FINANCIAL PROVISION FOR THE PROSPECTING ACTIVITIES ON FARM BOERDRAAI 228, KURUMAN ROAD, NORTHERN CAPE PROVINCE

Boerdraai 228

Prepared for: Khwara Manganese (Pty) Ltd

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EXECUTIVE SUMMARY

INTRODUCTION

Khwara Manganese (Pty) Ltd ("Khwara") proposes to conduct prospecting activities for Iron Ore and Manganese in respect of the Farm Boerdraai 228, Kuruman RD, near Black Rock, in the Joe Morolong Local Municipality, located in the John Taolo Gaetsewe District Municipality, Northern Cape Province. The prospecting activities will include non-invasive and invasive activities. Non-invasive activities will comprise analysing existing core, ground penetrating radar and hand held ground magnetic mapping. Invasive activities would comprise drilling of four exploration boreholes. The property is 27km North West of Hotazel.

SLR Consulting (South Africa) (Pty) Ltd (SLR), an independent firm of environmental assessment practitioners (EAP's), has been appointed by Khwara to manage the environmental authorisation processes.

CLOSURE PLAN OBJECTIVES

The closure plan objectives and principles for the proposed project include the following:

- That environmental damage is minimised to the extent that it is acceptable to all parties involved;
- That contamination beyond the project area site by surface run-off, groundwater movement and wind will be prevented;
- That prospecting right closure is achieved efficiently, cost effectively, and in compliance with the law;
- That the social and economic impacts resulting from prospecting right closure are managed in such a way that negative socio-economic impacts are minimised; and
- That the land is rehabilitated to achieve an end use of livestock grazing and game farming to the extent reasonably possible.

LEGAL FRAMEWORK

A financial provision has been prepared for the project. This financial provision has been prepared in accordance with GNR 1147 of the National Environmental Management Act (107/1998): Regulations pertaining to the financial provision for prospecting, exploration, mining or production operations, were published on 20 November 2015 (Financial Provisioning Regulations, 2015). The table below details the requirements of GNR 1147 and also the relevant sections in the report where these requirements are addressed.

In accordance with GNR 1147, third party independent contractor rates have been used to calculate the financial closure liability. The third party independent contractor rates used for the determination of the financial closure liability are derived from SLR's own database of rates. This database is considered to be a national average of rates for South African prospecting and mining operations, since the rates have been obtained from various sources throughout the country, mainly in the gold, platinum, coal and base metal 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.

GNR 1147 – Appendix 3, 4 and 5		Relevant section in the report
Annual Rehabilitation Report (Appendix 3)		
3(a)-(g)	Content of report	Section 2
Closure Plan (Appendix 4)		
3(a)	Details of the specialists	Section 2
3(b)(i)	Material information	Section 3.1
3(b)(ii)	Environmental and social context	Section 3.2

GNR 1147 – Appendix 3, 4 and 5		Relevant section in the report
3(b)(iii)	Stakeholder issues and comments	Section 3.3
3(b)(iv)	Mining plan and schedule	Section 4**Error! Reference source not found.**
3(c)(i)	Risk assessment methodology	Section 5.1
3(c)(ii)	Identification of indicators	Section 5.3
3(c)(iii)	Strategies to manage/mitigate risks	Section 5.2
3(c)(iv)	Reassessment of risks	Section 5.4
3(c)(v)	Changes to risk assessment results	n/a – no changes deemed necessary
3(d)(i)	Legal and governance framework	Section 6.1
3(d)(ii)	Closure vision and objectives	Section 6.2
3(d)(iii)	Evaluation of alternatives	Section 6.3
3(d)(iv)	Motivation for closure option	Section 6.4
3(d)(v)	Motivation for closure period	Section 6.5
3(d)(vi)	Details of ongoing research	Section 6.6
3(d)(vii)	Assumptions made for closure	Section 6.7
3(e)(i)	Post-mining land use	Section 7
3(e)(ii)	Map of post mining land use	n/a – land to be returned to pre-disturbance state
3(f)(i)	Specific technical solutions	Section 8
3(f)(ii)	Threats and uncertainties	Section 8
3(g)(i)&(iii)	Schedule of actions	Section 9
3(g)(ii)	Assumptions and drivers	Sections 6.7
3(h)(i)-(iii)	Organisational capacity and structure	Section 10
3(i)	Indication of gaps	Section 11
3(j)	Relinquishment criteria	Section 12
3(k)(i)	Closure cost estimate & accuracy	Section 13
3(k)(ii)	Closure cost estimate methodology	Section 13.2
3(k)(iii)	Annual updates	Section 13.3
3(l)(i)-(iii)	Monitoring, auditing and reporting	Section 15
3(m)	Amendments to the closure plan	n/a – no amendments deemed necessary
Environmental Risk Assessment (Appendix 5)		
(a)	Details of the specialists	Section 2
(b)(i)	Risk assessment methodology	Section 5.1
(b)(ii)	Latent risk substantiation	Section 5.5
(b)(iii)	Risk drivers	Section 5.3
(b)(iv)	Expected timeframe	n/a – no latent risks identified
(b)(v)	Risk triggers	n/a – no latent risks identified

