1: Extreme Hazard; • Hazard Rating 2: High Hazard; • Hazard Rating 3: Moderate Hazard; and • Hazard Rating 4: Low Hazard.
Hazardous waste	Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment. This can include waste oil solvents, laboratory waste, medical waste and contaminated PPE.
Incineration	Both a form of treatment and disposal. It is the controlled combustion of waste materials to a non-combustible residue or ash and exhaust gases, such as carbon-dioxide and water.
Inert waste	Inert waste is waste which is neither chemically nor biologically reactive and will not decompose. Examples of this are sand and concrete.
Medical waste	Includes all the waste that is generated by both human and animal health-care establishments, research facilities, and laboratories. This includes the following: • Infectious Waste – waste suspected to contain pathogens e.g. laboratory cultures, waste from isolation wards, tissues (swabs), materials or equipment that have been in contact with infected patients etc.; • Pathological waste – human tissue or fluids e.g. body parts, blood and other body fluids etc.; • Sharps – needles, infusion sets, scalpels, knives, blades etc.; and • Pharmaceutical waste – waste containing pharmaceuticals e.g. medication that is expired or no longer needed, items contaminated by or containing pharmaceuticals (bottles, boxes etc.).
Manifest system	A system for documenting and controlling the fate of a hazardous waste from source to disposal.

Term	Definition
Non-biodegradable waste	A substance or chemical that is non-biodegradable cannot be changed to a harmless natural state by the action of bacteria or other natural processes.
Pollution	The contamination of air, water or soil by substances harmful to living organisms.
Recycle	A process where waste is reclaimed for further use. The process involves the separation of waste from a waste stream for further use and the processing of that separated material as a product or raw material.
Re-use	To utilize articles from the waste stream again for a similar or different purpose without changing the form or properties of the articles.
Waste	Any substance, whether or not that substance can be reduced, re-used, recycled and recovered: • That is surplus, unwanted, rejected, discarded, abandoned or disposed of; • Which the generator has no further use for; and • That must be treated or disposed of. But: • A by-product is not considered waste; and • Any portion of waste, once re-used, recycled and recovered, ceases to be waste.
Waste disposal	Removing and destroying or storing damaged, used or other unwanted products and substances. Disposal includes incineration, dumping / burial at landfill sites and recycling.
Waste disposal facility	Any site or premise used for the accumulation of waste with the purpose of disposing of that waste at that site or on that designated premise.
Waste treatment	The biological, chemical or mechanical methods employed to: • Remove pollutants from industrial or municipal wastes; • Change the character and composition of waste; or • Reduce or eliminate its potential for harm to living organisms or the environment.
WEEE waste	Waste electrical and electronic equipment that is dependent on electric currents or electromagnetic fields in order to function (including all components, subassemblies and consumables which are part of the original equipment at the time of discarding). This type of waste may include: • Consumer / entertainment electronic equipment e.g. televisions and DVD players; • Devices for office, information and communication technology e.g. computers, telephones and mobile phones; • Household / office appliances e.g. fridges and microwave ovens; • Lighting devices e.g. desk lamps; and • Power tools.

1. Introduction

1.1 The Project Area

Sierra Rutile Limited (SRL), a wholly owned subsidiary of Iluka Resources Limited (Iluka), is an existing mining operation located in the Bonthe and Moyamba Districts of the Southern Province of Sierra Leone, 30 km inland from the Atlantic Ocean and 135 km south east (geodesic distance) of Freetown (Figure 1). The mine has been in operation for over 50 years and produces rutile, ilmenite and zircon rich concentrate. The SRL operation has an existing Environmental Licence (reference number EPA-SL030) and has undertaken two previous Environmental and Social Impact Assessment (ESIA) studies for their operations in 2001 and an update in 2012 respectively. When these studies were undertaken, the primary mining process was dredge mining (referred to as wet mining). During 2013, SRL commenced a distinct open cast mining operation (referred to as dry mining) as an auxiliary method of ore extraction in conjunction with wet mining. In 2016, a second dry mining operation (Gangama) was commissioned. It is anticipated that, over time, dredge mining will cease, and dry mining would be the primary mining method employed.

In 2015 the Sierra Leone Environmental Protection Agency (EPA-SL), issued a notification to SRL (reference number EPA-SUHA.96/214/a/HNRM), instructing them to undertake an integrated Environmental, Social and Health Impact Assessment (ESHIA) and develop an Environmental, Social and Health Management Plan (ESHMP) for their current and proposed dry and wet mining activities, including the proposed expansion areas. SRK Consulting (South Africa) (Pty) Ltd (SRK) was appointed by SRL to undertake the ESHIA and ESHMP.

1.2 Background Information

This third edition of the SRL Waste Management Plan (WMP), aims to provide a holistic integrated approach to waste management at the operation. This should be a live document that will be revised on a regular basis or when changes to systems and processes are implemented. Waste inventories are to be reviewed on an annual basis.

The basis for any integrated WMP is to develop objectives that are practical and implementable. This should be done in light of current waste management practices and systems whilst still adhering to local legislation and Good International Industry Practice (GIIP).

The previous version of the WMP was used and adjusted where required to serve as an improved WMP for SRL. The waste hierarchy was also applied more pertinently than in the previous version of the document.

