APPENDIX Q: MINE CLOSURE UPDATE

CLOSURE PLAN ADDENDUM FOR GAMSBERG SMELTER PROJECT

Gamsberg Zinc Smelter

Prepared for: Black Mountain Mining (Pty) Ltd

SLR Project No.: 720.22013.00002 (Phase 5)
Report No.: 1
Revision No.: 0
09/2020

DOCUMENT INFORMATION

Title	Closure Plan Addendum for Gamsberg Smelter Project
Project Manager	S van Niekerk
Project Manager Email	svanniekerk@slrconsulting.com
Author	S van Niekerk
Reviewer	K Hamilton
Keywords	Vedanta, Black Mountain, Gamsberg, Zinc, Smelter, Closure
Status	Final
DEA Reference	
DMR Reference	
DWS Reference	
Report No.	1
SLR Company	SLR Consulting (South Africa) (Pty) Ltd

DOCUMENT REVISION RECORD

Rev No.	Issue Date	Description	Issued By
A	11 September 2020	Issued for comment	SvN
0	21 September 2020	Final	SvN

BASIS OF REPORT

This document has been prepared by an SLR Group company with reasonable skill, care and diligence, and taking account of the manpower, timescales and resources devoted to it by agreement with **Black Mountain Mining (Pty) Ltd** (the Client) as part or all of the services it has been appointed by the Client to carry out. It is subject to the terms and conditions of that appointment.

SLR shall not be liable for the use of or reliance on any information, advice, recommendations and opinions in this document for any purpose by any person other than the Client. Reliance may be granted to a third party only in the event that SLR and the third party have executed a reliance agreement or collateral warranty.

Information reported herein may be based on the interpretation of public domain data collected by SLR, and/or information supplied by the Client and/or its other advisors and associates. These data have been accepted in good faith as being accurate and valid.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

The copyright and intellectual property in all drawings, reports, specifications, bills of quantities, calculations and other information set out in this report remain vested in SLR unless the terms of appointment state otherwise.

This document may contain information of a specialised and/or highly technical nature and the Client is advised to seek clarification on any elements which may be unclear to it.

Information, advice, recommendations and opinions in this document should only be relied upon in the context of the whole document and any documents referenced explicitly herein and should then only be used within the context of the appointment.

EXECUTIVE SUMMARY

Closure Vision and Objective

The primary objective for closure at the existing Gamsberg Zinc Mine (including the proposed Gamsberg Smelter Project and associated infrastructure) is to strive towards achieving closure that will be widely accepted and cost-effective for the mine. The BMM/Gamsberg Zinc Mine Closure Vision aims to make sure the BMM/Gamsberg Zinc Mine zone of influence is a safe, stable, non-polluting and healthy environment with predominantly grazing potential supporting local biodiversity and small-scale, socio-economic enterprises for the Aggeneys area.

Post Closure Land Use

The most suitable post closure land use is still considered to be wilderness/nature reserve and the promotion of eco-tourism in the area. It is, however, important to recognise that the Gamsberg Smelter Project would extend the current projected life of the Gamsberg Zinc Mine.

The projected useful economic life of the proposed smelter complex is 15 years – hence, the current projected life of the Gamsberg Zinc Mine would therefore be pushed out to at least 2039 and maybe even further in the event it is economically feasible to do so.

Certain smelter complex (or mine) infrastructure could also remain to support future post closure land uses if supported by the local communities and authorities. The feasibility of using any smelter complex (or mine) infrastructure to support post closure land use would need to be considered in terms of: sustainability of land use, engineering and environmental aspects, maintenance requirements, monitoring requirements, capital costs, post closure support services and available institutional capacity and skills. This aspect would need to be further investigated and incorporated into future closure plan updates.

Progressive Rehabilitation Planning

Progressive rehabilitation planning following the construction of the Gamsberg Smelter Project works should include:

- The laydown area and Business Partner camp.
- The individual cells of the secured landfill facility (once their design capacity has been reached).

Relinquishment Criteria

It is recommended that four key indicators (with associated performance targets) be used to facilitate evaluation of the ongoing environmental impacts, associated risks to closure (risk triggers) and for evaluation of rehabilitation success (i.e. relinquishment criteria), namely:

- Groundwater quality;
- Surface water quality;
- Secured landfill facility cover stability/landscape function analyses and
- Vegetation cover.

Closure Liability Calculation

The smelter complex, secured landfill facility, bulk water pipeline and associated support infrastructure is estimated to add a further R 204,286,019 (excl. VAT) to the overall life of mine (LOM) closure liability associated with the Gamsberg Zinc Mine. The closure liability calculation is at Current Value (CV) as at September 2020.

CONTENTS

APPENDICES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Definition
BMM	Black Mountain Mining (Pty) Ltd
CV	Current Value
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EVES	Endemic Vision Environmental Services Pty (Ltd)
GNR	Government Notice Regulation
LFA	Landscape Function Analyses
LOM	Life of Mine
NEMA	National Environmental Management Act
SLF	Secure Landfill Facility
TCE	Tata Consulting Engineers Limited
TSF	Tailings Storage Facility
WRD	Waste Rock Dump

1. INTRODUCTION

1.1 STUDY OBJECTIVE

To prepare a closure plan addendum report for the proposed smelter complex and secured landfill facility that forms part of the Environmental Impact Assessment (EIA)/ Environmental Management Programme (EMPr) submission for the proposed Gamsberg Smelter Project. This closure plan addendum report should, in future, also be able to be fully integrated with the existing mine closure plan report for the Gamsberg Zinc Mine.

1.2 SCOPE OF WORK

The scope of work for the closure plan included:

- Updating the environmental risk assessment to include the smelter complex and secured landfill facility;
- Reviewing the existing mine closure strategy, objectives, schedules and motivations;
- Assessing the long-term/ latent impacts and mitigation measures (from latest specialist studies) associated with the Gamsberg Smelter Project;
- Updating rates, quantification and closure liability assessment to include the smelter complex and secured landfill facility;
- Identifying any knowledge gaps (for future closure plan updates);
- Reviewing proposed monitoring, auditing and reporting procedures;
- Incorporating new stakeholder comments applicable to closure and the smelter complex and secured landfill facility; and
- Generating an addendum closure report for the smelter complex and secured landfill facility (to be integrated with existing mine closure report).

Socio-economic considerations (e.g. employee retrenchment provision, new employment opportunities, re-training costs etc.) have been specifically excluded from the closure plan at this stage.

1.3 SPECIALIST DETAILS

1.3.1 Specialists that prepared the Closure Plan

SLR has been appointed to prepare the closure plan that forms part of the EIA/EMPr submission for the proposed Gamsberg Smelter Project. The details of the specialists involved in the preparation of this closure plan are provided in Table 1-1.

Table 1-1: Specialists Details

Details	Reviewer	Project Manager
Name of practitioner	Kate Hamilton	Steve van Niekerk
Responsibility on project	Environmental Assessment Practitioner	Closure Specialist
Tel No.:	011 467 0945	
Fax No.:	011 467 0975	
Postal address	PO Box 1596, Cramerview, 2060	
E-mail address	khamilton@slrconsulting.com	svanniekerk@slrconsulting.com

Neither SLR nor any of the specialists involved in the preparation of the closure plan have any interest in the project other than contractually agreed payment for consulting services rendered as part of the EIA/EMPr process.