GNR 1147 – Appendix 3, 4 and 5		Relevant section in the report
(b)(vi)	Risk assessment results	Section 5.2
(b)(vii)	Changes to risk assessment results	Section 5.4
(c)(i)	Monitoring to inform management	Section 15
(c)(ii)-(iv)	Alternative mitigation measures following impacts	n/a – no changes to risk identified
(d)(i)-(iii)	Cost estimation and accuracy	Section 13
(e)	Monitoring, auditing and reporting	Section 15

FINANCIAL PROVISION

The closure cost calculation for the prospecting activities amounts to **R 55 579.62 (inclusive of VAT).**

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1. INTRODUCTION

Khwara Manganese (Pty) Ltd (Khwara) proposes to conduct prospecting activities for Iron Ore and Manganese in respect of the Farm Boerdraai 228 near Black Rock in the Joe Morolong Local Municipality, located in the John Taolo Gaetsewe District Municipality, Northern Cape Province.

The prospecting activities will include non-invasive and invasive activities. Non-invasive activities will comprise analysing existing core, ground penetrating radar, and hand held ground magnetic mapping. Invasive activities will comprise drilling of four exploration boreholes. The property is 27 km North West of Hotazel.

Prior to the commencement of prospecting activities on the Farm Boerdraai 228, the following authorisations will be required:

- An environmental authorisation from the Department of Mineral Resources (DMR) in terms of the National Environmental Management Act (NEMA) (No. 107 of 1998). The Environmental Impact Assessment (EIA) Regulations being followed are Government Notice Regulation (GNR) 982 of 4 December 2014, as amended. Listed activities in terms of Listing Notice 1 GNR 983 will be triggered as part of the proposed project and as such a Basic Assessment (BA) Process will be followed.
- A prospecting right from the DMR in terms of Section 16 of the Mineral, Petroleum and Resources Development Act (MPRDA) (No. 28 of 2002).

SLR Consulting (South Africa) (Pty) Ltd (SLR), an independent firm of environmental consultants, has been appointed by Khwara to manage the environmental assessment process.

2. SPECIALIST INPUT

2.1 SPECIALISTS THAT PREPARED THE FINANCIAL PROVISION

The details of the persons who prepared this financial provision report are provided in Table 2-1 below.

Table 2-1: Details of the people who prepared this report

Details	Environmental Assessment Practitioner and Author	Professional Engineer and Reviewer	Environmental Assessment Practitioner and Reviewer
Company:	SLR	SLR	SLR
Name:	Caitlin Hird	Steve van Niekerk	Edward Perry
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Fax No.:	011 467 0978	011 467 0978	011 467 0978
E-mail:	chird@slrconsulting.com	svanniekerk@slrconsulting.com	eperry@slrconsulting.com

2.2 EXPERTISE OF THE SPECIALISTS

Ed Perry is the Operations Manager for the Environmental Management Planning and Approvals (EMPA) Team in SLR. He has a BSC. (Hons) in Environmental Science and an MSc. in Freshwater Biology. Ed has over 20 years of experience in environmental consultancy working for a range of public and private clients. Ed has successfully undertaken numerous environmental authorisation applications in South Africa and is a registered Lead Auditor with the International Cyanide Management Institute for audits of gold mines.

Caitlin Hird holds a Hons in Geography and Environmental Management Science and has 9 years of relevant experience.

Stephen van Niekerk is a manager at SLR, holds a MSc Engineering degree, has over 20 years of relevant experience and is registered as a Professional Engineer (#20010256) with the Engineering Council of South Africa (ECSA).

Copies of the specialist's curriculum vitae are attached in Appendix A.

2.3 DECLARATION OF INDEPENDENCE

Caitlin Hird, Steve van Niekerk and Edward Perry hereby declare that we are independent consultants, who have no interest or personal gains in this proposed project whatsoever, except receiving fair payment for rendering an independent professional service.

3. CONTEXT OF THE PROJECT

3.1 MATERIAL INFORMATION

This financial provision has been prepared in accordance with GNR 1147 of the National Environmental Management Act (107/1998): *Regulations pertaining to the financial provision for prospecting, exploration, mining or production operations*, published on 20 November 2015 (Financial Provisioning Regulations, 2015).