The current WMP described the procedures, systems, equipment, and structures specific to waste management and disposal. The WMP is aimed at limiting waste generation at all levels of the mining operation in order to decrease the volume of waste generated and make waste disposal more manageable. This WMP also defines who is responsible for developing and implementing the plan, and what records and reporting will be required. It was envisaged that adjustments to the WMP will be required as changes occurred during mining operations. SRL considered national and international laws, regulations and best practice in the design and management of waste containment facilities.

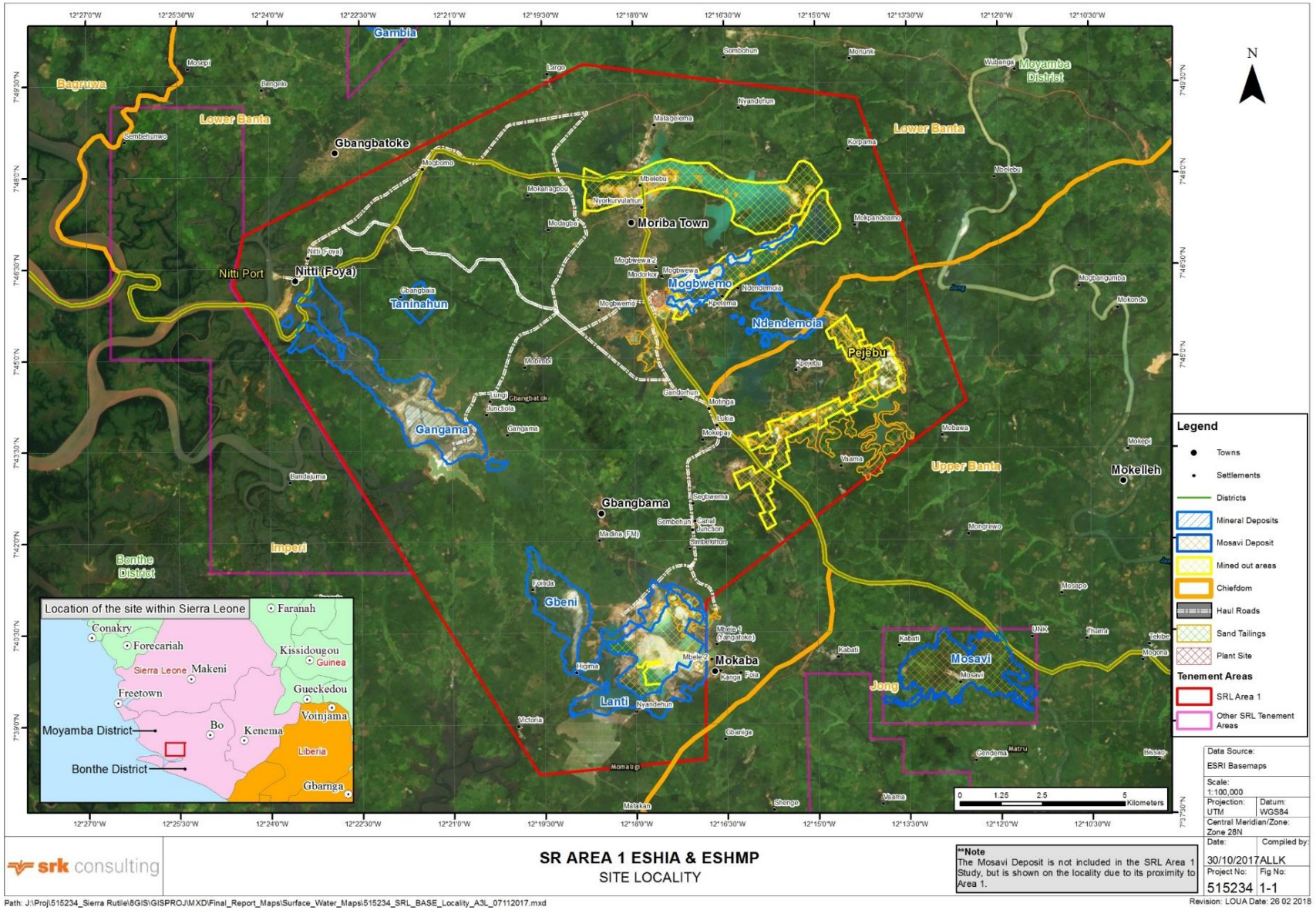

Figure 1: SRL Area 1 General Locality Map

1.3 Notes on Revised Waste Management Plan

- The original Waste Management Plan (WMP) report was prepared in 2001 by Knight Piesold & Co. The WMP report was completed to a standard that satisfied the requirements of Sierra Leone's environmentally related legislation as well as international requirements of the International Finance Corporation (IFC) and other major lending institutions;
- CEMMATS, in 2012, maintained the original text, format and layout of the document as far as practicable; but included required amendments;
- New information added to the report has been obtained from various Sierra Rutile Limited (SRL) departments;
- The current update to the WMP has been conducted as part of the development of an updated ESHIA and ESHMP for the Area 1 operation of SRL, being undertaken by SRK;
- The current WMP takes into consideration relevant legislative requirements; the IFC Performance Standards; as well as the IFC / World Bank Group (WBG) Environmental, Health and Safety (EHS) Guidelines;
- Although present practices are documented in certain instances, little attempt has been made to give an opinion on their efficacy. This matter has been left for a separate audit report; and
- This WMP will be comprehensively updated as part of the Mokula Engineered Landfill ESHIA currently in process.

