

**Appendix 1: Final Rehabilitation, decommissioning and mine
closure plan
Including Environmental Risk Assessment**

**Gertruida Johanna Burden
Plot 2100 Concordia**

Reference NC30/5/1/3/2/10939MP

Contents

1	Introduction	2
1.1	The annual rehabilitation plans	2
1.2	Final rehabilitation, decommissioning and mine closure plan	2
1.3	Environmental risk assessment report.....	3
1.4	Issues that have guided the development of the plan	3
2	Context of the Mining operation.....	4
2.1	Mining Permit	4
2.2	Project Description.....	4
2.2.1	Mine design maps	4
2.2.2	Project layout	4
3	Regulatory Requirements	5
3.1	Environmental Authorisation (EMPr) requirements	5
4	Basic rehabilitation methodology	7
4.1	Rehabilitation of Mining area	8
4.2	Aftercare and Maintenance	9
5	Risk Assessment.....	9
5.1	Risk Identification.....	9
5.2	Mitigation and Closure objectives.....	10
5.2.1	Create a safe and healthy post-mining environment.....	10
5.2.2	Create a stable, free draining post mining landform, productive land use that achieves a land capability equal or better than pre-mining.....	11
5.2.3	Providing optimal post-mining social opportunities	12
6	Estimated cost for requirements to fully decommission the site.....	13
6.1	Assesment of financial provision	13
6.2	Quantified Closure elements	13
6.3	Calculation of Closure cost	14
7	The Public Participation Process	14
7.1	Principles and Objectives	14
7.2	Stakeholder Identification and Project Data Base	15
8	Way Forward	16

1 INTRODUCTION

This document serves to comply with regulation 6 of the NEMA Financial Regulations (2015) that states that an applicant must determine the financial provision through a detailed itemisation of all activities and costs, calculated based on the actual costs of implementation of the measures required for—

- (a) annual rehabilitation, as reflected in an annual rehabilitation plan;
- (b) final rehabilitation, decommissioning and closure of the prospecting, exploration, mining or production operations at the end of the life of operations, as reflected in a final rehabilitation, decommissioning and mine closure plan; and
- (c) remediation of latent or residual environmental impacts which may become known in the future, as reflected in an environmental risk assessment report.

1.1 The annual rehabilitation plans

The annual rehabilitation plan provide for concurrent or progressive rehabilitation and contain information that defines activities on an annual basis and how these relate to the Final closure vision, as detailed in this final rehabilitation, decommissioning and mine closure plan.

The objective of the annual rehabilitation plan is to—

- review concurrent rehabilitation and remediation activities already implemented;
- establish rehabilitation and remediation goals and outcomes for the forthcoming 12 months, which contribute to the gradual achievement of the post-mining land use, closure vision and objectives identified in the holder's final rehabilitation, decommissioning and mine closure plan;
- establish a plan, schedule and budget for rehabilitation for the forthcoming 12 months;
- identify and address shortcomings experienced in the preceding 12 months of rehabilitation; and
- evaluate and update the cost of rehabilitation for the 12 month period and for closure, for purposes of supplementing the financial provision guarantee or other financial provision instrument.

Taking into account the objective of the annual rehabilitation plan it is clear that it cannot form part of the environmental management programme to be submitted in terms of section 24N of the Act and the Environmental Impact Assessment Regulations, 2014 but will be submitted on an annual basis as part of the environmental audit report in terms of Regulation 34 (1)(b) of the NEMA EIA Regulations (2014).

1.2 Final rehabilitation, decommissioning and mine closure plan

According to the NEMA Financial Regulations the final rehabilitation, decommissioning and mine closure plan will form a component of the environmental management programme to be submitted in terms of section 24N of the Act and the Environmental Impact Assessment Regulations, 2014 and will be subjected to the same requirements of the environmental management programme with regards opportunities for stakeholder review and comment as well as auditing.

The objectives of this final rehabilitation, decommissioning and mine closure plan is to identify a post-mining land use that is feasible through-

- providing the vision (goals), objectives, targets and criteria for final rehabilitation, decommissioning and closure of the project;
- outlining the design principles for closure;
- explaining the risk assessment approach and outcomes and link closure activities to risk rehabilitation;

- detailing the closure actions that clearly indicate the measures that will be taken to mitigate and/or manage identified risks and describes the nature of residual risks that will need to be monitored and managed post closure;
- committing to a schedule, budget, roles and responsibilities for final rehabilitation, decommissioning and closure of each relevant activity or item of infrastructure;
- identifying knowledge gaps and how these will be addressed and filled;
- detailing the full closure costs for the life of project at increasing levels of accuracy as the project develops and approaches closure in line with the final land use proposed; and
- outlining monitoring, auditing and reporting requirements.

1.3 Environmental risk assessment report

According to the NEMA Financial Regulations the environmental risk assessment report will also form a component of the environmental management programme to be submitted in terms of section 24N of the Act and the Environmental Impact Assessment Regulations, 2014 and will be subjected to the same requirements of the environmental management programme with regards opportunities for stakeholder review and comment as well as auditing.