Khwara Manganese (Pty) Ltd (Khwara) proposes to conduct prospecting activities for Iron Ore and Manganese in respect of the Farm Boerdraai 228 near Black Rock in the Joe Morolong Local Municipality, located in the John Taolo Gaetsewe District Municipality, Northern Cape Province.

The prospecting activities will include non-invasive and invasive activities. Non-invasive activities will comprise analysing existing core, ground penetrating radar and hand held ground magnetic mapping. Invasive activities will comprise drilling of four exploration boreholes.

Prior to the commencement of prospecting activities, Khwara requires an environmental authorisation from the DMR in terms of NEMA, as well as a prospecting right from the DMR in terms of Section 16 of the MPRDA.

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N

2/704 50/703 1/710 1/709 75/703

Kuruman

20/704 709 Kuf3 709

704/20 42/703

49/703 Eersbegint 703/43

Mollers Ville 703/49 43/703

22/704 741

704 Afguns

1/741

234 233 228

Mecca 233 Boerdraai 228

R380

2/227 3/226 224

Harefield 232 Bergheim 229 Wessels 227

235 232 229

Dibiaghomo 226

RE/226

1/226

4/226

260 231 230

Elizabethville 231 Santoy 230

2/230 RE/227 2/266

Wessels Mine

1/227 1/268

5/267

Dikgathlong 268

261 262 263 264

Black Rock 1/264

-20000 -10000

Legend

- Proposed Project Area
- Main Roads
- Secondary Roads
- Power Line
- Rivers and Streams
- 20m Contour Lines
- Farm Boundaries
- Farm Portions

0 1 2 Kilometers

Scale: 1 : 63 360 @ A3

Projection: Transverse Mercator

Datum: Hartebeeshoek, Lo23

KWHARA MANGANESE (PTY) LTD

Figure 1

Local Setting

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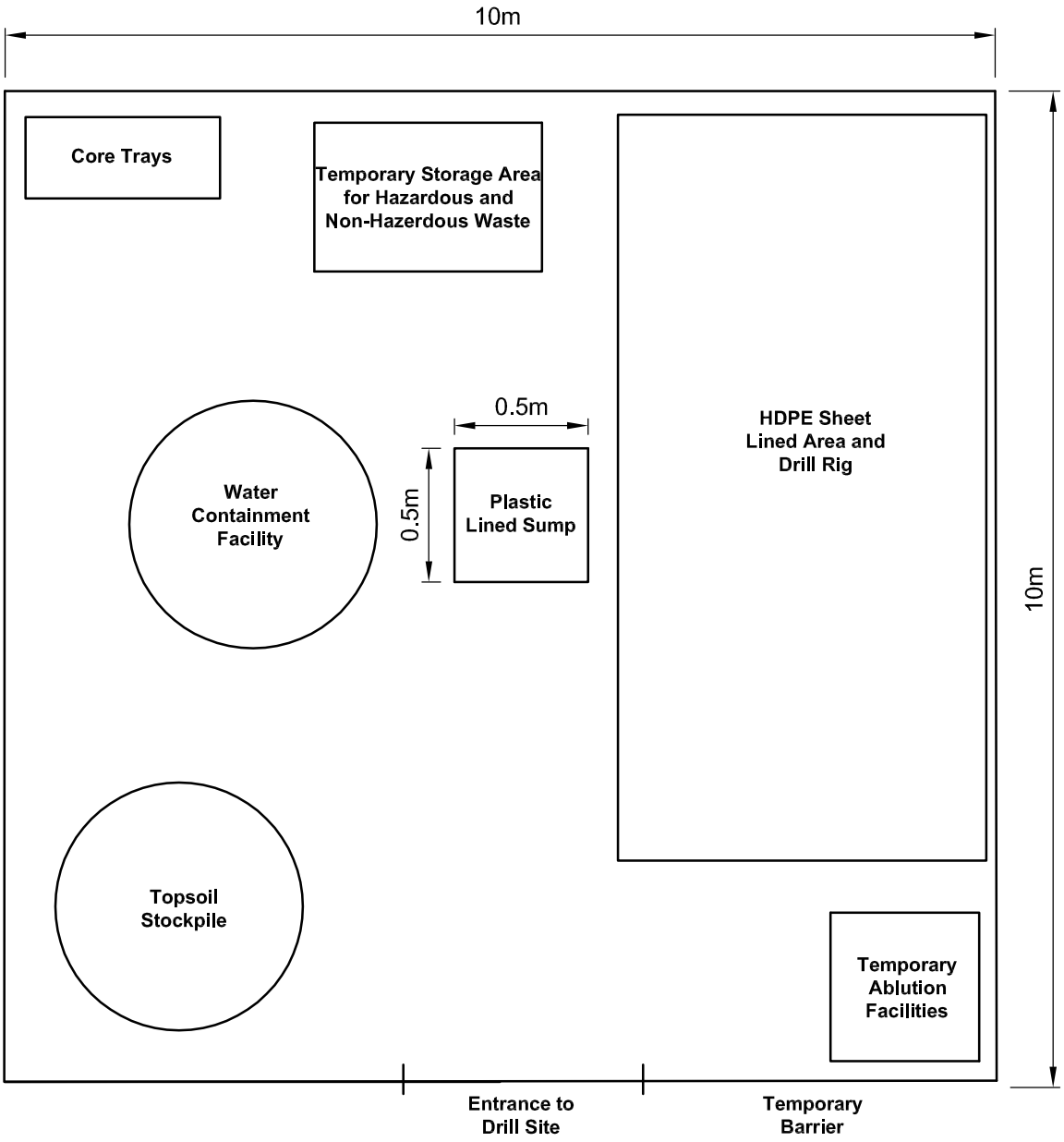