1.4 Mokula Engineered Landfill Site

A separate ESHIA process has recently commenced in respect to obtaining authorisation for a new engineered landfill site to be constructed at a location known as Mokula. This ESHIA is being undertaken by Digby Wells Environmental (Jersey) Limited and CEMMATS. The engineered design will be undertaken by Ebcon Consulting (Pty) Ltd, to ensure that the facility meets current and future requirements, as well as compliance with Sierra Leone legal requirements, and as far as practicable, GIIP requirements.

Notification of commencement of this process was submitted to the EPA-SL and was acknowledged by – EPA-SL on 15 February 2018 (refer to Appendix 1).

It should be noted that the current WMP will again be updated as part of this separate ESHIA to ensure that all changes to current systems are fully incorporated into the WMP.

1.5 Objectives

The main objective of this report is to provide SRL with an updated WMP that is practical, implementable and form the basis for everyday waste management practices on the mine for both general and hazardous waste.

More specifically, the WMP aims to provide SRL with the following relating to waste management:

- Meeting local legislative requirements whilst implementing applicable GIIP. It has to be noted that local conditions and constraints may not always allow for the implementation of GIIP, although this should always be the ultimate aim;
- The WMP should be practical and measurable to be successful. To achieve this, measurable objectives or goals needs to be set to monitor implementation and maintenance of the WMP;
- Various avenues exist in meeting goals and / or objectives. The WMP should therefore be a working document, allowing for continual improvements and updates, to ensure that current best practice is implemented which are based on local conditions. Even the goals and objectives may change regularly based on new processes or systems;

- Developing an implementation program and budget is key to any WMP, since it allows the owner of the plan to implement systems and improvements in a structured manner, whilst enabling the measurement and monitoring of the implementation based on the goals or objectives; and
- All the above should be undertaken, whilst considering the practical implementation of the waste hierarchy in respect of waste management.

2. Legislation and GIIP

This WMP has been developed in accordance with national and international regulations and guidelines. The legislation, regulations and guidelines are discussed in the following sections.

2.1 Environment Protection Agency Act of 2008, Sierra Leone

The *Environment Protection Agency Act, 2008*, establishes general guidelines for toxic and hazardous substances. These guidelines include the following:

- The Environmental Board may prescribe activities or substances that shall be considered hazardous;
- The Director will take the necessary and appropriate measures to monitor, control, and regulate the manufacture, sale, transportation, handling or disposal of toxic and hazardous substances, including toxic and hazardous wastes;
- The introduction or importation of toxic or hazardous wastes into Sierra Leone for storage or disposal by any means whatsoever is prohibited;
- The possession, introduction, or importation into Sierra Leone of internationally banned chemicals or substances is prohibited;
- The uncontrolled discharge of any toxic or hazardous substances into the air or in, on or under the land and waters of Sierra Leone is prohibited; and the EPA-SL may take investigative and enforcement actions in instances where it has reasonable grounds to believe an offence has been committed against the Act; and
- Part V – Ozone depleting substances, provides guidance on the control and use of ozone depleting substances. This section also makes provisions should an individual or entity contravene this Act. SRL also takes cognisance of the *Ozone Depleting Substances Regulations, 2010*.

2.2 International Finance Corporation / World Bank Group: Environmental, Health and Safety Guidelines – General EHS Guidelines: Waste Management

The IFC / WBG EHS General Guideline (2007), outlines specific requirements in respect of waste management in section 1.6. The EHS Guideline for Mining (2007), further highlights waste management considerations specific to mining operations.

The Guidelines include the following aspects:

- General waste management that should be addressed through a programme which links waste minimisation, generation, transport, disposal and monitoring;
- Waste management planning should include that waste be characterised according to source, composition, type, rate of generation and regulatory requirements;
- Waste prevention must focus on waste avoidance and minimisation;
- Recycling and reuse of waste should be optimised to reduce the volume of waste ultimately going to landfill;
- Where disposal is necessary, appropriate treatment should be applied prior to disposal, and
- Disposal should be undertaken in a manner which will minimise harm to human health and the environment.

- Hazardous waste should always be segregated from non-hazardous waste at the source of generation, to avoid contamination and keep hazardous waste to an absolute minimum;
- Waste should be stored in a manner that prevents incompatible wastes coming into contact with each other resulting in cross contamination and/or uncontrolled reactions;
- Transportation of hazardous waste shall be undertaken in such a manner that it poses minimal risk to people and the environment, and conforms to local and international legislative requirements as may be applicable;
- Hazardous waste shall be treated where possible to reduce the volumes and potential impact of the hazardous waste; and
- The remaining hazardous waste shall be disposed of in a proper hazardous waste disposal facility.

2.3 International Finance Corporation / World Bank Group EHS Guidelines for Waste Management Facilities

In addition to the Environment Protection Agency Act, 2008, the SRL project will follow the IFC / WBG EHS Guideline for Waste Management Facilities (2007). The Guidelines include the following:

- Industry specific impacts and management sections, provide a summary of the most significant EHS issues during operation and de-commissioning;
- Performance indicators and industry benchmarks relating to environmental performance and health and safety management; and
- Annex A also provides a general description of industry activities.