The objective of the environmental risk assessment report is to—

- ensure timeous risk reduction through appropriate interventions;
- identify and quantify the potential latent environmental risks related to post closure;
- detail the approach to managing the risks;
- quantify the potential liabilities associated with the management of the risks; and
- outline monitoring, auditing and reporting requirements.

1.4 Issues that have guided the development of the plan

Three approaches were employed to identify the key aims for the closure process:

- Technical assessments which involved the recording of the project activities over the full life cycle of the mining operation (including closure) and the consequent potential impacts on the environment (including cumulative impacts). This resulted in the compilation of a draft closure plan that facilitated discussions with the authorities as well as Interested and Affected Parties (I&APs).
- Identification and consultation with the relevant authorities to record their requirements as well as public meetings with I&APs to solicit/record their suggestions/issues/concerns.
- The collection of available/published environmental data, the review thereof for adequacy and hence the identification of the need for more comprehensive environmental studies/investigations and/or further information gathering.

As a result of the consultation and recommendations from the basic assessment report and EMPr completed the company identified three key closure goals for the final closure of the prospecting operation that are listed below.

- To create a safe and healthy post-mining environment with no residual environmental impact.
- To create a stable, free draining post mining landform, which is compatible with the surrounding landscape and which is capable of a productive land use that achieves a land capability equal to that of pre-mining conditions
- To provide optimal post-mining social opportunities

Each goal is supported by a suite of key objectives and activities which are elaborated on in section 3 of this report. This report also describes how these objectives are planned to be met and elaborate on the implementation of certain risk mitigation actions (section 5). With risk assessment and mitigation being integral to the planning and executing of the rehabilitation and closure of the mine. Aftercare and maintenance of rehabilitated sites is often the difference

between the ultimate successes or failure of rehabilitation and monitoring of rehabilitation will determine whether rehabilitation objectives and requirements are being achieved.

This report fulfils the requirements of both the Final Rehabilitation, Decommissioning and Mine Closure Plan and the Environmental Risk Assessment Report required in terms of the NEMA (Act 107 of 1998) regulations and applicable MPRDA (Act No. 28 of 2002) regulations.

Several pieces of legislation are applicable to mine closure. Importantly, public participation is an integral part of mine closure and the process followed needs to fulfil the requirements of all relevant legislation. The following government departments have been identified amongst others as playing a key role in the closure process:

- Department of Minerals Resources (DMR). Lead agent, facilitator of closure inspections and issues the closure certificate,
- Department of Water and Sanitation (DWAS). Lead agent for potential water related issues and signs off on the mine closure certificate. Cancellation of Water Use license.
- Provincial Department of Environment and Nature Conservation. Gives input into the closure plan and guides and monitors protection of the natural environment.

The local municipality and district municipality. Gives input into the mine closure plan and interfacing thereof with their integrated development plan (IDP) of the local area.

2 CONTEXT OF THE MINING OPERATION

2.1 Mining Permit

The mining area is situated over a 5Ha portion of the Remainder of Plot 2100 Concordia. The operation is situated in the Nama Khoi local authority of the Namakwaland administrative district of the Northern Cape.

The area is situated of the N14 Main Road 11Km West of Concordia via a Farm Road.

The property is registered in the name of Nama Khoi Local Municipality by virtue of Title deed T56485/2016CTN filed in the Kimberley Deeds Office. LPI Code C05300020000210000000. Refer to the layout plans in the BAR that shows the properties and co-ordinates with access routes.

2.2 Project Description

2.2.1 Mine design maps

Mining will be in the form of a simple process that only include loading and hauling of river sand from a sand quarry.

There are existing roads that provide access off the N14 to the mining area. Farm tracks along the ephemeral drainage line provide access to the sections being mined.

No water or electricity is used in the mining operation. No permanent infrastructure will be developed and existing farm tracks are used as haul roads and no new roads will be developed.

2.2.2 Project layout

Construction Phase

Due to the small scale of operations no permanent infrastructure will be developed and only existing farm tracks will be used. Upgrading of the existing tracks will be done as part of the construction phase. No buildings and infrastructure will be required as the operation will be run from the company headquarters where all logistics will be available.

Development of infrastructure and logistics

- **Access and service roads**

Access to the mine workings is via the N14 main road and existing farm tracks. The existing farm tracks will be used as haul roads and will only be upgraded to facilitate haul trucks.

- Water supply
No process water is used in the mining process.
- Electrical supply
No electricity is used on the mining area.
- Logistics
No infrastructure will be required due to the simple mining method and only limited waste management facilities will be supplied consisting of the following:
 - Domestic waste to be collected in plastic containers and transported daily to the company headquarters.
 - A temporary storage area for used lubrication products and other hazardous chemicals needs to be provided for the collection of the small volume of waste before it is removed to the company headquarters.
 - Only one 200-litre container is needed for the small amount of waste.
- Maintenance Oil/grease/diesel management systems will consist of the following:
 - Service Bay/Parking area with drip trays for stationary equipment to be provided outside the drainage channel.