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CONCEPTUAL LAYOUT OF A DRILLING SITE

11/20019

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FIGURE 2

3.2 ENVIRONMENTAL AND SOCIO-ECONOMIC OVERVIEW

The information in this section provides a summary of the environmental and socio-economic baseline situation that is likely to be influenced by the proposed project. Information in this section was sourced from the Basic Assessment Report (BAR) compiled for the proposed project (SLR, December 2019).

Table 3-1: Overview of environmental and socio-economic baseline situation

Aspect	Overview
Topography	The proposed project area is relatively flat and slopes gently north east towards the Kuruman River. The elevation of the prospecting right area ranges between 1 009 and 1 046 meters above mean sea level (mamsl). The proposed access road junction with the R380 lies at 1 008 mamsl.
Climate	The project area falls within the Northern Steppe climatic zone, which is a semi-arid region characterised by erratic rainfall, high evaporation levels, hot summers and cold winters. The annual rainfall is less than 400mm per annum. The prevailing wind direction in the project area is in a north easterly direction with significant winds also blowing from the south east. The strongest winds are in excess of 7 m/s primarily during the autumn. During the summer, autumn and winter months, winds from the north-easterly sector dominates
Soils and land capability and land use	The proposed project area is comprised of structureless, deep (>1 200 mm), sandy, red and yellow soils of the Hutton and Clovelly forms. Soils in the proposed project area have a low cultivation potential due to the high infiltration rates associated with sandy soils. Due to the fine sandy nature of the soil forms and the low clay content and limited organic matter, the soils are highly erodible, particularly where vegetation is removed. The Hutton and Clovelly soil forms are classified as having a grazing land capability in terms of the Soil, Climate and Water Land Capability Classification System for South Africa (Schoeman et al, 2000).
Biodiversity	The proposed project area falls within the Kathu Bushveld and the Southern Kalahari Mekgacha. The Kathu Bushveld is characterised by open savannah with *Vachellia erioloba* (Camel Thorn) and *Boscia albitrunca* (Shepherd's Tree) as the prominent trees. Tall *Vachellia erioloba* trees can form a dominant belt along the Kuruman river. *Vachellia erioloba* are protected in terms of the National Forests Act of 1998. The Kuruman River flows across the northern eastern corner boundary of the proposed project area site. According to the National Freshwater Ecosystem Priority Area (NFEPA) Database the Kuruman River is considered to be in a largely natural condition (River Condition and Present Ecological Sate Class B). The north eastern boundary of the project area falls within a Critical Biodiversity Area1 (CBA1). The extent of this area follows the path of the Kuruman River. The majority of the remaining project site falls within an ecological support area and other natural areas. A CBA1 area is deemed an irreplaceable site and the most important areas for conservation. According to the biodiversity land management plan, these areas should be maintained in their natural state. An area in the north eastern portion of the project area along the Kuruman River is considered to be of Highest Biodiversity Importance according to the Mining and Biodiversity Guidelines. A highest biodiversity importance areas has the highest risk for