2.4 International Legislation and Policy

2.4.1 The Stockholm Convention on Persistent Organic Pollutants

This Convention was adopted in May 2001 in Stockholm, and Sierra Leone became a signatory thereto in August 2001.

Persistent Organic Pollutants (POPs) are chemicals that are persistent in the environment and bio-accumulates in human and animal tissue. They are bio-magnified through the food chain, and adversely affect health and the environment. This Convention recommends the elimination or restriction of the production and use of all internationally produced POPs (i.e. Industrial chemicals and pesticides). The chemicals to be eliminated include Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Hexachlorobenzene (HCB), Mirixtexaphene, and Polychlorinated biphenyls (PCBs). The Convention also seeks continuing the minimization and, where feasible, the ultimate elimination of the releases of POPs, such as Dioxins and Furans. Stockpiles and waste containing POPs, must be managed and disposed of in a safe, efficient and environmentally friendly manner, in line with international rules, standards and guidelines.

2.4.2 International Treaty for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 [MARPOL Treaty (MARPOL 73/78)]

The Treaty includes regulations aimed at preventing and minimizing pollution from ships - both accidental pollution and that from routine operations - and currently includes six technical Annexes:

- Annex I: Regulations for the prevention of pollution by oil;
- Annex II: Regulations for the control of pollution by noxious liquid substances in bulk;
- Annex III: Prevention of pollution by harmful substances carried by sea in packaged form;
- Annex IV: Prevention of pollution by sewage from ships;
- Annex V: Prevention of pollution by garbage from ships; and

- Annex VI: Prevention of air pollution from ships (entry into force 19 May 2005).

International shipping represents a substantial and growing source of emissions of air pollutants, including Greenhouse Gases (GHGs). Annex VI sets limits on the sulphur content of marine fuel oils and on the emissions of Nitrogen Oxides (NOx) from new ship engines.

However, the 1997 standards are weak and unlikely to have any appreciable effect, and on 9 October 2008 the International Maritime Organisation's (IMO's) Marine Environment Protection Committee (MEPC) agreed to revise and strengthen the emission standards in Annex VI. The revised law entered into force on 1 July 2010.

3. Waste Hierarchy

It is internationally accepted that there is an order (hierarchy) of preference or desirability in which waste needs to be managed, usually seeking waste prevention as a first choice down to disposal as a last resort.

This hierarchy is generally depicted as a pyramid or inverted pyramid as shown below, with the largest portion or base always being waste prevention or avoidance as the most desirable; and disposal being least desirable.

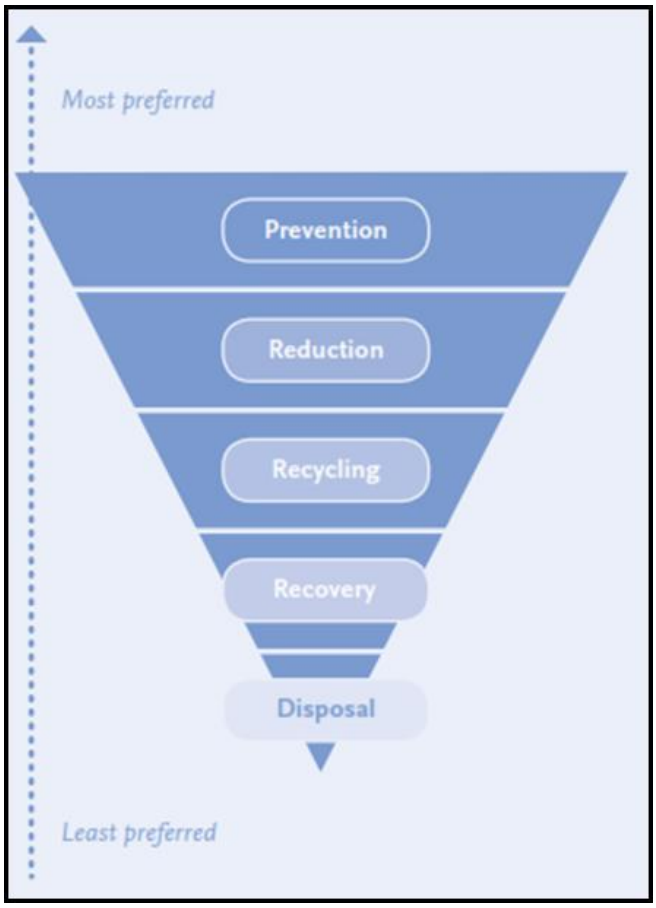

Figure 2: Waste Hierarchy[1]

[1] Source: UNEP 2013. Towards a Green Economy – Pathway to Sustainable Development and Poverty Eradication.

Integrated waste management considers the main components of the waste hierarchy, from raw material to products, as well as incorporating the mining process, loading, transporting, processing to the point of product export. Also included is all the support around these aspects such as workshops, living quarters, salvage yards etc.

4. General Waste Management Principles

The following general waste management principals should apply during continuous development and improvement of this WMP.

4.1 Waste Management Planning

A guidance document, such as this WMP, is the first step towards effective waste management planning. It is imperative that supporting documents and systems be developed to document, track and monitor various waste types throughout the waste management process i.e. from generation to final treatment and/or disposal. The more integrated the ultimate approach is, the more environmentally sound the overall waste management will be due to process and system optimisation towards supporting each other whilst keeping the waste hierarchy in mind.