Operational Phase

This operation will only involve the loading and hauling of raw river sand and no processing will take place. The only surface disturbance that will take place, except for the mining excavation within the ephemeral drainage line, is a small stockpile area and service bay (parking) for equipment outside the ephemeral drainage line. During operations mining will only consist of loading and hauling of river sand. Only temporary product stockpiles will be developed as sand will be transported to the applicant's headquarters for stockpiling and distribution as it is loaded.

The total footprint will be 5 hectares and sand will be removed over the total area. Backfilling is not an option as the sand is completely removed as it is washed in from upstream. All material consisting mainly of river sand is removed from the ephemeral drainage line to a depth of 2m and sold as a Free on Truck (FoT) product. No processing is taking place except for limited stockpiling so no mining waste or overburden and Fine Residue Deposits (FRD) will be created.

Only minor repairs are done on site. A PVC lining and drip trays are used during maintenance and accidental spills are cleaned up immediately by removing of the contaminated sand. The small volume of contaminated sand is sold with the rest of the sand to be used in the building industry. Equipment used in the mining process is transported to the company headquarters for major repairs. The trucks will transport sand from the site 6 days a week, operating between 7h00 and 18h00. No operations will take place on Sundays or during the builder's break at year end.

As part of the operational phase training of personnel in the implementation of the EA will be undertaken and the implementation of the environmental awareness plan as part of the BAR will be an ongoing process.

Decommissioning and Closure Phase

The decommissioning and closure phase at the end of the life of the mine will consist of implementing this Final Rehabilitation, Decommissioning and Closure Plan.

3 REGULATORY REQUIREMENTS

3.1 Environmental Authorisation (EMPr) requirements

The requirement as per the approved Environmental Authorisation (EA) is that after mining, the site must be rehabilitated to its original land use, small stock farming (grazing). The key closure objective is to leave the site in as safe and self-sustaining a condition as possible and in a situation where no post-closure intervention is required to ensure that the rehabilitation

measures prove successful. The aim is to ensure a stable environment that will not be detrimental to the safety and health of humans and animals and that will not pollute the environment or lead to the degradation thereof.

This key closure objective is divided in three closure objectives as stated below.

- Objective 1 - To create a safe and healthy post-mining environment.
 - Safe mining area (no potentially dangerous areas like deep excavations or securely fenced off)
 - Limit the depth of the excavation to a maximum of 2m deep.
 - Maintaining the affected environment in a stable condition that will not be detrimental to the safety and health of humans and animals.
 - Promote re-vegetation of bank with natural riparian vegetation.
 - Minimise risk of erosion from either increased base flow or mining operations followed by prompt rehabilitation and maintenance of erosion events.
 - Limited residual environmental impact (No surface and/or groundwater contamination, waste management practices not creating or leaving legacies with a landscape that reduces the requirement for long term monitoring and management)
 - No waste in the form of dumps or structures will remain on surface after mine closure
 - No development of infrastructure and services will take place and facilities at the company headquarters will be used.
 - Unwanted steel, sheet metal and equipment need to be removed from the mining area on a daily basis and no salvage yard will be established.
 - No temporary storage area for used lubrication products and other hazardous chemicals will be developed and waste must be disposed of at a collection point at the company headquarters on a daily basis.
 - Existing farm roads must be used for mining operations.
 - Equipment used in the mining process will be adequately maintained in the workshops available at the company headquarters so that during operations it does not spill oil, diesel, fuel, or hydraulic fluid.
 - Accidental petro-chemical spills if any must be cleaned up immediately by removing the spillage together with the polluted soil and by disposing of them together with the mined sand.
- Objective 2 - To create a stable, free draining post mining landform, which is compatible with the surrounding landscape and which is capable of a productive land use that achieves a land capability equal to that of pre-mining conditions
 - Preventing attenuating or diverting any of the natural flow.
 - Remove sand to the demarcated stockpile area with no stockpiling within the drainage channel
 - Maintaining river-bank stability to be able to withstand high flow conditions.
 - Prevent canalisation of the flow that can lead to scouring or erosion.
 - Levelling of the river bed to prevent impeding and damming upstream.
 - Topsoil must be removed from virgin areas to be disturbed and vegetation cleared, keeping disturbance to the native vegetation to an absolute minimum.
 - Any topsoil removed from stockpile area must be stored separately for later reuse.
 - Topsoil borrowing from the virgin areas to cover disturbed areas will not take place.
 - All topsoil which is removed prior to any activity will be stockpiled in berms (no higher than 2m) along with its resident seed bank and vegetation cover to an area above the proposed development.
 - This berm will then serve a storm water control function in the unlikely event of surface water run-off.