Aspect	Overview
	mining, mining is not legally prohibited in these areas, but where there is a very high risk that due to their potential biodiversity significance and importance to ecosystem services (e.g. water flow regulation and water provisioning) that mining projects will be significantly constrained or may not receive necessary authorisations.
Surface water	The proposed project area is located in quaternary catchment D41M which has a gross total catchment area of 13 780 km^2. The Kuruman River is located along the north-eastern boundary of the proposed project area. Due to the ephemeral nature of the river there is no third party reliance of surface water.
Groundwater	The project area is underlain by a shallow unconfined Kalahari Aquifer and the deeper fractured Hotazel Aquifer. Groundwater levels range from 20 to 70 m below ground level (mbgl). Groundwater quality results show elevated concentrations of electrical conductivity, total dissolved solids, chloride, fluoride, nitrate, manganese, and selenium when compared to the South African National Standards 241 of 2015. Localised groundwater flow within and around the project area shows a dominant groundwater flow in a north-westerly direction with slight localised groundwater flow towards the Kuruman River.
Air quality	The surrounding ambient air quality has been influenced by neighbouring mines, household fuel combustion and vehicle tailpipe emissions. Potential receptors include the homes of farmers and farm workers in the broader area.
Noise aspects	The greater area is generally defined by rural features and is not subjected to elevated noise levels. Noise levels in the project area are mainly as a result of surrounding farming activities, localised traffic and mining operations.
Visual aspects	The proposed project area is located within the flat open plains of the Kalahari. The site is rural in nature however the existing surrounding mining operations located to the south of the proposed project area have already affected the sense of place and natural visual character of the area.
Heritage	Heritage resources in the proposed project area include Stone Age site, a grave and a historical farmhouse. The palaeontological sensitivity of the site is low.
Socio-economic	The town of Black Rock is located approximately 2.5km south of the proposed project area. The educational levels in the area are relatively low with a high level of unemployment and a dependency on subsistence agriculture, the public sector, seasonal workers and employment in the mining sector. Water provision and sanitation remains a challenge, mostly in the rural areas. There has been an increase in the number of households that were provided with electricity as a source of energy in the area. Mining and government services are the main economic sectors.

3.3 STAKEHOLDER ISSUES AND COMMENTS

As part of the Basic Assessment process a public participation process is being undertaken for the proposed project. To date, no comments around rehabilitation and closure objectives have been raised. This Financial Provision report has been prepared in support of the Basic Assessment process for the proposed project. The BAR together with this report will be made available for public review. This report will be updated to include any closure related comments and concerns raised during the public review period.

4. PROSPECTING PLAN AND SCHEDULE

Information in this section was sourced from the BAR (SLR, December 2019) for the proposed project. A summary of the key project components is provided in the section below. For further detail refer to Section 3 of the BAR for the proposed project.

4.1 OVERVIEW OF PROSPECTING ACTIVITIES

The prospecting project will include invasive and non-invasive activities. Non-invasive activities comprise usage of ground penetrating radar to provide some detail of the geological structures.

Once the non-invasive activities have been completed, the location of the prospecting boreholes can be sited and the invasive activities can be undertaken. The following facilities and activities are required at each of the prospecting drill sites:

- Temporary ablution facilities for contractors;
- The establishment of a temporary access track;
- Plastic lined sumps;
- Temporary storage of hazardous and non-hazardous waste;
- HDPE sheet lined area and dill rig; and
- The demarcation of the prospecting site.

4.2 DECOMISSIONING AND REHABILIATION OF DISTURBED AREAS

4.2.1 Active phase

Decommissioning and rehabilitation will take place immediately after exploration work at each drill site has been completed. This usually takes a period of a week at the most. Decommissioning and rehabilitation activities at each drill site will include the following steps:

- Capping and sealing of boreholes;
- Removal of any drilling equipment, chemicals, and waste;
- Removal and filling of sumps; and
- Ripping of compacted soils (at drill sites and access tracks) to allow for re-vegetation of the site.

4.2.2 Passive phase – Aftercare and maintenance

Typically, a period of aftercare and maintenance is applied to each rehabilitated drill site to ensure closure objectives are being met. Given the nature of the prospecting activities, a 2 to 3 year period of maintenance and aftercare is usually applied. For the drill sites, the aftercare and maintenance activities should include the monitoring of erosion and vegetation establishment, and control and eradication of alien invasive plants.

4.2.3 Life of project

At this stage it is envisaged that a total of four prospecting boreholes will be drilled using diamond core drilling methods. Drilling will be done over a period of two years i.e. two boreholes drilled per year.

4.2.4 Areas of disturbance

For each drill site it is anticipated that a 10 x 10 m area will be disturbed. In addition each drill site will require the development of a temporary access road. The access roads will comprise two tyre tracks (each track approximately 0.5 m wide) and the roads will be approximately 50 m long. The total disturbance footprint per drill site, including temporary access track will therefore be approximately 150 m^2.

Assuming a disturbance footprint of 150 m^2 per drill site, the total disturbance footprint for four drill sites will be approximately 600 m^2.

5. ENVIRONMENTAL RISK ASSESSMENT

5.1 RISK ASSESSMENT METHODOLOGY

The methodology applied to assess the significance of risks is provided in the table below.