1.3.2 Qualifications and Experience of the Specialists

Reviewer: Kate Hamilton

Kate is a Senior Consultant based in Johannesburg and holds an Honours Degree in Environmental and Geographical Science. As a specialist environmental project manager she has over 12 years of private sector experience in Environmental Consulting. Kate has worked as a project manager in environmental management, project management and coordination and environmental monitoring, with a focus in the mining sector. Kate has worked on projects throughout the project lifecycle from exploration/ site identification through pre-feasibility to feasibility, to operation and closure for the mining sector. This includes conducting site screening and scoping studies, baseline studies, impact assessments, monitoring, management planning and implementation, and public consultation processes; for local regulatory permitting processes. Kate has worked extensively in the SADC region and has experience in managing large scale environmental projects with large integrated teams.

Project Manager: Steve van Niekerk

Steve Van Niekerk is a registered Professional Engineer with more than 20 years of experience as a consulting engineer specialising in mine closure, tailings engineering and hydrological studies. Steve is currently the Technical Director responsible for the development and management of SLR's closure and rehabilitation team across South Africa and Africa, and as such is focussed with compiling mine closure plans, calculating closure liability assessments, undertaking environmental risk assessments, advising on concurrent rehabilitation activities and assisting with 3rd party/due diligence reviews. Steve's previous tailings experience covers site selection, preliminary to detailed design of tailings facilities/waste rock dumps, construction supervision, water balances, storm water planning, closure planning, advising operations management and overall safety performance. Steve holds a BSc (Eng) Civil (1995) and MSc (Eng) Civil (2000) from the University of the Witwatersrand. Steve is based in Johannesburg.

1.4 BACKGROUND INFORMATION

The Integrated Closure Plan for Black Mountain Mine (BMM) (EVES, 2018a, 2018b, 2018c) has been used as the basis for preparing this closure plan for the proposed smelter complex and secured landfill facility.

2. APPLICABLE LEGAL REQUIREMENTS

This closure plan addendum together with the Integrated Closure Plan for Black Mountain Mine (EVES, 2018a, 2018b, 2018c) have been prepared to meet the requirements of the NEMA EIA Regulations (GNR 982, 2014) and the 2015 Financial Provisioning Regulations (GNR 1147, 2015).

3. CLOSURE VISION AND OBJECTIVES

3.1 CLOSURE VISION

The primary objective is to strive towards achieving closure that would be widely accepted and cost-effective for the Gamsberg Zinc Mine. The BMM/Gamsberg Zinc Mine Closure Vision aims to make sure the BMM/Gamsberg Zinc Mine zone of influence is a safe, stable, non-polluting and healthy environment with predominantly grazing potential supporting local biodiversity and small-scale, socio-economic enterprises (EVES, 2018a).

Note: This closure vision remains unchanged with the introduction of the proposed smelter complex and secured landfill facility.

3.2 CLOSURE OBJECTIVES

The closure objectives should be achieved in as cost effective a manner as possible and the closure solution should be sustainable in the long-term. The following key objectives are identified to make sure that the following commitments would be achieved as a minimum (EVES, 2018a):

- The site will be made safe for both humans and animals;
- The site will be rehabilitated to be physically safe, chemically stable and ecologically self-sustaining;
- The residual impacts will be managed to acceptable levels and not deteriorate over time; and
- Rehabilitation and socio-economic enterprises will fulfil the pre-determined end land use.

Note: These closure objectives remain unchanged with the introduction of the proposed smelter complex and secured landfill facility.

4. POST CLOSURE LAND USE

Possible options identified for post closure land-use at BMM (including the Gamsberg Zinc Mine) from all the data collected include five options ranked from most suitable to least suitable (EVES, 2018a):

- 1: Establish a nature reserve on suitable areas, use functional infrastructure for alternative uses where possible and demolish the rest. The remaining infrastructure could be used for accommodation and facilities for eco-tourism (viz. battlefield tours, special species, flowers and game viewing trails).
- 2: Leasing all land on a permanent basis.
- 3: Possible multiple closure enterprises/land use:
    - Sell some property and/or infrastructure for industrial purposes.
    - Sell some houses to employees or other willing buyers.
    - Establish Aggeneys as a functional town run by Khâi-Ma Local Municipality.
    - Outsource all other services (waste management, sewage, water etc.).

  - Establish parts of Aggeneys as a Retirement Village.
  - Transfer ownership of contracting companies, township and other workshops, training centre and general use facilities to highest bidder.
  - Investigate alternative industries (e.g. algae farming at sewage farms; reprocessing of tailings).
  - Maximise local conditions for solar energy plants.
- 4: Agricultural development (specialist farming/small farming projects).
- 5: Demolish town and mining infrastructure and rehabilitate for grazing by game and livestock (in the event that the municipality decides not to assume responsibility for the town after a thorough consultation process).

The public participation process of 2010 indicated the following post closure land use options as appropriate:

- Game ranching (or farming); and
- Agricultural projects mixed with conservation and eco-tourism activities.

Note: With the introduction of the proposed smelter complex and secured landfill facility, the most suitable post closure land use is still considered wilderness/nature reserve and the promotion of eco-tourism in the area. It is, however, important to recognise that the Gamsberg Smelter Project would extend the current projected life of the Gamsberg Zinc Mine.

5. GAMSBERG LIFE OF MINE

The Gamsberg Zinc Mine has had three distinct development periods (EVES, 2018a):

- The Barite mine development that has been rehabilitated with a then LOM up to 1990.
- The Gamsberg decline development and associated infrastructure (workshops and Franks dams) - that is separate from the open pit development.
- The Gamsberg open pit development that included a large open pit mine, WRDs, construction housing village, some housing expansion in Aggeneys, a concentrator plant and TSF.

The LOM for both the decline and open pit operations is considered to be 2031 (prior to the introduction of the Gamsberg Smelter Project).

Note: The projected useful economic life of the proposed smelter plant is 15 years. The LOM for Gamsberg Zinc Mine would therefore be pushed out to at least 2039 and maybe even further in the event it is economically feasible to do so.

6. STAKEHOLDER CONSULTATION

The scoping report for the Gamsberg Smelter Project (SLR, 2020) provided stakeholders with the opportunity to provide preliminary input into the Closure Plan associated with the proposed project. A summary of the closure related issues and concerns raised by stakeholders to date are as follows:

- What legacy will BMM leave once the resource is completed for example in 20/30 years' time?
- How will BMM ensure long term sustainability and employment opportunities post life of mine?

Note: This closure plan addendum along with the Integrated Closure Plan for Black Mountain Mine (EVES, 2018a, 2018b, 2018c) will be continuously updated during the Gamsberg Zinc Mine LOM, in consultation with a range of government authorities, to aid with the development of a long-term, post-mining economy for the Aggeneys area.

7. GAMSBERG SMELTER PROJECT INFRASTRUCTURE

The Gamsberg Smelter Project infrastructure that would be developed can be divided into 4 main areas, namely:

- The smelter complex;
- The secured landfill facility;
- The bulk water pipeline (from Horseshoe reservoir to the smelter); and
- Support infrastructure.

The smelter complex infrastructure (TCE, 2019), as shown in Appendix A, includes:

- Raw material storage and unloading hopper;
- Two roasters, two waste heat recovery boilers, two electro-static precipitators and substation;
- Gas cleaning plant;
- Acid plant and acid stack;
- Steam turbine generator building;
- Ozone preparation plant;
- Calcine silos;
- Leaching plant;
- Manganese removal plant;
- Purification plant;
- Jarofix preparation plant;
- Jarosite despatch area;
- Acid loading stations and acid storage tanks;
- Gypsum removal plant;
- Electrolyte storage tanks;
- Cell house, substation, cathode stripping section, anode washing section and cooling tower;
- Cathode storage area;
- Melting, casting and switch gear room, substation;
- Product storage area;
- Zinc dust plant;
- Cooling towers;
- Switchyard, main receiving substation and rectiformers;

- Central electrical room, offices and control room;
- Utility substation;
- Raw water reservoir, water treatment facility and effluent treatment facility;
- Compressor room;
- Central store;
- Canteen;
- Repair shop;
- Gate house;
- Change house;
- Weigh bridge;
- LDV parking and access roads;
- Fencing and entry/exit gates; and
- Storm water dam.