- Movement of vehicles will be restricted to demarcated areas so as to keep the footprint of the mining operation to the absolute minimum.
- Movement of equipment must be restricted to existing roads and no ad hoc driving or turning outside demarcated loading and hauling areas will be allowed.
- All equipment and other items used during the mining operation needs to be removed from the site at final closure.
- All compacted areas due to stockpiling, loading and hauling will be ripped with erosion control measures.
- All stockpiles and leftover product must be removed or used to backfill the excavations
- Minimise the loss of land with agricultural potential: minimize footprint of disturbances to facilitate recovery of degrading patches into active patches through colonization of the patch by dispersing species (patch dynamics)
- Minimising footprint of disturbed areas including stockpile platforms and loading and hauling areas.
- Minimise loss of vegetation within the disturbance footprint: scarifying of all compacted areas as soon as possible for natural plant succession.
- Minimise disturbance of ecology due to loss of habitat and noise/visual/dust
- Objective 3 – To provide optimal post-mining social opportunities
 - Optimised benefits for the social environment
 - Maintain positive and transparent relationships with stakeholders and maintaining communication channels.
 - Provide stakeholders including government authorities with relevant information as per legislative requirements.
 - Undertaking environmental management in accordance with the approved EMP and Closure Plan.
 - Minimise noise disturbance: limiting earth moving to day time.
 - Management of air emissions to minimise nuisance effects or health risk; implementation and maintenance of dust monitoring programs accompanied by dust suppression activities by spraying water and/or dust-allaying agents.
 - Prevent long term changes in land use: revert back to grazing land where possible.
 - Minimal negative aesthetic impact
 - Minimise visual disturbance: implementation of mitigating measures from the public road views.
 - Waste material of any description, including receptacles, scrap, rubble and tyres, must be removed entirely from the mining area and disposed of at a recognised landfill facility. It will not be buried or burned on the site.

4 BASIC REHABILITATION METHODOLOGY

Concurrent or progressive rehabilitation is good practice and has advantages for the company as it reduces its overall financial exposure. Concurrent rehabilitation and remediation are provided for in the annual rehabilitation plan and contain information that defines activities on an annual basis and how these relate to the Final closure vision, as detailed in this final rehabilitation, decommissioning and mine closure plan.

Annual reviews in terms of regulations 6(a) and 11(1)(a) of the NEMA Financial Regulations, that form part of the Annual Environmental Audit, assesses what closure objectives and criteria are being achieved through the implementation of the plan.

Areas that are not covered during concurrent rehabilitation as described in the Annual rehabilitation plan that require specific intervention as part of this final rehabilitation, decommissioning and mine closure plan are discussed below.

4.1 Rehabilitation of Mining area

The post closure objective is to restore the land where active mining has taken place to its pre-mining carrying capacity for stock farming taking into account the absence of vegetation within the ephemeral drainage line and as all sand will be removed re-vegetation of the disturbed areas is not an option. Although the post mining land use will be grazing the landform will be an active ephemeral drainage line. The main closure objective therefore is to leave the site in as safe and self-sustaining a condition as possible and in a situation where no post-closure intervention is required. The aim is to ensure that the affected environment is maintained in a stable condition that will not be detrimental to the safety and health of humans and animals and that will not pollute the environment or lead to the degradation thereof. The aesthetic value of the area will also be reinstated. Access control and fencing will be maintained until a closure certificate is issued by the DMR

The basic rehabilitation methodology will therefore only include reinstating the original profile of the ephemeral drainage line and ensuring the hydrological integrity of the ephemeral drainage line. This will be achieved by leaving the bed of the drainage line even, and in a natural state containing no foreign debris or other materials. All scrap and other foreign materials will be removed from the area and disposed of as in the case of other refuse, whether these accrue directly from the mining operation or are brought on to the site. The access points to the drainage line needs to be filled in with erosion control measures at final decommissioning.

Post mining topography will follow the original landform shape. Sand mining do not produce any overburden or waste rock and no residue deposits will be created.

The compacted movement areas will be screened for petrochemical spills and cleaned before it is ripped and leveled.

Infrastructure area

The main **post closure objective** for the infrastructure area is to leave the site in as safe and self-sustaining a condition as possible and in a situation where no post-closure intervention is required. The aim is to ensure that the affected environment is maintained in a stable condition that will not be detrimental to the safety and health of humans and animals and that will not pollute the environment or lead to the degradation thereof. The aesthetic value of the area will also be reinstated. Access control and fencing will be maintained until a closure certificate is issued by the DMR

The **basic rehabilitation methodology** for the infrastructure area and associated buildings and services will involve the identification of the infrastructure required by the landowner. The general approach adopted is to reuse all infrastructures and equipment either at another location by the company or at the same location for farming activities. The majority of the infrastructure in and around the infrastructure area will remain as part of farm improvement. Redundant structures, buildings and civil foundations (down to one meter below surface for subsurface infrastructure) will be removed for use elsewhere or demolished and discarded. All steel structures and reinforcing will be discarded or sold as scrap. Building rubble will be removed to the waste disposal site of the local authority due to the absence of excavations in the mining process. The compacted lay down and movement areas will remain as part of the farmstead but the area will be screened for petrochemical spills and cleaned. The demarcation fences will remain as a boundary for the farmstead and the fenced area will not be restored to grazing as per agreement with the landowner.