Table 5-1: Impact Assessment Methodology

Note: Part A provides the definition for determining impact consequence (combining intensity, spatial scale and duration) and impact significance (the overall rating of the impact). Impact consequence and significance are determined from Part B ***and C. The interpretation of the impact significance is given in Part D.***

PART A: DEFINITIONS AND CRITERIA*		
Definition of SIGNIFICANCE		**Significance = consequence x probability**
Definition of CONSEQUENCE		**Consequence is a function of intensity, spatial extent and duration**
Criteria for ranking of the Y of environmental impacts	**VH**	Severe change, disturbance or degradation. Associated with severe consequences. May result in severe illness, injury or death. Targets, limits and thresholds of concern continually exceeded. Substantial intervention will be required. Vigorous/widespread community mobilization against project can be expected. May result in legal action if impact occurs.
	H	Prominent change, disturbance or degradation. Associated with real and substantial consequences. May result in illness or injury. Targets, limits and thresholds of concern regularly exceeded. Will definitely require intervention. Threats of community action. Regular complaints can be expected when the impact takes place.
	M	Moderate change, disturbance or discomfort. Associated with real but not substantial consequences. Targets, limits and thresholds of concern may occasionally be exceeded. Likely to require some intervention. Occasional complaints can be expected.
	L	Minor (Slight) change, disturbance or nuisance. Associated with minor consequences or deterioration. Targets, limits and thresholds of concern rarely exceeded. Require only minor interventions or clean-up actions. Sporadic complaints could be expected.
	VL	Negligible change, disturbance or nuisance. Associated with very minor consequences or deterioration. Targets, limits and thresholds of concern never exceeded. No interventions or clean-up actions required. No complaints anticipated.
	VL+	Negligible change or improvement. Almost no benefits. Change not measurable/will remain in the current range.
	L+	Minor change or improvement. Minor benefits. Change not measurable/will remain in the current range. Few people will experience benefits.
	M+	Moderate change or improvement. Real but not substantial benefits. Will be within or marginally better than the current conditions. Small number of people will experience benefits.
	H+	Prominent change or improvement. Real and substantial benefits. Will be better than current conditions. Many people will experience benefits. General community support.
	VH+	Substantial, large-scale change or improvement. Considerable and widespread benefit. Will be much better than the current conditions. Favourable publicity and/or widespread support expected.
Criteria for ranking the DURATION of impacts	**VL**	Very short, always less than a year. Quickly reversible
	L	Short-term, occurs for more than 1 but less than 5 years. Reversible over time.
	M	Medium-term, 5 to 10 years.
	H	Long term, between 10 and 20 years. (Likely to cease at the end of the operational life of the activity)
	VH	Very long, permanent, +20 years (Irreversible. Beyond closure)
Criteria for ranking the EXTENT of impacts	**VL**	A part of the site/property.
	L	Whole site.
	M	Beyond the site boundary, affecting immediate neighbours
	H	Local area, extending far beyond site boundary.
	VH	Regional/National

PART B: DETERMINING CONSEQUENCE							
			EXTENT				
			A part of the site/property	Whole site	Beyond the site, affecting neighbours	Local area, extending far beyond site.	Regional/ National
			VL	**L**	**M**	**H**	**VH**
INTENSITY = VL							
DURATION	Very long	**VH**	**Low**	**Low**	**Medium**	**Medium**	**High**

	Long term	H	Low	Low	Low	Medium	Medium
	Medium term	M	Very Low	Low	Low	Low	Medium
	Short term	L	Very low	Very Low	Low	Low	Low
	Very short	VL	Very low	Very Low	Very Low	Low	Low
INTENSITY = L							
DURATION	Very long	VH	Medium	Medium	Medium	High	High
	Long term	H	Low	Medium	Medium	Medium	High
	Medium term	M	Low	Low	Medium	Medium	Medium
	Short term	L	Low	Low	Low	Medium	Medium
	Very short	VL	Very low	Low	Low	Low	Medium
INTENSITY = M							
DURATION	Very long	VH	Medium	High	High	High	Very High
	Long term	H	Medium	Medium	Medium	High	High
	Medium term	M	Medium	Medium	Medium	High	High
	Short term	L	Low	Medium	Medium	Medium	High
	Very short	VL	Low	Low	Low	Medium	Medium
INTENSITY = H							
DURATION	Very long	VH	High	High	High	Very High	Very High
	Long term	H	Medium	High	High	High	Very High
	Medium term	M	Medium	Medium	High	High	High
	Short term	L	Medium	Medium	Medium	High	High
	Very short	VL	Low	Medium	Medium	Medium	High
INTENSITY = VH							
DURATION	Very long	VH	High	High	Very High	Very High	Very High
	Long term	H	High	High	High	Very High	Very High
	Medium term	M	Medium	High	High	High	Very High
	Short term	L	Medium	Medium	High	High	High
	Very short	VL	Low	Medium	Medium	High	High