The secured landfill facility (TCE, 2020), as shown in Appendix A, consists of:

- A landfill facility made up of various cells, each with a lifespan of about 5 years;
- Fencing and entry/exit gate(s);
- An access road from the smelter plant to the secured landfill facility;
- An above-ground pipeline from the secured landfill facility to the effluent treatment facility at the smelter plant; and
- Watercourse crossings for the road and pipeline.

The new bulk water pipeline infrastructure will consist of:

- An above-ground pipeline from the Horseshoe reservoir to the smelter complex.

The support infrastructure consists of:

- Laydown area;
- Business partners camp;
- Contractors (construction) camp; and
- 132Kv Eskom transmission line.

8. POST CLOSURE ALTERNATIVES FOR MINE INFRASTRUCTURE

At LOM closure it is currently assumed that:

- All smelter complex infrastructure would be demolished and the area rehabilitated;

- The secured landfill facility would be decommissioned and the area rehabilitated;
- The above-ground bulk water pipeline from the Horseshoe water reservoir to the smelter complex would be dismantled and the area rehabilitated;
- The laydown area, business partners camp and contractors camp would be dismantled and the areas rehabilitated;

Certain smelter complex infrastructure may also remain to support future post closure land uses if supported by the local communities and authorities, namely:

- Steel buildings, workshops, stores, offices, water holding facilities, water treatment facilities and power generation units that could be used for the establishment of a nature reserve or for small business development (e.g. agricultural products, livestock farming, aquaculture, light engineering, alternative industries, solar energy plants etc.); and
- Accommodation units that could be used for the establishment of a nature reserve/for eco-tourism purposes (provided the accommodation units can be easily converted in bigger family units – if required).

The feasibility of using any mine and smelter complex related infrastructure to support post closure land use would need to be considered in terms of: sustainability of land use, engineering and environmental aspects, maintenance requirements, monitoring requirements, capital costs, post closure support services and available institutional capacity and skills.

A detailed hand-over programme, including likely risks, operation instructions, future monitoring and maintenance requirements etc., would need to be developed for any infrastructure that remains post closure to better inform affected communities and local authorities.

9. ENVIRONMENTAL RISK ASSESSMENT

9.1 EXISTING GAMSBERG ZINC MINE

Screening level qualitative risk assessment workshops were undertaken as part of the Integrated Closure Plan for Black Mountain Mine (EVES, 2018b and EVES, 2020).

The priority areas for mine closure planning at the Gamsberg Zinc Mine identified in the risk assessment includes:

- High priority areas:
  - WRD and
  - TSF.
- Medium priority areas:
  - Open pit;
  - Industrial site; and
  - Evaporation pond.
- Low priority areas:
  - Conservation and offset areas.

These are discussed in more detail in the Environmental Risk Assessment report (EVES, 2018b).

9.2 PROPOSED SMELTER COMPLEX AND SECURED LANDFILL FACILITY

Similar to the previous risk assessment, the priority areas for the new infrastructure would be:

- High priority areas:
  - Secured landfill facility.
- Medium priority areas:
  - Smelter complex.

These two areas are discussed in more detail below.

9.2.1 Secured Landfill Facility

The potential for impact on the environment:

- Groundwater;
- Surface water;
- Waste;
- Noise during decommissioning;
- Air quality;
- Biodiversity; and
- Risk of catastrophic event.

9.2.2 Smelter Complex

The potential for impact on the environment:

- Groundwater;
- Surface water;
- Waste;
- Noise during demolition;
- Air quality;
- Biodiversity; and
- Risk of catastrophic event.

9.3 RESIDUAL RISKS

“Residual environmental impact” means any environmental impact or risk that may emit or manifest after actions for final rehabilitation, decommissioning and closure have been identified (i.e. post closure).

The residual environmental impacts are also the latent (delayed) impacts. Any of the latent impacts have the potential to become residual through environmental variables such as seepage rates, dilution and distribution of pollutants beyond the area of impact as well as the nature of the polluting chemical and associated reactions (like acidification) (EVES, 2018b). The natural ecosystem functioning can cause a latent impact to become residual even if mitigation measures were put in place, specifically rain events (e.g. rain events cause groundwater recharge of polluted groundwater sources that is not isolated from unaffected groundwater sources, or where rain events cause significant erosion exposing underlying waste materials).

9.3.1 Biophysical Residual Risks

Potential latent liabilities that may manifest themselves well beyond closure are extremely difficult to predict and or quantify in terms of financial implications. It could, however, be safely assumed that any additional latent liabilities would most likely be associated with the secured landfill facility, and not the smelter complex site.

9.4 RISK TRIGGERS

The known risk triggers that can be used to identify residual environmental impacts or risks include:

- The presence of acid mine drainage;
- The presence of heavy metals and hydrocarbons in groundwater, surface water and/or soils;
- The salination of groundwater and/or soils;
- Soil degradation by compaction, erosion and/or leaching;
- Vegetation disturbance;
- Drought;
- The aspect and gradient of steep slopes;
- Loss of species (fauna or flora); and
- Inadequate mitigation measures during operations and/or at decommissioning.

10. PROGRESSIVE REHABILITATION PLANNING

Existing planned rehabilitation works for the existing Gamsberg Zinc Mine are detailed in the 2018 EVES Report (EVES, 2018c). Additional planned rehabilitation works associated with the proposed Gamsberg Smelter Project includes:

- Closure and rehabilitation of the individual landfill cells (each with a lifespan of about 5 years) once their design storage capacity has been reached.
- Decommissioning and rehabilitation of the laydown area and business partner camp associated with the construction phase of the Gamsberg Smelter Project.

The bulk of the disturbed areas associated with the Gamsberg Smelter Project would, however, only be able to be rehabilitated at LOM.

11. LOM DECOMMISSIONING AND REHABILITATION PLAN

At a conceptual level, decommissioning is a reverse of the construction phase. The LOM decommissioning plan is as follows:

- Smelter plant infrastructure not required to support post-closure land use(s) should be demolished and removed.
- The secured landfill facility should be capped and would remain in perpetuity.
- The bulk water pipeline from the Horseshoe water reservoir to the smelter complex should be dismantled and removed (for recycling / scrap).

- The laydown area, business partners camp and contractors camp infrastructure should be demolished and removed.
- The 132Kv transmission line to the smelter complex should be dismantled and removed (for recycling / scrap).
- Roads no longer required for post closure use should have any engineered layers removed, and then deep ripped to promote the re-establishment of vegetation.
- Fencing and gates no longer required should be dismantled and removed (for recycling / scrap).
- It is currently anticipated that the storm water dam (for the smelter complex) would not be required post closure, and hence this facility should be decommissioned.
- Areas where surface infrastructure has been removed should be levelled and restored in terms of soil horizons, vegetation and drainage (as far as practical).
- Material that can be recycled/ has a scrap value should be de-contaminated, stockpiled and removed from site.
- Inert rubble and non-recyclable decommissioning/demolition waste (including concrete, plastic liners, brickwork, conveyor belting etc.) should be disposed of on-site at a dedicated dump site, or within the TSF (subject to approval from authorities).
- Hazardous material should be disposed of on-site at the secured landfill facility (subject to approval from authorities, as well as, adequate storage capacity), otherwise removed from site for disposal at an approved hazardous landfill facility.