All redundant water pipes, pumps, power lines and cable, at the residential area and associated raw water supply not to remain for use by the landowner will be removed. Service roads needs to be maintained and handed over to the landowner in a good state of repair and all redundant fences needs to be removed and gates repaired.

All temporary waste storage areas need to be cleaned out and removed. Waste material of any description, including receptacles, scrap, rubble and tyres, will be removed entirely from the complete mining area and disposed of at a recognised landfill facility. It will not be buried or burned on the site.

4.2 Aftercare and Maintenance

Maintenance of rehabilitated sites is often the difference between the ultimate successes or failure of rehabilitation and monitoring of rehabilitation will determine whether rehabilitation objectives and requirements are being achieved.

As the final phase in the project cycle, decommissioning may present positive environmental opportunities associated with the return of the land for alternative use and the cessation of impacts associated with operational activities. However, depending on the nature of the operational activity, the need to manage risks and potential residual impacts may remain well after operations have ceased. Examples of potential residual impacts and risks include erosion, slow recovery of vegetation, stock that has been abandoned (e.g., oil drums, scrap equipment) and old (unserviceable) structures.

The main closure objective is to hand back the rehabilitated properties to the respective landowners in a state that is fit for grazing, as close as possible to the original carrying capacity and to ensure that the affected environment is maintained in a stable condition that will not be detrimental to the safety and health of humans and animals and that will not pollute the environment or lead to the degradation thereof. The rehabilitation strategy is based on reinstating the original profile of the landscape and prepare the area for natural re-vegetation. The aim therefore is to leave the site in as safe and self-sustaining a condition as possible and in a situation where no post-closure intervention is required. Due to the specific nature of the mining operation no aftercare and maintenance were identified except for monitoring of erosion event over a period of 2 years.

5 RISK ASSESSMENT

Identified risk with their potential impacts are assessed in terms of: nature (character status); extent (spatial scale); duration (time scale); probability (likelihood) of occurring; reversibility of the impact; the degree to which the impact may cause irreplaceable loss of resources; the significance (size or magnitude scale) prior to mitigation; the degree to which the impact can be mitigated; and, the significance (size or magnitude scale) after mitigation as per the criteria provided in the Environmental Authorisation (EA).

The impact rating and mitigation actions of each risk are also addressed in the in the Environmental Authorisation (EA).

Any unforeseen risks and related impacts with their associated mitigating actions will be included as part of this Final Rehabilitation, decommissioning and mine closure plan during the annual environmental assessment and reviews.

5.1 Risk Identification

Potential risks associated with Soil (contamination, erosion, compaction) & Land capability (viable and sustainable land)

Potential risks associated with Change in topography

Potential Risks associated with Biodiversity, Flora & Fauna

Potential Risks associated with Aquatic biodiversity & Water Resources

Potential Risks associated with visual intrusion, noise, vibration, light pollution and air emissions.

Potential Risks associated with the socio-economic environment.

Potential Risks associated with regard archaeological, cultural heritage or paleontological sites

5.2 Mitigation and Closure objectives

Internationally, there seem to be three schools of thought:

- “What the affected community wants, the affected community gets” – that is, the key focus is on providing the end product requested by the affected communities, rather than focusing on the previous status quo of the receiving environment
- “Restoration of previous land use capability” – the original thought process in the South African context, because mining often occurs on land with high agricultural potential
- “No net loss of biodiversity” – the focal point in the ICMM/IUCN dialogue sponsored guidelines for mining and biodiversity, and of many mining corporate policies.

The thought process for the closure of this operation is based on the last two. In addition to the goals and objectives for final decommissioning and mine closure the vision for the post closure land form is to leave the site in as safe and self-sustaining a condition as possible and in a situation where no post-closure intervention is required. The vision is to ensure that the affected environment is maintained in a stable condition that will not be detrimental to the safety and health of humans and animals and that will not pollute the environment or lead to the degradation thereof and that the aesthetic value of the area will be reinstated. The closure process involves a series of actions, executed over a number of years as indicated in the annual rehabilitation plans, with continual monitoring, review and remedial actions (if required). Identified and assessed risks feed into mitigation actions (or primary tasks) of which successful implementation result in achievement of the mine closure goals and objectives.

Financial provision is made in section 6 to deal with these mitigating measures in case of temporary closure or sudden closure during the normal operation of the project or at final planned closure.

5.2.1 Create a safe and healthy post-mining environment

The only mitigating measure that needs to be implemented to create a safe post mining landscape without the requirement for long term monitoring and management is to profile and level the disturbed areas and restore the original profile of the ephemeral drainage line as discussed as part of mitigating measures for a stable, free draining post mining landform. No topsoil is available for replacement in the drainage line and re-vegetation is not an option.

As the infrastructure will remain post closure as part of farm improvement no mitigating measures are needed to create a safe post mining environment. No unsafe areas are present within the infrastructure area.