PART C: DETERMINING SIGNIFICANCE							
PROBABILITY (of exposure to impacts)	Definite/ Continuous	VH	Very Low	Low	Medium	High	Very High
	Probable	H	Very Low	Low	Medium	High	Very High
	Possible/ frequent	M	Very Low	Very Low	Low	Medium	High
	Conceivable	L	Insignificant	Very Low	Low	Medium	High
	Unlikely/ improbable	VL	Insignificant	Insignificant	Very Low	Low	Medium
			VL	L	M	H	VH
			CONSEQUENCE				

PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	**Decision guideline**
Very High	Potential fatal flaw unless mitigated to lower significance.
High	It must have an influence on the decision. Substantial mitigation will be required.
Medium	It should have an influence on the decision. Mitigation will be required.
Low	Unlikely that it will have a real influence on the decision. Limited mitigation is likely to be required.
Very Low	It will not have an influence on the decision. Does not require any mitigation
Insignificant	Inconsequential, not requiring any consideration.

* VH = very high, H = high, M= medium, L= low and VL= very low and + denotes a positive impact.

5.2 IDENTIFICATION OF STRATEGIES TO MANAGE AND MITIGATE THE IMPACTS AND RISKS

Impacts and risks identified for the proposed project are included in Table 5-2 below. Strategies to manage and mitigate impacts and risks (Table 5-3) have been identified, taking into account, the findings of existing specialist studies, where relevant, and consideration of the project plan. These management and mitigation

strategies are aimed at controlling the project activities and process which have the potential to result in environmental degradation.

Table 5-2: Impacts and risks identified for the proposed project

Aspect	Potential impact	Impact discussion and reference to mitigation measures	Significance	
			Unmitigated	Mitigated
Soil and land capability	Loss of soil resources and land capability through physical disturbance and contamination	Soils play a key role in rehabilitation of disturbed areas and establishing ecosystem functionality. This in turn supports restoring pre-disturbance land uses. Its disturbance and loss should be prevented wherever this is avoidable. Prospecting activities have the potential to damage soil resources through physical disturbance (removal, erosion, compaction) and contamination. Contamination of soil resources would occur through the use and handling of drilling materials and the presence of equipment and machinery on site leaking or spilling hydrocarbons. Additionally, poor waste management practices could result in soil contamination. This could alter the soil composition, negatively impacting on the chemistry of the soils and affecting the use of the soils as part of site rehabilitation during decommissioning. Although contaminant events are possible, it is expected that the scale and frequency of contaminant events would be relatively low given the control measures that are planned. Where there are quick reaction times and effective remediation measures applied, the duration and probability of potential impacts reduces. Management actions focus on soil conservation and waste management procedures. During the decommissioning and closure phases, management actions as outlined in Table 5-3 will be implemented.	Low	Insignificant
Biodiversity	General and physical disturbance of biodiversity	Prospecting activities have the potential to destroy biodiversity through physical destruction of habitat and related species which are considered to be significant because of their status, and/or the role that they play in the ecosystem. In addition to this, prospecting activities can also directly disturb vegetation, vertebrates and invertebrates. Without mitigation the impact is expected to have a prominent change to biodiversity habitat and functionality, which can have long terms effects given that the project area is associated with protected trees (Camel Thorn and the Grey Camel Thorn) and areas of high biodiversity importance and sensitivity, particularly along the Kuruman River. Prospecting related activities will require the removal of vegetation as part of site preparation activities and the establishment of access tracks. Prospecting activities can also indirectly impact on the survival of individual plants, vertebrates, and	High	Very low