The LOM rehabilitation plan involves the following:

- Decommissioned infrastructure areas should be landscaped and levelled so that the areas are free-draining and that there is no ponding of water.
- Any remaining slopes should be modified to at least 1V:3H (or flatter) to minimise erosion, and long slopes may require energy/flow breakers to curb the velocity of storm water runoff.
- Decommissioned infrastructure areas should be deep ripped and revegetated with indigenous species to align to the surrounding natural environment as far as practical.
- Topsoil that was stripped and stockpiled as part of construction works, should be replaced (presumably 375 mm – similar to existing mining areas).
- Planting with a mix of indigenous grasses (dry seeding), shallow rooted pioneer species and deep-rooted species, where appropriate, such as trees/shrubs (hand planting of seedlings). Deep rooted species are typically not suitable for areas that have covers (e.g. secured landfill facility).

12.RELINQUISHMENT/COMPLETION CRITERIA

Relinquishment/ completion criteria are used to facilitate the fulfilment of the closure plan vision and objectives. Keys aspects of the completion criteria are:

- The completion criteria should be specific to the Gamsberg Zinc Mine and Smelter Project reflecting its site-specific set of environmental, social and economic circumstances.
- The completion criteria, and basis on which successful reclamation is determined, should be developed in consultation with stakeholders. This ensures that there is broad agreement on both the post-closure land use objectives and the basis for measuring the achievement of that objective.

- The completion criteria should be flexible enough to adapt to changing circumstances without compromising the agreed post-closure objective. This provides certainty of process and outcome (i.e. relinquishment when the conditions have been met).
- The completion criteria should be periodically reviewed and modified in light of improved knowledge (e.g. data from ongoing field trials, updated modelling exercises etc.) or changed circumstance.

12.1 IDENTIFICATION OF INDICATORS

SLR propose using four key indicators (with associated performance targets) that would facilitate evaluation of the ongoing environmental impacts and associated risk to closure (risk triggers). These key indicators can be evaluated through analysis of ongoing monitoring results. The key indicators are namely:

- Groundwater quality;
- Surface water quality;
- Dump cover stability/landscape function analyses; and
- Vegetative cover.

An additional key indicator covering socio-economic aspects (with associated performance targets e.g. portion of former employees successfully retrained), would need to be developed over time, in line with the development of the social closure plan.

The first and second indicators, groundwater and surface water quality, are an important measure of the effectiveness of mitigation activities (particularly for the latent environmental impact of groundwater associated with the smelter complex and the secured landfill facility, as well as, the TSF, concentrator plant, WRDs and open pits) and for protecting the health and safety of post closure land users, neighbouring and/or down gradient land users, livestock, and wildlife.

The third and fourth indicators, dump cover stability/landscape function analyses and vegetative cover, are highly correlated with all the other major environmental parameters of the area, including erosion, dust, physical stability, chemical stability, and soil quality. Good vegetative cover results in a reduction in the volume of surface runoff, increases soil and slope stability, and leads to the formation of an organic layer. In addition, vegetative growth is visually correlated with successful rehabilitation (and/or protection of the surrounding environment).

A summary of the suggested relinquishment criteria to be utilized for evaluation of rehabilitation success for each of the selected key indicators is provided in the following sections.

12.2 GROUNDWATER QUALITY EVALUATION SYSTEM

To utilise groundwater quality as an indicator of rehabilitation success, Gamsberg Zinc Mine should:

- Identify sampling locations for rehabilitation, and post-rehabilitation periods;
- Determine which water quality analyses would be required and the required frequency of sampling;
- Determine where ground water elevations would be required and the required frequency of monitoring;
- Establish a detailed field sampling methodology;
- Update the groundwater model; and
- Analyse and compare the results of chemical analyses of groundwater samples to the agreed standards to provide proof of compliance, and therefore verification of rehabilitation success, over the agreed monitoring period.

12.3 SURFACE WATER QUALITY EVALUATION SYSTEM

To utilise surface water quality as an indicator of rehabilitation success Gamsberg Zinc Mine should:

- Confirm the sampling locations for rehabilitation, and post-rehabilitation periods;
- Confirm which water quality analyses would be required and the required frequency of sampling;
- Establish a detailed field sampling methodology; and
- Analyse and compare the results of chemical analyses of surface water samples to the agreed standards to provide proof of compliance, and therefore verification of rehabilitation success, over the agreed monitoring period.

12.4 DUMP COVER STABILITY/LANDSCAPE FUNCTION ANALYSES EVALUATION SYSTEM

For all the facilities remaining post-closure at the Gamsberg Zinc Mine (i.e. the secured landfill facility, TSF and WRD), the same basic principles to the installed covers should be applied, namely:

- Limit water ingress;
- Stabilize material against cover erosion; and
- Prevent off-site contamination of surface water and groundwater.

To utilise dump cover stability as an indicator of rehabilitation success Gamsberg Zinc Mine should utilise landscape function analyses (LFA), which evaluates the cover for a number of parameters and then lists three indices that can be tracked over time to see if the system is improving. If the LFA scores have been calibrated for the area, using indicative reference scores, a final score for each parameter index can be set to use as the relinquishment state.

Geotechnical side slope stability assessments of the facilities would also have to be done prior to final closure to ensure that a post-closure factor of safety of better than 1.5 is achieved.

12.5 VEGETATIVE COVER EVALUTION SYSTEM

The degree to which the vegetation cover is effective at reducing erosion is a function of the height and continuity of the plant canopy, the density of the ground contact cover, and the root density. The vegetation contact cover dissipates the energy from surface water runoff (and wind), thereby decreasing erosional forces. An increase in the vegetation cover also results in an increase in both the evapo-transpiration rate and the infiltration rate leading to changes in the water balance.

Wildlife diversity responds positively to an increase in available habitat and food supply that is brought on by the establishment of vegetative cover. Additionally, the success of vegetative cover reflects the chemical and physical suitability of soils to develop and maintain a productive ecosystem that would support a post closure land use of nature reserve/game farming (provided the field quality is maintained by not exceeding the grazing capacity).

To utilise vegetative cover evaluation as an indicator of rehabilitation success the Gamsberg Zinc Mine should utilise/measure three parameters to evaluate vegetative cover on rehabilitated land, namely:

- The percentage of basal cover;
- The tree/shrub (woody species) density; and
- The species composition (indigenous and alien invasive species).

Corresponding reference plots with a similar land use should be used for comparative purposes and for verification of rehabilitation success, over the agreed monitoring period.

A list of vegetative species that are considered appropriate for use in rehabilitation should also be confirmed during progressive rehabilitation planning at the Gamsberg Zinc Mine.