Regular inspections and audits will be used as management system to ensure compliance. At the time of final decommissioning there will be no significant risks and no significant risks will remain post decommissioning and closure.

Documentation and monitoring results will be provided as objective evidence of achieving the objective of minimum legacies as listed in Table 1. The criteria with the contents of these documents must comply with are also given in this table.

Table 1: Objective evidence and closure criteria

Closure objective	Document scope	Author	Success criteria (standard)
Slope stability	Inspection of the post-mining areas with the objective to identify unstable areas and formation of erosion gully's	Independent EAP	Post-mining area declared stable by DMR mine health and safety

No negative effect on surface water flow and waste management practices do not leave/create legacies	Inspection of the post-mining surface area with the objective to identify erosion and scouring due to flood event and storm water and sheet flow	Independent EAP	Post-mining area declared stable by DMR
	Assessment of the completeness of removal of mine waste	Independent EAP	Final performance assessment report declares 100% removal of waste and equipment
Secured potentially Dangerous post-mining sites	Inspection of the post-mining surface area with the objective to identify unsafe areas	Independent EAP	Post-mining area declared safe by DMR
Viable Small stock production	Report on the monitoring results with regard to succession tempo of total cover in comparison with virgin vegetation adjacent to mining area	Independent EAP	Total cover and species composition are comparable to that of the adjacent virgin area
Sustainable production of grazing	Monitoring results of erosion on steep slopes (20% gradient) and disturbed areas	Independent EAP	At the time of closure, soil loss has stabilised over the whole previously disturbed area
Limited environmental impacts during demolition activities	Summary of all complaints received during demolition activities and follow up actions	Mine SHE Head, audited by independent EAP	Nuisance levels consistently on par with legislative standards after completion of demolition activities. All incidents older than 90 days investigated and feedback given to complainant

5.2.2 Create a stable, free draining post mining landform, productive land use that achieves a land capability equal or better than pre-mining

To prevent significant negative effects arising from changes in post-mining surface water quantities, the post-mining topography will be adjusted where possible to minimise the effect on water flow and increase potential for re-vegetation.

Should the attenuation measures for prevention of pollution be implemented, the effect on surface water will be insignificant. The most important of these is that any oil or fuel leaks caused during operations must be removed immediately with the saturated soil and placed in bags or drums for disposal at a suitable site.

There will be no risk for acid mine drainage or poor-quality leachates emanating from the mine or residue deposits. Furthermore, no product stockpile will remain on site. It is important to note that for the mine to meet the key objective of economically viable and sustainable grazing, it is imperative that its other key objectives, viz. a safe post-mining area with limited residual impacts and optimal post-mining social opportunities are met.

At the time of final decommissioning there will be a risk regarding the viability and sustainability of agriculture on the rehabilitated areas. Successful rehabilitation will only be proven over time once results from a few consecutive vegetation surveys are available. The risk of possible changes in the surface water quantities and flow patterns leading to erosion on the rehabilitated areas will also remain. When more information becomes available during the post-mining period, appropriate actions will be taken if proved necessary.

The documentation which will be submitted as objective evidence of the state of the above risks at the time of closure is listed in Table 2. With the contents of these documents showing compliance with the closure criteria - also listed in Table 2 - it will be accepted that the mine has achieved the objective of economically viable and sustainable small stock agriculture.

Table 2 Objective evidence and closure criteria for economically viable and sustainable small stock agriculture

Closure objective	Document scope	Author	Success criteria (standard)
Topography compatible with original landform	Inspection of the post-mining surface area with the objective to identify stability compatible with virgin vegetation adjacent to disturbed patches	Independent EAP	Topography and landscape comparable to that of the adjacent virgin area
Stable post mining landform	Inspection of the post-mining surface area with the objective to identify erosion on steep slopes (20% gradient) and disturbed patches,	Independent EAP	At the time of closure, soil loss through water erosion has stabilised over the whole previously disturbed areas
No negative effect on surface water flow	Inspection of the post-mining surface area with the objective to identify erosion due to storm water and sheet flow	Independent EAP	Post-mining area declared stable by DMR
No negative effect on surface water quality	Assessment of the completeness of removal of mine waste	Independent EAP	Final performance audit report declares 100% removal of waste and equipment.

5.2.3 Providing optimal post-mining social opportunities

The impact of mine closure is limited and is not expected to alter the socio-economic circumstances of the study area significantly, however those losing employment will experience significant impacts. Due to the nature of the project no post closure intervention will however be needed. Business which could potentially be exposed to this risk will be identified and action plans to reduce such exposure will be implemented. Contract durations with service providers will be limited to address the risk of contractual agreements surpassing the mine closure date. Minimal negative aesthetic impact will be achieved by the implementation of the tasks required to limit residual environmental impact. Regarding risks associated with the objective of optimum post-mining social activities, at the time an application for a closure certificate is lodged, there will be no significant risks

The documentation which will be submitted as objective evidence and the closure criteria against which the contents of these documents will be measured are summarised in Table 3. Achieving these criteria will be evidence of achieving the objective of optimum post-mining social opportunities.