4.2 Setting Goals and Objectives

The setting of goals and objectives are also a continuous process that should be updated as waste management is improved. The goals and objectives must be practicably achievable and must ensure that continuous improvement results from meeting these.

4.3 Identification of Waste

A review should be conducted of all activities associated with the mining operation and the various waste types should be listed under four main headings as set out below:

- Mine process wastes[2] (sand, tailings, etc.);
- Hazardous wastes (waste oil solvents, laboratory wastes, and medical wastes);
- Domestic wastes (inert wastes such as plastic, glass, and construction materials); and
- Biodegradable wastes (food and plant material).

4.4 Waste Inventory and Classification

In order to effectively manage waste streams according to GIIP and legal requirements, a waste inventory (refer to Table 1) will be developed in respect of all the wastes identified above. The waste inventory shall as a minimum, describe the following:

- A description of the waste;
- The source of the waste;
- The hazard rating of the waste;

[2] Mine process wastes such as sand and tailings are managed in accordance with the Tailings Management Plan (SRL, 2018).

Table 1: Example Waste Inventory

Description (Type, composition, etc.)	Source	Hazard Rating (Hazardous / Non-Hazardous)	Estimated Volume / Annum	Regulatory Reporting Quantity?	Not Compatible With	Bin / Container Colour	Waste Hierarchy Level	Opportunity for Improvement / Alternative	Management Requirements (treatment / disposal, etc.)
Aluminium Cans	Canteen, Offices, Accommodation	Non-Hazardous	1 tonne	N/A	N/A	Green	Recyclable		Options for recycling should be investigated.
Fluorescent Tubes	Offices, Workshops, Production Areas, Accommodation	Hazardous	1 drum	N/A	N/A	Red	Treatment and disposal		All tubes are to be kept intact and may only be crushed in designated red containers. Protective glasses, a respirator (not dust mask), thick chemically resistant gloves and a chemically resistant apron are to be worn during the crushing process.
Batteries	Offices, Production Areas, Accommodation	Hazardous	1,000 kg	N/A	N/A	Red	Treatment and disposal		Not to be disposed of as hazardous waste should recycling be possible. Options for recycling should be investigated. Should recycling not be possible, disposal will take place in a red container.
Etc.									

- Whether regulatory reporting in respect of the waste is required;
- Specify the disposal or storage bin / container colour;
- Note the waste hierarchy levels; and
- Briefly describe the management requirements for each waste identified.

The waste inventory shall be regularly updated (annually as a minimum requirement) during the life of the operations.

4.5 Waste Risk Assessment

Once all the waste materials have been identified, a comprehensive waste risk assessment shall be conducted. This will include:

- The inherent hazards of each waste to humans; the environment; health and safety shall be identified and relevant waste handling, storage, transportation and disposal risks shall be identified. Suitable control measures shall be developed and implemented as may be applicable;
- Due care shall be taken to implement controls in respect to vector-borne disease control in the handling, storage and disposal of waste;
- Chemical compatibility will be considered in the risk assessment and relevant control measures shall be developed to ensure that uncontrolled reactions such as fire and explosion does not occur during the handling, storage, transportation and/or disposal of waste;
- Potential spill and/or release scenarios shall be considered. Relevant control measures shall be developed to deal with spill response, clean-up and remediation as may be applicable. Appropriate spill kits shall be purchased and made available at suitable locations. The location of spill kits is to be indicated on the emergency preparedness and response plan;
- An assessment of uncontrolled release scenarios and their potential impact on the health and safety of employees, sensitive environments and community health and safety shall be undertaken. Suitable containment and response plans shall be developed and included into the emergency preparedness and response plan; and
- The above assessment results shall be routed back into the operation's risk assessment.

4.6 Waste Management Alternatives and the Application of the Waste Hierarchy

There is usually more than one way of achieving a goal or objective and hence for each goal and or objective a number of possible alternatives should be evaluated to ensure that the best possible alternative is implemented to meet the goal.

Each waste type listed in the waste inventory, and taking the risk assessment into consideration, shall be evaluated in terms of the waste hierarchy with the aim to progress each waste type to an improved position on the waste hierarchy, including:

- Seeking ways to avoid waste;
- Reducing (minimise) waste where possible;
- Recycle waste where possible;
- Recover waste where possible; and
- Whatever remains should be treated to an environmentally acceptable standard or disposed of in an environmentally acceptable disposal facility.

Once identified, the preferred alternative should be implemented across the operation.

4.7 Implementation

A detailed, operational level implementation plan / strategy shall be developed to ensure that the set objectives and goals can be met. This shall include relevant timeframes and budget provision.

It is expected that this will be undertaken in detail as part of the Mokula Engineered Landfill site ESHIA. This step will also be accompanied by undertaking a detailed engineered design process, to ensure that the landfill meets both Sierra Leone legal requirements, and GIIP standards in as far as practicable.

4.8 Monitoring of the WMP

Continuous monitoring of waste management activities is vitally important to the successful implementation of any WMP, as is continuous updating of the WMP to ensure that it remains relevant to current practice. The existing SRL waste monitoring process will continue to be used in this regard.

5. Waste Handling

5.1 On-site Waste Management

The operation shall implement its waste management plan in full.

Management of mine process waste (sand, tailings, etc.), shall be undertaken in accordance with the Tailings Management Plan (SRL, 2018).