13. CLOSURE LIABILITY METHODOLOGY AND CALCULATIONS

13.1 ASSUMPTIONS AND EXCLUSIONS

Assumptions and exclusions that have been made in the development of this closure plan addendum, and the closure liability calculation are:

- The battery limits for the closure liability calculation are the smelter complex, secured landfill facility, bulk water pipeline and associated support infrastructure (as per Section 7).
- BMM must follow and adhere to the commitments made in the EMPr's.
- The volume of stockpiled topsoil that has been stripped from infrastructure and operational areas will be sufficient for closure activities. It is recommended that a topsoil inventory be established and maintained in order to preserve existing (and new) topsoil stockpiles and if necessary supplement with other potentially suitable growth medium materials.
- Runoff water quality from rehabilitated areas of the smelter complex, secured landfill facility, bulk water pipeline and associated support infrastructure would be acceptable and would not require any further treatment.
- Any flood prevention structures constructed as part of the project would be presumed to be permanent features, adequately designed and would remain post closure.
- No allowance for surface and groundwater remediation has been costed at this stage – the likelihood of such remediation would only be identified through monitoring, risk assessment exercises and water pollution potential studies during the project operations.
- Revegetation trials (and hence the long-term sustainability of any revegetation works) would be undertaken as part of operations, and the lessons learnt incorporated in future updates of the Integrated Closure Plan for BMM and the Gamsberg Zinc Mine.
- No allowance for salvage and/or recycling of scrap material has been considered in the estimation procedure.
- Inert building and demolition rubble can be safely disposed and buried on-site at a dedicated dump site, or within the TSF (subject to approval from authorities).
- Hazardous material can be safely disposed of on-site at the secured landfill facility (subject to approval from authorities). No allowance has been made for the removal of hazardous material from site for disposal at an approved hazardous landfill facility.
- Reagent, fuel and lubricant manufacturers/suppliers would accept returned product at LOM.
- No consideration of the social closure costs has been included in this report. Social closure costs (e.g. employee retrenchment provision, new employment opportunities and re-training costs) would need to be calculated and accounted for separately by the relevant Human Resources Department (and others).
- No assessment of any socio-economic/shared value/ community-based programmes being implemented (and whether these would continue post closure of the operation) has been considered.

- All costs associated with pre-closure monitoring, auditing and reporting are presumed to be covered under the operations expenditure of the Gamsberg Smelter Project, and have not been included in this closure plan addendum.
- All Gamsberg Smelter Project infrastructure would be demolished and removed from site. This assumption should be confirmed with stakeholders as part of the closure planning process since there may be some post closure use for certain infrastructure (e.g. offices, workshops, water treatment facilities etc.).
- Cell 1 of the secured landfill facility has already been rehabilitated and revegetated as part of progressive rehabilitation planning.
- The laydown area, business partners camp and contractors camp has already been rehabilitated and revegetated as part of progressive rehabilitation planning.
- The decommissioning, removal and rehabilitation of the 132Kv Eskom transmission line is the responsibility of Eskom.
- These assumptions and exclusions would be periodically reviewed during the ongoing operations of the Gamsberg Zinc Mine and Gamsberg Smelter Project. Any required technical work would be conducted in order to reduce information gaps and uncertainty prior to LOM closure.

13.2 QUANTITIES

The quantities and areas of disturbance were calculated from the current layouts available for the Gamsberg Smelter Project (as shown in Appendix A).

13.3 UNIT RATES

It is SLR's experience that reliable site specific rates can only be obtained through a formal tender process with a detailed bill of quantities, detailed scope of work with engineered drawings, as well as, contract specifications (i.e. the level of detail required to generate a ±10% cost accuracy when the remaining life of facility is 5 years or less).

The rates used for the determination of this closure liability have instead been derived from SLR's own database of rates. This database is considered to be a national average of rates for South African operations, since the rates are obtained from various sources throughout the country, mainly in the precious, fuel and base metal mining industries. These rates are typically acquired through the due diligence work that SLR gets involved with, or where SLR has been requested to undertake a detailed closure plan for a client.

Where up-to-date rates are not available, then previous known rates are escalated by a contract price adjustment formula (that is considered appropriate by SLR - specifically for closure related activities) that considers the escalation of labour, fuel, plant and materials. The escalation of labour, fuel, plant and materials is obtained from the monthly data provided by Statistics South Africa (www.statssa.gov.za).

A summary of the master rates (as at September 2020) used in the closure liability calculations are shown in Table 13-1.

Table 13-1: Master Rates used for the Closure Liability Calculation

Ref Nr	Description	Unit	Master Rate (ZAR)
1.1	Dismantling of heavy plant and associated superstructure	m^2	R 2,569-00
1.2	Dismantling of medium plant and associated superstructure	m^2	R 851-00

Ref Nr	Description	Unit	Master Rate (ZAR)
1.3	Dismantling of medium plant structures	m^2	R 740-00
1.4	Dismantling of workshops and shed type structures	m^2	R 245-00
1.5	Dismantling of suspended conveyors	m	R 495-00
1.6	Demolition of floors, bases and foundations after removal of structures (heavy duty)	m^2	R 1,254-00
1.7	Demolition of floors, bases and foundations after removal of structures (medium duty)	m^2	R 834-00
1.8	Demolish single storey buildings (incl. removal of foundations)	m^2	R 347-00
1.9	Remove tarred roads and bury associated layer works	m^2	R 150-00
1.10	Dismantle security fencing	m	R 70-00
1.11	Remove HDPE liner	ha	R 73,700-00
1.12	Reshaping, profiling of areas	ha	R 55,960-00
1.13	Dismantle and remove small diameter pipeline	m	R 25-00
2.5	Remove gravel roads and bury associated layer works	m^2	R 27-00
3.1	Dismantle and remove large diameter pipeline	m	R 165-00
5.1	Deep ripping of infrastructure areas	ha	R 12,400-00
5.2	Placing 375 mm topsoil for revegetation	ha	R 133,500-00
5.3	Establishment of vegetation	ha	R 63,000-00
6.1	SLF capping Cover [1] - 300 mm soil	ha	R 106,800-00
6.2	SLF capping Cover - 1.5 mm HDPE cover	m^2	R 90-00
6.3	SLF capping Cover - 300 mm drainage layer	ha	R 106,800-00
6.4	SLF capping Cover - 600 mm soil	ha	R 213,600-00

13.4 TIME, FEE AND CONTINGENCY COSTS

The following time, fee and contingency costs have also been included in the closure liability calculations as per the existing BMM closure liability calculations (BMM, 2019).

Table 13-2: Time, Fee and Contingency Costs

Description	Percentage	Rate
Contractor P&G's, site establishment and demobilisation	%	6
Detail design fees, procurement etc.	%	3
Project management and site supervision fees	%	2
Contingency	%	10

[1] Secured landfill facility capping cover as per design report (TCE, 2020)

13.5 POST CLOSURE SUPERVISION AND MONITORING

The following provisional post-closure monitoring and maintenance costs have been included in the closure liability calculation. These costs make provision for quarterly, bi-annual and annual sampling (surface and groundwater, dump cover stability/LFA and vegetation cover) and site inspections by independent external consultants for an estimated period of 7 years.

The 7-year period is made up of decommissioning and rehabilitation of the site (2 years), active maintenance and aftercare (3 years) and passive maintenance and aftercare (2 years). The passive maintenance and aftercare period could be a further 5 years depending on the time taken to reach agreed LFA and vegetative relinquishment/completion criteria (i.e. 7 years in total for passive maintenance and aftercare).

Table 13-3: Post-Closure Monitoring and Maintenance Costs

Description	Unit	Provisional Allowance (ZAR)
Water quality monitoring	Sum	R 4,718,400
Cover stability /LFA monitoring	Sum	R 1,260,000
Vegetation cover monitoring	Sum	R 1,200,000
Management of monitoring and maintenance	Sum	R 4,500,000

13.6 CLOSURE LIABILITY CALCULATION

The closure liability calculation is provided in Appendix B, indicating that the total LOM closure liability associated with the Gamsberg Smelter Project is R 204,286,019 (excl. VAT). The closure liability calculation is at Current Value (CV) as at September 2020.

14.CONCLUSION

This closure plan addendum report for the proposed Gamsberg Smelter Project has incorporated the existing closure vision, closure objectives and post-closure land-use for the operational Gamsberg Zinc Mine.

The smelter complex, secured landfill facility, bulk water pipeline and associated support infrastructure is estimated to add a further R 204,286,019 (excl. VAT, CV at September 2020) to the overall closure liability associated with the Gamsberg Zinc Mine.