Table 3 Objective evidence and closure criteria for optimum post-mining social opportunities

Closure objective	Document scope	Author	Success criteria (standard)
Optimal opportunities for social environment (incl. employees)	Assessment on implementation of commitments with third parties	ECO	Report verifies implementation of social responsibilities according to approved EA
Limited environmental impacts during demolition activities	Summary of all complaints received during demolition activities and follow up actions	ECO, audited by independent EAP	Nuisance levels on par with legislative standards after completion of demolition activities. All incidents older than 90 days investigated and feedback given to complainant
Minimal negative aesthetic impact	Inspection and photographic evidence of state of repair of infrastructure to be left.	Independent EAP	Remaining infrastructure and areas with minimal negative aesthetic impact.

6 ESTIMATED COST FOR REQUIREMENTS TO FULLY DECOMMISSION THE SITE

6.1 Assessment of financial provision

According to regulation 6 of the NEMA Financial Regulations 2015 an applicant must determine the financial provision through a detailed itemisation of all activities and costs, calculated based on the actual costs of implementation of the measures required for— (a) annual rehabilitation, as reflected in an annual rehabilitation plan; (b) final rehabilitation, decommissioning and closure of the prospecting, exploration, mining or production operations at the end of the life of operations, as reflected in a final rehabilitation, decommissioning and mine closure plan; and (c) remediation of latent or residual environmental impacts which may become known in the future, including the pumping and treatment of polluted or extraneous water, as reflected in an environmental risk assessment report.

In terms of regulation 11(2) the holder of a right or permit must, on completion of the actions contemplated in subregulation (1), ensure that the adequacy of the financial provision is assessed and any adjustments that need to be made to the financial provision are identified within one year of the commencement of the operations authorised in the right or permit.

6.2 Quantified Closure elements

Due to the unconventional mining process (no rock is broken or waste generated) the rehabilitation procedures required are very different from any conventional form of mining. No remediation of latent or residual environmental impacts which may become known in the future were identified at this stage. Financial provision in terms of reg. 6(c) are covered by the requirements for the actual costs of implementation of the measures required for final rehabilitation, decommissioning and closure of the mining operations at the end of the life of operations as reflected in this final rehabilitation, decommissioning and mine closure plan in terms of reg. 6(b).

The closure elements within the existing mining area were identified captured and quantified in the sections below. For each closure element, various possible combinations of required rehabilitation work were identified and costs were calculated for each of these, based on quotations obtained from independent third-party suppliers for earthmoving equipment rental and various other consumables. Rates used are from the Contractors Plant Hire Association.

Earth Moving Equipment	Rental Rate /hour	Fuel Cost	Total Cost /hour
Front End Loader - 30 Ton	R687.00	R495.00	R1 182.00
Excavator - 45 Ton	R687.00	R495.00	R1 182.00
Excavator - 30 Ton	R392.00	R330.00	R722.00
Excavator - 20 Ton	R322.00	R270.00	R592.00
Cat 14 H Grader	R453.00	R270.00	R723.00
Articulated Dump Truck - 30 Ton	R392.00	R210.00	R602.00
Tipper Truck 6m ³	R255.00	R180.00	R435.00
Tipper Truck 10m ³	R309.00	R210.00	R519.00
Ferric Chloride 43% /Kg	R5.47		
Manual Labour /hour	R45.00		

Cost Factor	Closure Element	Cost calculation				
		Cost/h	Service hours	Labour	Total	
1	Remove waste from temporary storage and scrap from salvage yard screen for petrochemical spills and clean					
	Tipper Truck 10m ³ transport to waste disposal site	R519.00	8.00	0	R4 152.00	
	Treat petrochemical spills and clean out oil trap	R2 000.00	1.00	R0.00	R2 000.00	
	Cleanup	R45.00	8.00	2	R720.00	
	Total per facility				R6 872.00	
2	Remove 20cm of contaminated soil cover and dispose	Minutes	Load m³	m³/h	R/h	R/m²
	Excavator cycle 30 Ton	0.5	1.2	144.0	R722.00	R5.01
	Dump Truck cycle (30 ton ADT)	9.0	17.0	113.3	R602.00	R5.31
		Total cost/m³				R10.33
	Total cost/m²				R2.07	
3	Levelling of the river bed to prevent impeding and damming upstream	m²/h		Cost/h	R/m²	R/Ha
	Excavator - 20 Ton	120		1182.00	R9.85	R11 642.70
4	Reinstate topography of access points to drainage channel	m²/h		Cost/h	R/m²	R/Ha
	Excavator - 20 Ton	120		592.00	R4.93	R2 920.53
		Total cost/Ha				R2 920.53
	Total cost/m²				R0.29	
5	Level and rip compacted areas	Speed m/h	Rip width (m)	m²/hour	R/m²	R/Ha
	Grader 140 K	4000.0	3.5	14000.0	R0.05	R516.43
		Total cost/Ha				R516.43
	Total cost/m²				R0.05	
6	Cleanup - remove all mining related waste walk through with ECO	Cost/h	Service hours	Labour	R/Ha	
	Tipper Truck 10m ³ transport to waste disposal site	R519.00	8.00	0	R4 152.00	
	Cleanup	R45.00	8.00	2	R720.00	
		Total cost/Ha				R4 872.00