Colour coded, labelled bins shall be provided at suitable locations across the operation, inclusive of the mining areas, wet concentration- and mineral separation plants, workshops, offices, clinic and accommodation camps. The labels should clearly identify the type of waste to be disposed of into the bin (e.g. paper, plastic, oily rags, etc.).

The bins must be covered or have tightly closing lids to prevent wind scatter and overflow of waste. Waste bins must be adequately secured in order to prevent these from blowing / getting knocked over.

The waste bins must be constructed of impervious materials which can be cleaned and sanitised readily, and a schedule must be in place for such cleaning and sanitisation of bins.

Appropriate vector-borne disease control measures will be implemented.

Waste must be properly segregated, and the mixing of biodegradable, non-biodegradable and hazardous wastes must be prevented. This must be continually inspected and reinforced with employees through regular awareness training.

Waste should not accumulate in large quantities before it is transported to the temporary waste storage area / incinerator / landfill site (as may be applicable).

5.2 Temporary Storage and Separation of Waste

Waste must be transported from the point of generation to the centralised temporary waste storage / separation area.

A temporary waste storage and sorting area need to be constructed as part of the Mokula Engineered Landfill site and shall be designed to meet the following criteria:

- Be located on an impermeable surface;
- Have adequate bunding in place to minimise environmental and health impacts associated with leachate and spills;
- Have adequate protection against storm water ingress from adjacent areas;
- Be located outside the 1:10 year flood line of any water course, wetland or any similar ecologically sensitive area;
- The facility shall be access controlled and locked at all times when designated and competent waste handlers are not present;

- Relevant signage shall be displayed at the entrance of the facility, including prohibiting open flames and smoking in or near the temporary waste storage facility;
- Adequate containers shall be available (skips, bins, drums, etc.), must be appropriately colour coded and labelled to show what type of waste can be disposed of in them;
- Containers shall be appropriately designed to store liquid, solid, hazardous or non-hazardous waste. Food waste and other compostable waste will be kept in separate containers to be used for composting;
- Waste containers must be secured in order to prevent them from blowing / getting knocked over;
- The storage area must be inspected on a regular basis for leaks or defective containers;
- Waste shall be stored in a manner that prevents the contamination of and contact between incompatible wastes;
- Hazardous waste shall be kept in a separate area within the temporary waste handling area (see requirements below); and
- Spill kits shall be available and adequately stocked at all times. Waste handlers shall be fully trained in the use of these spill kits.

Hazardous waste storage should only be conducted / undertaken by employees who have been suitably trained to handle and store hazardous waste, and must comply with the following:

- Hazardous waste shall not to be co-disposed with general / non-hazardous waste;
- The storage facility shall be appropriately designed to ensure it is well ventilated, protected from elements and storm water ingress, as well as having impermeable floors and a bunded area to contain accidental spills or leaks;
- Where necessary, bunding shall be coated with a chemically resistant coating;
- Hazardous wastes will be placed and stored in containers suitable for the specific chemical and physical characteristics of the specific waste;
- Different containers for storing different hazardous wastes will be located within the storage facility and shall be clearly marked. These containers will be labelled for the appropriate waste;
- No hazardous wastes shall be stored outside of containers and/or bunding;
- Appropriate operational procedures shall be implemented to ensure that no incompatible wastes are co-disposed to prevent chemical reactions. A compatibility chart shall be available in the area where hazardous wastes are being handled;
- Suitable PPE shall be used when handling hazardous waste e.g. full-length overalls, eye protection, chemically resistant gumboots, gloves and apron, as well as individually assigned chemical respirators when handling hazardous waste; and
- Safety Data Sheets (SDSs) shall be available within the facility and all staff shall be fully trained in the safe handling of each applicable hazardous waste.

Waste separation shall be undertaken by suitably competent personnel only and may include:

- The final separation of any residual hazardous waste which has been accidentally mixed with non-hazardous waste. Any non-hazardous waste which is visibly contaminated by the hazardous waste, shall be treated as hazardous waste and separated accordingly;
- Recyclable and compostable materials will be separated into appropriate containers; and
- The waste containers and waste management area shall be kept neat and tidy at all times, and waste containers shall be regularly cleaned and sanitised based on a documented schedule.

5.3 Waste Transportation

This section applies to:

- Transportation of waste from waste generation areas to waste sorting or temporary storage areas;
- Transport of waste for recycling or disposal purposes; and
- Transport of hazardous waste for treatment or disposal.

Waste will be transported from source to temporary storage facilities taking the following in to account:

- The nature, composition and integrity of transport packaging and containers will be appropriate to the type of waste being transported;
- All containers designated for transport to the waste disposal facility must be secured and labelled in terms of associated hazards of their contents;
- Transport vehicles will cater for the type and quantity of waste being transported in terms of its composition, load capacity, covering etc.;
- Transport vehicles will follow the traffic speed limits and safety requirements;
- Care should be taken when loading and unloading waste transport vehicles to avoid spillage / waste loss;
- Employees will be trained in the correct procedure(s) to address waste-related accidents and emergencies;
- All transport vehicles will be equipped with suitable materials or equipment to contain, manage and remove accidental waste spills;
- Hazardous waste being transported must be accompanied by a manifest that describes the load and its associated hazards, including: Name and identification number of material(s); physical state (i.e. solid, liquid, gas or a combination of one or more of these); quantity (e.g. kilograms or litres, number of containers); date dispatched; date transported; date received in accordance with the relevant legal requirements;
- Waste transportation records must be kept by the waste contractor and copies provided to the E&R Superintendent;
- The driver and accompanying staff must be appropriately trained and licensed;
- All waste transportation shall be undertaken in accordance with the Emergency Response and Contingency Plan (SRL, 2018); and
- No waste may be removed for disposal, treatment or recycling without consultation and permission of the E&R Superintendent.