S van Niekerk
(Report Author)

S van Niekerk
(Project Manager)

K Hamilton
(Reviewer)

15.REFERENCES

BMM, 2019. *2019-03-21 Gamsberg Closure Costing – Sensitivity Analyses.* Black Mountain Mining Pty (Ltd). 21 March 2019.

EVES, 2018a. *Chapter 01: Black Mountain Integrated Closure Plan*. Endemic Vision Environmental Services Pty (Ltd). 01 April 2018.

EVES, 2018b. *Chapter 02: Black Mountain Integrated Closure Plan*. Endemic Vision Environmental Services Pty (Ltd). 01 April 2018.

EVES, 2018c. *Chapter 03: Black Mountain Integrated Closure Plan*. Endemic Vision Environmental Services Pty (Ltd). 01 April 2018.

EVES, 2020. *Black Mountain Closure Risk Report (Draft Report)*. Endemic Vision Environmental Services Pty (Ltd). 01 April 2020.

GNR 982, 2014. GNR 982 of the National Environmental Management Act (107/1998). *Environmental Impact Assessment Regulations, 2014*. December 2014. (referred to as NEMA EIA Regulations).

GNR 1147, 2015. GNR 1147 of the National Environmental Management Act (107/1998). *Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations.* November 2015. (referred to as 2015 Financial Provisioning Regulations).

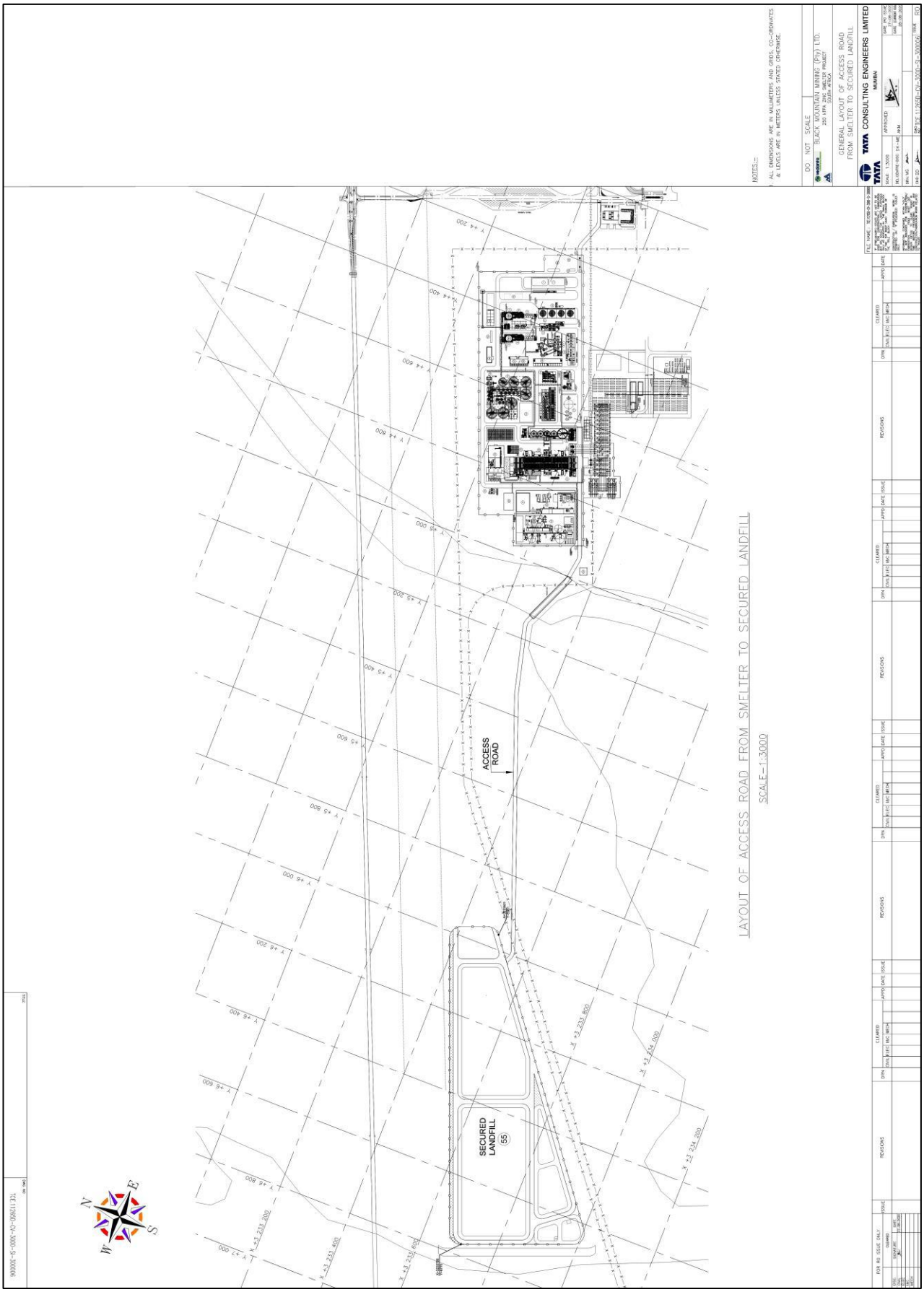
SLR, 2020. *Final Scoping Report Gamsberg Smelter Project*. SLR Consulting (South Africa) (Pty) Ltd. Report No. 1 (Revision C). Ref: 720.22013.00002. 11 March 2020.

TCE, 2019. *Pre-feasibility Study Report – 250 kTPA Zinc Smelter Refinery with Infrastructure at Gamsberg, South Africa*. Tata Consulting Engineers Limited. Ref: TCE.11265A-MT-7000-BS-01. August 2019.

TCE, 2020. *Basic Design Report on Secured Landfill (SLF) - 250 kTPA Zinc Smelter Refinery with Infrastructure at Gamsberg, South Africa*. Tata Consulting Engineers Limited. Ref: TCE.11265D-CV-3000-BS-30002. August 2020.

APPENDIX A: GAMSBERG SMELTER PROJECT INFRASTRUCTURE


SYMBOL LEGEND
1. EXISTING UNITS
2. PROPOSED UNITS
3. PROPOSED ROADS
4. COMBINED PIPE AND CABLE CORRIDOR
5. FENCING
6. GATE
7. OVER HEAD 33KV POWER LINE
GENERAL LAYOUT
CONSULTING ENGINEERS LIMITED
DO NOT SCALE
BLACK MOUNTAIN MINING (Pty) LTD.
250 KTA ZINC SMELTER PROJECT
GENERAL LAYOUT
CONCENTRATOR PLANT
OFFICE
ESKOMS SERVITUDE
66 kV TRANSMISSION LINE
ROAD TO SECURED LAND FILL
132 kV TRANSMISSION LINE PROPOSED


LAYOUT OF ACCESS ROAD FROM SMELTER TO SECURED LANDFILL
SCALE - 1:3000
ACCESS ROAD
SECURED LANDFILL
55
NOTES:-
DO NOT SCALE
BLACK MOUNTAIN MINING (Pty) LTD.
GENERAL LAYOUT OF ACCESS ROAD FROM SMELTER TO SECURED LANDFILL
TATA CONSULTING ENGINEERS LIMITED
MUMBAI

APPENDIX B: CLOSURE LIABILITY CALCULATION

CALCULATION OF THE QUANTUM

Mine: **Gamsberg Zinc Smelter Project**
Evaluators: **SLR Consulting (Pty) Ltd**
Date: At September 2020