6.3 Calculation of Closure cost

Cost Factor	Closure Element Mitigating measures	Unit	No Units	Unit Cost	Cost per Element
1	Remove waste from temporary storage and scrap from salvage yard screen for petrochemical spills and clean		1	R6 872.00	R6 872.00
2	Remove 20cm of contaminated soil cover and dispose	Part of annual rehab plan			
3	Levelling of the river bed to prevent impeding and damming upstream, preventing attenuating or diverting any of the natural flow	Ha	1	R11 642.70	R11 642.70
4	Reinstate original profile of the riverbank by back filling of access point with the original material excavated	Ha	1	R2 920.53	R2 920.53
4	Maintaining river-bank stability, prompt rehabilitation and maintenance of erosion events	Part of annual rehab plan			
5	Promote re-vegetation of bank with natural riparian vegetation (ripping & levelling)	Ha	1	R516.43	R516.43
5	Compacted area - Stockpile and hauling area (ripping & levelling)	Ha	2	R516.43	R1 032.86
6	Final clean-up - remove all product stockpiles and mining related waste walk through with ECO	Ha	5	R4 872.00	R24 360.00
Total financial provision required to fully decommission and rehabilitate the mining operation					R47 344.52

7 THE PUBLIC PARTICIPATION PROCESS

7.1 Principles and Objectives

The Public Participation Process (PPP) was designed to fulfil the requirements of several pieces of legislation applicable to mine closure. It forms an integral component of the mine closure process by affording Interested and Affected Parties (I&AP) the opportunity to identify environmental issues and concerns relating to the proposed closure, which they feel should be addressed. This is consistent with the provisions of the National Environmental Management Act (Act No. 107 of 1998), Section 2(4)(f), which states that "the participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured".

The objective of the sand mining operation public consultation process is to inform key stakeholders, I&APs and the general public about mine closure objectives and activities during the life of the mine. The PPP was designed to provide sufficient and accessible information to I&APs in an objective manner to assist them to:

- Identify issues of concern, and provide suggestions for enhanced benefits and alternatives associated with mine closure,
- Identify risks not yet identified during the risk assessment exercise,
- Identify risks associated with mine closure and rehabilitation,
- Contribute local knowledge and experience,
- Verify that their issues have been considered.
- Comment on the Risk Assessment and Mine Closure Plan at the time of final decommissioning of the project, including the significance of potential risks that have been identified and associated impacts,
- Play an oversight role in the monitoring and evaluation of mine closure. Play an oversight role in the monitoring and evaluation of mine closure.

7.2 Stakeholder Identification and Project Data Base

Existing data bases were used to inform the list of stakeholders. Special consideration was given to ensure that organizations and individuals that had expressed interest in the activities of the operation, and those who are potentially affected by mine closure, were included on the data base. The following are principles which governed the PPP:

- Key stakeholder groups and the general public comprised the target audience in the development of the PPP.
- Providing information to lay people to allow them to contribute to and participate meaningfully in the process.
- Stakeholder participation is most effective when the proponent and the practitioner recognise, acknowledge and validate stakeholder values when designing a PPP (i.e., there should be no underestimation of the technical and professional competence of citizens).
- The recognition that in the current political climate of South Africa, consultation, empowerment and capacity building is particularly important.

The process of involving stakeholders had three main objectives:

- Steps should be taken to ensure that stakeholder input into the project is relevant and representative.
- Stakeholders should be made aware of their objectives and role in the process,
- An efficient communication and feedback mechanism should be developed during the process to ensure that all stakeholders are kept informed of progress.

Stakeholders were drawn from the sectors outlined below:

- National (DWAS, DMR), Provincial (DENC, DALR) and Local Government (Local and District Municipalities)
- Industry (commercial farmers)
- Corporations and businesses (service providers to operation)
- Operations staff

The operation set up a database of I&APs using existing project databases as a starting point. Names of persons and organisations will be added to or deleted from the database where appropriate.

8 WAY FORWARD

This final Rehabilitation, Decommissioning and Mine Closure Plan will be reviewed on an annual basis to align such approved financial provision set out in regulations 9 and 11, of the NEMA Financial Regulations. Concurrent rehabilitation and remediation will be provided for in the annual rehabilitation plan and will contain information that defines activities on an annual basis and how these relate to the closure vision, as detailed in this final rehabilitation, decommissioning and mine closure plan.

When final planned closure is applied for the operation will submit a final environmental performance audit report to DMR as lead agent for final perusal with the objective to issue a closure certificate. At that point, the closure process, and associated public participation program, will close.