5.4 Waste Recycling

The following requirements in respect of waste recycling apply:

- Opportunities for recycling shall be investigated as part of the waste inventory and risk assessment processes, and optimised where possible;
- Only approved and appropriately licenced / permitted, reputable and legitimate contractors may be used for the recycling of waste generated at SRL;
- Waste which can be re-used or recycled must be separated from the other waste streams at source to avoid contamination and secondary sorting at the waste sorting area – there must be separate bins / containers for glass, cans etc.;
- The temporary waste storage area must make provision for the storage and packaging of recyclable materials, including containers, which must be clearly marked / labelled for which recyclable materials it should contain;
- Recyclable materials should not accumulate unnecessarily at the temporary storage area; and
- Only materials which have been approved by the E&R Superintendent, may be recycled or re-used.

5.5 On-Site Disposal

SRL has a current non-engineered landfill site in place where final waste disposal is undertaken. As described earlier, a new engineered landfill is currently being designed and an ESHIA for this facility, is being undertaken.

SRL currently employs both landfill and incineration of waste as final solid waste disposal methods. The handling of obsolete chemicals, sanitary waste management, bioremediation and composting is also broadly discussed in this section.

All no-value equipment, scrap and building rubble at the completion of mine closure activities will be disposed of in an appropriate and authorized facility.

The following broad principles must be incorporated into the current and future disposal practices at SRL.

5.5.1 Medical Waste Incineration

The following requirements in respect of the medical incinerators shall be implemented:

- Only the fit for purpose incinerators, located at the SRL clinic, may be used for the incineration of medical waste;
- Only approved waste materials may be burned in the incinerator;
- The incinerator may only be operated by suitably trained individuals, equipped with the appropriate PPE, and in accordance with the operational procedure;
- The type and quantities of waste, as well as operating times and temperatures for the incinerator must be recorded before and during use;
- Incinerator ash is classified as “hazardous” and must be disposed of accordingly; and
- The incinerators must be regularly maintained to ensure it functions in accordance with the Original Equipment Manufacturer (OEM) specifications.

5.5.2 Landfill

The following requirements in respect of the landfills shall be implemented:

- The necessary Environmental Licence shall be obtained in respect of the Mokula Engineered Landfill site in accordance with the *Environment Protection Agency Act, 2008*. This process is presently underway;
- All permit conditions shall be adhered to at all times;
- A detailed operational procedure shall be developed, based on the design and operation criteria currently being developed. This shall detail *inter alia* the requirements in respect of site development and fencing, access control and security, disposal methodology, closure and rehabilitation, monitoring, training and awareness;
- The area shall be access controlled to prevent / minimise scavenging activities;
- Appropriate vector-borne disease controls shall be implemented;
- Appropriate / relevant training must be provided / undertaken for the operation and management of the landfill site; and
- Once the Mokula Engineered Landfill site is operational, appropriate closure of the current landfill site shall be undertaken.

5.5.3 Obsolete Chemicals

Obsolete chemicals are present at the SRL operations. These chemicals are temporarily stored on site until suitable treatment and/or disposal options become available as per the directive of the Chemical Control and Management department of the EPA-SL.

5.5.4 Sanitary Waste

Sanitary waste is managed across the operation through the utilisation of septic tank systems. Three sewage treatment plants are in place at Mobimbi Camp, Panguma and at the Area 1 Plant respectively.

The treatment plants comprise of several small treatment cells including a settling cell and aeration cell. The Facility Maintenance Manager is responsible for the construction, commissioning, operation, maintenance and ongoing monitoring of both of these systems. Both the treatment plants require to be upgraded and this is currently under investigation by SRL to ensure that legal and IFC effluent discharge standards can be met. This plan will be updated once the preferred alternative has been identified for implementation.

A detailed design and operational procedure in this regard will be submitted to EPA-SL as an addendum to the ESHIA once completed.

5.5.5 Bioremediation Facility

Bioremediation relies on microorganisms that break down petroleum-contaminated hydrocarbons in an oxygen-rich environment to make carbon dioxide and water. A typical bio-treatment cell involves the placement of affected materials in an isolated impoundment and treating it physically and bio-chemically to create optimal conditions for microbial action.

The design of such a facility should be considered once a detailed assessment of the various waste types and volumes is completed, and SRL is presently conducting an investigation into the most optimal manner in which to facilitate bioremediation. A detailed design and operational procedure in this regard will be submitted to EPA-SL as an addendum to the ESHIA once completed.

5.5.6 Composting Facility

Once the volumes for compostable materials are known, an informed decision can be made regarding the feasibility of composting. Composting will provide a limited supply of soil enhancing material that could be used in rehabilitation of the SRL operation, or for other uses as deemed appropriate. Wastes generated from food wastes or other biodegradable materials can be composted.