No.	Description:	Unit:	Operational Area	Quantity	Master Rate	Amount
1. Decommissioning of the Smelter Plant						
1.1	Dismantling of heavy plant and associated superstructure	m^2	Roaster-1, WHRB-1, Hot ESP-1	1 548	R 2 569.00	R 3 976 812.00
		m^2	Steam turbines	200	R 2 569.00	R 513 800.00
		m^2	Roaster-2, WHRB-2, Hot ESP-2	1 548	R 2 569.00	R 3 976 812.00
		m^2	Acid stack	20	R 2 569.00	R 51 380.00
1.2	Dismantling of medium plant and associated superstructure	m^2	Cell house, cathode stripping & anode washing building	8 160	R 851.00	R 6 944 160.00
1.3	Dismantling of medium plant structures	m^2	Raw material storage & unloading hopper	448	R 740.00	R 331 520.00
		m^2	Gas cleaning plant	840	R 740.00	R 621 600.00
		m^2	Acid plant	1 680	R 740.00	R 1 243 200.00
		m^2	Ozone prep plant	1 326	R 740.00	R 981 240.00
		m^2	Calcine silos & leaching plant	7 544	R 740.00	R 5 582 560.00
		m^2	Mn removal plant	1 008	R 740.00	R 745 920.00
		m^2	Purification plant	3 360	R 740.00	R 2 486 400.00
		m^2	Jarofix prep plant	945	R 740.00	R 699 300.00
		m^2	Jarosite despatch plant	496	R 740.00	R 367 040.00
		m^2	Acid storage & loading stations	1 560	R 740.00	R 1 154 400.00
		m^2	Gypsum removal & electrolyte storage	2 084	R 740.00	R 1 542 160.00
		m^2	Cell house, cathode stripping & anode washing	10 200	R 740.00	R 7 548 000.00
		m^2	Cathode storage	600	R 740.00	R 444 000.00
		m^2	Melt cast & switch gear room, casting substation	1 008	R 740.00	R 745 920.00
		m^2	Zinc dust plant	364	R 740.00	R 269 360.00
		m^2	Cooling towers	1 760	R 740.00	R 1 302 400.00
		m^2	Cell house cooling towers	224	R 740.00	R 165 760.00
		m^2	Switchyard	2 868	R 740.00	R 2 122 320.00
		m^2	Main substation	975	R 740.00	R 721 500.00
		m^2	Rectoformer	630	R 740.00	R 466 200.00
		m^2	Offices & control room	1 352	R 740.00	R 1 000 480.00
		m^2	Roaster substation	1 540	R 740.00	R 1 139 600.00
		m^2	Utility substation	1 196	R 740.00	R 885 040.00
		m^2	Water treatment plant	1 254	R 740.00	R 927 960.00
		m^2	Effluent treatmnent plant	3 640	R 740.00	R 2 693 600.00
		m^2	Compressor room	240	R 740.00	R 177 600.00
		m^2	Weigh bridge	120	R 740.00	R 88 800.00
		m^2	Pipe racks	3 700	R 740.00	R 2 738 000.00
1.4	Dismantling of workshops and shed type structures	m^2	Purification building	3 360	R 245.00	R 823 200.00
		m^2	Jarofix prep building	1 050	R 245.00	R 257 250.00
		m^2	Jarosite despatch building	400	R 245.00	R 98 000.00
		m^2	Gypsum removal & electrolyte storage building	680	R 245.00	R 166 600.00
		m^2	Cathode storage building	600	R 245.00	R 147 000.00
		m^2	Melt cast & switch gear room, casting substation	4 032	R 245.00	R 987 840.00
		m^2	Zinc dust building	364	R 245.00	R 89 180.00
		m^2	Repair shop	900	R 245.00	R 220 500.00
1.5	Dismantling of suspended conveyors	m	Plant conveyors	425	R 495.00	R 210 375.00
1.6	Demolition of floors, bases and foundations after removal of structures (heavy duty)	m^2	Roaster-1, WHRB-1, Hot ESP-1	1 548	R 1 254.00	R 1 941 192.00
		m^2	Acid stack	20	R 1 254.00	R 25 080.00
		m^2	Roaster-2, WHRB-2, Hot ESP-2	1 548	R 1 254.00	R 1 941 192.00
		m^2	Cooling towers	1 760	R 1 254.00	R 2 207 040.00
		m^2	Cell house cooling towers	224	R 1 254.00	R 280 896.00

1.7	Demolition of floors, bases and foundations after removal of structures (medium duty)	m^2	Raw material storage & unloading hopper	2 208	R 834.00	R 1 841 472.00
		m^2	Gas cleaning plant	1 120	R 834.00	R 934 080.00
		m^2	Acid plant	4 200	R 834.00	R 3 502 800.00
		m^2	Ozone prep	1 768	R 834.00	R 1 474 512.00
		m^2	Calcine silos & leaching	9 430	R 834.00	R 7 864 620.00
		m^2	Mn removal	2 520	R 834.00	R 2 101 680.00
		m^2	Purification plant	3 360	R 834.00	R 2 802 240.00
		m^2	Jarofix prep plant	1 050	R 834.00	R 875 700.00
		m^2	Jarosite despatch plant	720	R 834.00	R 600 480.00
		m^2	Acid storage & loading stations	2 600	R 834.00	R 2 168 400.00
		m^2	Gypsum removal & electrolyte storage	3 472	R 834.00	R 2 895 648.00
		m^2	Cell house, cathode stripping & anode washing	10 200	R 834.00	R 8 506 800.00
		m^2	Cathode storage	600	R 834.00	R 500 400.00
		m^2	Cell house, cathode stripping & anode washing	4 032	R 834.00	R 3 362 688.00
		m^2	Product storage	2 775	R 834.00	R 2 314 350.00
		m^2	Zinc dust plant	364	R 834.00	R 303 576.00
		m^2	Switchyard	11 472	R 834.00	R 9 567 648.00
		m^2	Raw water reservoir	1 620	R 834.00	R 1 351 080.00
		m^2	Water treatment plant	5 016	R 834.00	R 4 183 344.00
		m^2	Effluent treatmnent plant	9 100	R 834.00	R 7 589 400.00
		m^2	Repair shop	900	R 834.00	R 750 600.00
		m^2	Weigh bridge	120	R 834.00	R 100 080.00
		m^2	SWD silt trap	315	R 834.00	R 262 710.00
1.8	Demolish single storey buildings (incl. removal of foundations)	m^2	Main substation	975	R 347.00	R 338 325.00
		m^2	Rectoformer	630	R 347.00	R 218 610.00
		m^2	Offices & control room	1 352	R 347.00	R 469 144.00
		m^2	Roaster substation	1 540	R 347.00	R 534 380.00
		m^2	Utility substation	1 196	R 347.00	R 415 012.00
		m^2	Compressor room	240	R 347.00	R 83 280.00
		m^2	Central store	1 548	R 347.00	R 537 156.00
		m^2	Canteen	1 056	R 347.00	R 366 432.00
		m^2	Gate house	456	R 347.00	R 158 232.00
		m^2	Change house	988	R 347.00	R 342 836.00
1.9	Remove tarred roads and bury associated layer works	m^2	Plant roads and parking areas	35 056	R 150.00	R 5 258 400.00
1.10	Dismantle security fencing	m	Security fencing	2 500	R 70.00	R 175 000.00
1.11	Remove HDPE liner	ha	Smelter SWD	0.9	R 73 700.00	R 66 330.00
1.12	Reshaping, profiling of areas	ha	Smelter SWD and silt trap area	1.0	R 55 960.00	R 55 960.00
1.13	Dismantle and remove small diameter pipeline	ha	SWD pipeline to plant	150	R 25.00	R 3 750.00
					Subtotal 1	**R 138 927 344.00**
					(Decommissioning of the Smelter Plant)	
2. Decommisoning of the Secured Landfill Facility (SLF)						
2.1	Remove HDPE liner	ha	SLF SWD	0.75	R 73 700.00	R 55 275.00
2.2	Demolition of floors, bases and foundations after removal of structures (medium duty)	m^2	SLF SWD Silt trap	574	R 834.00	R 478 716.00
2.3	Reshaping, profiling of areas	ha	SLF SWD and silt trap area	0.9	R 55 960.00	R 50 364.00
2.4	Dismantle and remove small diameter pipeline	m	SWD pipeline to plant	2 250	R 25.00	R 56 250.00
2.5	Remove gravel roads and bury associated layer works	m^2	Access road to SLF	10 575	R 27.00	R 285 525.00
					Subtotal 2	**R 926 130.00**
					(Decommissioning of the Secured Landfill Facility)	
3. Decommisoning of the Bulk Water Pipeline						
3.1	Dismantle and remove large diameter pipeline	m	Pipeline from Horseshoe reservoir to smelter	7 000	R 165.00	R 1 155 000.00
					Subtotal 3	**R 1 155 000.00**
					(Decommissioning of the Bulk Water Pipeline)	
4. Decommissioning of the Support Infrastructure						
4.1	Dismantle remaining infrastracture (non-salvageable)	ha	Laydown area	n/a	R 0.00	R 0.00
		ha	Business partners camp	n/a	R 0.00	R 0.00
		ha	Contractors camp	n/a	R 0.00	R 0.00
		ha	132Kv Eskom transmission line	n/a	R 0.00	R 0.00
					Subtotal 4	**R 0.00**
					(Decommissioning of the Support Infrastructure)	

5. Rehabilitation of the Smelter Plant						
5.1	Ripping of infrastructural footprint areas	ha	Smelter plant area	21.70	R 12 400.00	R 269 080.00
5.2	Place 375 mm topsoil for revegetation	ha	Smelter plant area	21.70	R 133 500.00	R 2 896 950.00
5.3	Establishment of vegetation	ha	Smelter plant area	21.70	R 63 000.00	R 1 367 100.00
		ha	Smelter SWD and silt trap area	1.00	R 63 000.00	R 63 000.00
					Subtotal 5	**R 4 596 130.00**
					(Rehabilitation of Smelter Palnt)	
6. Rehabilitation of the Secured Landfill Faclity						
6.1	Capping Cover - 300 mm soil	ha	Cell 1	n/a	R 106 800.00	R 0.00
		ha	Cell 2	6.10	R 106 800.00	R 651 480.00
		ha	ETP & Manganese waste area	1.40	R 106 800.00	R 149 520.00
6.2	Capping Cover - 1.5 mm HDPE cover	m^2	Cell 1	n/a	R 90.00	R 0.00
		m^2	Cell 2	61 000	R 90.00	R 5 490 000.00
		m^2	ETP & Manganese waste area	14 000	R 90.00	R 1 260 000.00
6.3	Capping Cover - 300 mm drainage layer	ha	Cell 1	n/a	R 106 800.00	R 0.00
		ha	Cell 2	6.10	R 106 800.00	R 651 480.00
		ha	ETP & Manganese waste area	1.40	R 106 800.00	R 149 520.00
6.4	Capping Cover - 600 mm soil	ha	Cell 1	n/a	R 213 600.00	R 0.00
		ha	Cell 2	6.10	R 213 600.00	R 1 302 960.00
		ha	ETP & Manganese waste area	1.40	R 213 600.00	R 299 040.00
6.5	Ripping of infrastructural footprint areas	ha	Laydown area	0.92	R 12 400.00	R 11 408.00
		ha	Access road to SLF	1.06	R 12 400.00	R 13 144.00
6.6	Place 375 mm topsoil for revegetation purposes	ha	Laydown area	0.92	R 133 500.00	R 122 820.00
		ha	Access road to SLF	1.06	R 133 500.00	R 141 510.00
6.7	Establishment of vegetation	ha	Cell 1	n/a	R 63 000.00	R 0.00
		ha	Cell 2	6.10	R 63 000.00	R 384 300.00
		ha	ETP & Manganese waste area	1.40	R 63 000.00	R 88 200.00
		ha	Laydown area	0.92	R 63 000.00	R 57 960.00
		ha	Access road to SLF	1.53	R 63 000.00	R 96 390.00
					Subtotal 6	**R 10 869 732.00**
					(Rehabilitation of Securred Landfill Facility)	
7. Rehabilitation of the Bulk Water Pipeline						
7.1	Establishment of vegetation	ha	Water pipeline area	5.00	R 63 000.00	R 315 000.00
					Subtotal 7	**R 315 000.00**
					(Rehabilitation of Bulk Water Pipeline)	
8. Rehabilitation of the Support Infrastructure						
8.1	Ripping of footprint areas	ha	Laydown area	n/a	R 12 400.00	R 0.00
		ha	Business partners camp	n/a	R 12 400.00	R 0.00
		ha	Contractors camp	n/a	R 12 400.00	R 0.00
		ha	132Kv Eskom transmission line	n/a	R 12 400.00	R 0.00
8.2	Place 375 mm topsoil for revegetation purposes	ha	Laydown area	n/a	R 133 500.00	R 0.00
		ha	Business partners camp	n/a	R 133 500.00	R 0.00
		ha	Contractors camp	n/a	R 133 500.00	R 0.00
		ha	132Kv Eskom transmission line	n/a	R 133 500.00	R 0.00
8.3	Establishment of vegetation	ha	Laydown area	n/a	R 63 000.00	R 0.00
		ha	Business partners camp	n/a	R 63 000.00	R 0.00
		ha	Contractors camp	n/a	R 63 000.00	R 0.00
		ha	132Kv Eskom transmission line	n/a	R 63 000.00	R 0.00
					Subtotal 8	**R 0.00**
					(Rehabilitation of Support Infrastructure)	
9. Subtotal for Decommissioning and Rehabilitation Works						
9.1					**Subtotal 9**	**R 156 789 336.00**
					(Sum of Subtotals 1 to 8)	
10. Time, Fee, Monitoring and Maintenance Costs						
10.1	Contractor P&G's, site establishment and demobilisation			6 % of Subtotal 9		R 9 407 360.00
10.2	Detail design fees, procurement etc.			3 % of Subtotal 9		R 4 703 680.00
10.3	Project management and site supervision fees			2 % of Subtotal 9		R 3 135 787.00
10.4	Post closure water quality monitoring			Sum		R 4 718 400.00
10.5	Post closure cover stability/LFA monitoring			Sum		R 1 260 000.00
10.6	Post closure vegetation cover monitoring			Sum		R 1 200 000.00
10.7	Post closure management of monitoring and maintenance			Sum		R 4 500 000.00
					Subtotal 10	**R 28 925 227.00**
					(Time, Fee, Monitoring and Maintenance Costs)	

11. Contingency			
11.1	Contingency	10 % of Subtotal 9 & 10	R 18 571 456.00
		Subtotal 11 (Contingency)	**R 18 571 456.00**
12. Grand Totals			
12.1		**Grand Total (excl. VAT) (Subtotal 9 to 11)**	**R 204 286 019.00**

AFRICAN OFFICES

South Africa

CAPE TOWN
T: +27 21 461 1118

JOHANNESBURG
T: +27 11 467 0945

Namibia

WINDHOEK
T: + 264 61 231 287