Composting of wastes will serve as an effective, sanitary method for disposal of waste food that will provide a useful soil amendment to low nutrient soils. Knowledge and experience gained in composting practices by locally employed mine workers can be developed, with the encouragement of SRL, as an agricultural tool to be transferred to the local agricultural community to enhance crop and garden production.

A detailed design and operational procedure in this regard will be submitted to EPA-SL as an addendum to the ESHIA once completed.

5.6 Health, Safety and Emergency Response

The handling of hazardous substances poses potential risks to the health and safety of employees, operators, waste contracting staff and employees in general. Appropriate engineering controls and operational procedures shall be implemented and be adhered to at all times. It is vital that the correct PPE is provided and used when handling hazardous and general waste. PPE commonly used include: protective jackets, safety boots, dust masks, respirators, protective aprons, goggles and/or eye shields and gloves.

Medical records for all staff involved in all aspects of waste management must be maintained.

Employees shall be made aware of emergency telephone numbers, locations of spill kits, emergency exits and evacuation routes.

Medical emergency response shall be undertaken when necessary.

In accordance with the Emergency Response and Contingency Plan (SRL, 2018), the response actions shall include *inter alia* the following:

- Untrained employees shall be kept away from a spillage area / emergency scene;
- As may be applicable, all employees and community members shall be evacuated from an area where a highly toxic or volatile chemical spill has occurred;
- Allow only trained employees who have been appropriately trained and who are equipped with the necessary PPE and equipment to enter the area of the spill for clean-up;
- If applicable, forced ventilation in the area of the spill shall be undertaken if necessary;
- Manage spills according to the relevant operational procedure. Contain spills using an appropriate spill kit and transfer spills back into suitable containers using appropriate equipment where possible;

- The necessary spill kits, protective devices, safety equipment, containers etc. must be readily available for emergency use. This may include: fire extinguishers, brushes, dustpans, mops, buckets, dry sand, tissue and towelling, containers including plastic bags, drums etc., absorbing materials, pumps and sampling devices; and
- Training and awareness must be provided regarding spillages and emergency response procedures.

6 Training and Awareness

Training and awareness about all the aspects of waste management and the contents and implementation of this WMP, and operational procedures must be provided to all employees and contractors as appropriate. Records must be maintained of all training and awareness programmes undertaken.

7 Monitoring and Reporting

Regular visual inspections of all waste storage, collection and disposal areas must be conducted to monitor for spillage, and to ensure that waste containers are labelled and stored appropriately.

Regular inspections must be undertaken around the mining area, operational plants, accommodation, office and operational areas to monitor littering, inspect whether adequate waste disposal is undertaken and that the appropriate equipment and facilities are available / in good condition.

Regular inspection of the waste transportation vehicles is to be undertaken to ensure they are adequate and suitable for their purpose and that they are kept in good condition.

Regular inspections and record keeping in respect of the incinerators should include:

- Monitoring of the operating temperatures and operation of the burners;
- Inspections of the incinerator feed to ensure that only waste designated for incineration is entering the incinerator;
- Sampling of incinerator ash to ensure correct disposal; and
- Physical inspection of the refractory protection inside the combustion chamber, stacks, etc

The following general monitoring of the waste management process should be undertaken:

- Monitoring of waste generation trends by type and volume of waste generated;
- Periodic auditing of third-party treatment and disposal services (if applicable). Audits must include site visits to the treatment, storage and disposal facilities;
- Monitoring records for waste (hazardous and non-hazardous) generated, collected, stored and disposal must include:
    - Name and identification number of materials composing the waste;
    - Physical state (solid, liquid, gaseous or combination of one or more of these);
    - Quantity (e.g. kilograms or litres, number of containers);
    - Tracking documentation must include waste information as described above, date dispatched, date transported, and date received; and
    - Method and date of storing, repacking, treating or disposal.
- Waste statistics to be reported to the EPA-SL as may be applicable; and
- Any non-conformances in regard with the handling, storage, transportation, treatment and disposal must be recorded in terms of the incident reporting procedures and investigated accordingly. Preventative and/or corrective actions must be identified, implemented and monitored, during and subsequent to closing out the incident.

8 References

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Annexure A: EPA-SL Acknowledgement of Mokula Engineered Landfill Site ESHIA

GOVERNMENT OF SIERRA LEONE
Environment Protection Agency - Sierra Leone
Office of the President
21 Old Railway line, Brookfields, Freetown

Ref: EPASL/AB/214/707/02/18

15th February 2018

The Managing Director
CEMMATS Group Limited
7A Cantonment Road
Off Kingharman Road,
Brookfields
Freetown

Dear Sir,

Re: Development of an Engineered Landfill Facility at the Mokula Mine Site

I acknowledge receipt of your request to conduct an Environmental Impact Assessment of an engineered landfill.

Considering that an ESHIA for the Rutile mining project is ongoing, we are hoping that this assessment will ensure a holistic waste management programme for all the project components and facilities in the concession area. Recognizing that the company has been struggling with storage and disposal of obsolete chemicals and other hazardous materials, it is our expectations that this assessment will fully take hazardous waste management into account.

On this note, we ask that you proceed with the assessment and should you require further information or clarification, please do not hesitate to contact our office.

Yours sincerely,

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Haddijatou Jallow (Mrs.)
Executive Chairperson