Aspect	Potential impact	Impact discussion and reference to mitigation measures	Significance	
			Unmitigated	Mitigated
		invertebrates. The location of the boreholes has not been determined. The exact location of the boreholes will be decided on once the ground penetrating radar and handheld ground magnetic mapping have been completed. It is however understood that the orebody is anticipated to be towards the north eastern section of the farm Boerdraai 228 near the Kuruman River. Prospecting activities could take place within the Kuruman riverbed. Management actions focus on limiting areas of disturbance, avoiding the removal of protected tree species, controlling vehicle movement and implementation of dust control measures. During the decommissioning and closure phases, management actions as outlined in Table 5-3 will be implemented.		
Surface water	Alteration of drainage patterns reducing contributions to the catchment	The catchment is large but sparsely vegetated and features freely draining soils which indicates that minor rainfall events would infiltrate to groundwater as opposed to generating significant volumes of runoff. Given this and that each drill site would occupy a relatively small footprint and be of a temporary nature, impacts on the quaternary or local catchment are not expected. During the decommissioning and closure phases, management actions as outlined in Table 5-3 will be implemented.	Not applicable to decommissioning and closure phases	Not applicable to decommissioning and closure phases
Surface water	Contamination of surface water resources	Prospecting activities have the potential to contaminate surface water resources. Spills of fuels and lubricants as well as silt runoff and poor waste management could result in contamination of the Kuruman River.. Although the location of the boreholes has not been determined the orebody is anticipated to be towards the north eastern section of the farm Boerdraai 228 near the Kuruman River. Prospecting activities could take place within the Kuruman riverbed. Although contaminant events are possible, it is expected that the scale and frequency of contaminant events would be relatively low given the size of the proposed prospecting activities (provision for the drilling of four boreholes). Given the drainage patterns of the area and the ephemeral nature of the Kuruman River, the potential for contamination of the Kuruman River is unlikely. Management actions focus on soil management measures and rehabilitation. During the decommissioning and closure phases, management actions as outlined in Table 5-3 will be implemented.	Insignificant	Insignificant

Aspect	Potential impact	Impact discussion and reference to mitigation measures	Significance	
			Unmitigated	Mitigated
Groundwater	Reduction of water availability to third parties through groundwater abstraction	Abstraction of groundwater for prospecting activities has the potential to impact on third-party groundwater users. Where water is sourced from boreholes located on the farm Boerdraai 228, this could affect the water supply of the landowner, where large volumes of water are required, However, it is estimated that a relatively small volume of water (approximately 17 000 litres in total for the duration of drilling at each drill site) would be required. The use of this water would be in consultation and agreement with the landowner. Where water cannot be sourced from boreholes located on the farm, water will be sourced from a nearby town such as Black Rock. Management actions focus on obtaining the necessary General Authorisation for the use of borehole water.	Not applicable to decommissioning and closure phases	Not applicable to decommissioning and closure phases
Groundwater	Contamination of groundwater	Prospecting activities present potential sources of water contamination. Leakages of fuel or lubricants from prospecting equipment on site, spillages from the handling of fuel and lubricants, temporary storage of consumables (such as fuels, lubricants) and waste handling and storage (general and hazardous) can result in seepage of contaminants into the groundwater system. Given the nature of prospecting activities, the source of contamination would be temporary; however, the potential contamination could be long-term. Where prospecting takes place near to existing third-party boreholes (used for livestock watering and domestic use), seepage entering the groundwater system could impact on third-party water uses. Only one borehole is known to exist on the farm Boerdraai, near the Boerdraai farm house and Kuruman River. Although contaminant events are possible, it is expected that the scale and frequency of contaminant events would be relatively low given the control measures that are planned. Management actions focus on the implementation of soil management procedures and avoid establishing drill sites close to third party boreholes as far as possible. During the decommissioning and closure phases, management actions as outlined in Table 5-3 will be implemented.	Insignificant	No impact

Aspect	Potential impact	Impact discussion and reference to mitigation measures	Significance	
			Unmitigated	Mitigated
Air quality	Air pollution	Prospecting activities have the potential to contribute to ambient air quality. Site preparation and earthworks could result in air pollution through windblown dust from exposed soils. In addition, vehicle movement along dirt access tracks and the operation of vehicles and machinery (including generator) could result in air pollution from dust and exhaust fumes respectively. The potential for health and nuisance impacts also depends on the wind direction and speed, proximity and sensitivity of receptors and duration of exposure to air pollution sources. Although the location of the drill sites has not been determined the orebody is anticipated to be towards the north eastern section of the farm Boerdraai 228 near the Kuruman River and near to private residences. Any potential impacts are expected to be of a very short duration and limited to the immediate surrounds of the drilling activities or access tracks. Management actions focus on limiting areas of disturbance to what is absolutely necessary, controlling vehicle speed limits and maintaining equipment in good working order. During the decommissioning and closure phases, management actions as outlined in Table 5-3 will be implemented.	Low	Insignificant
Noise	Increase in disturbing noise levels	Prospecting activities have the potential to generate noise through the use of vehicles and machinery and the operation of drill rigs. Prospecting activities will introduce mechanical and vehicle noise sources to an otherwise rural and quiet environment. In the absence of mitigation measures, noise impacts can present a disturbance or be a nuisance to nearby receptors (residence and livestock). Given the relatively small scale of the drilling activities, potential impacts are expected to result in a moderate disturbance or nuisance to nearby receptors. Management actions focus on limiting prospecting activities to day time only and week days, limiting vehicle speed and maintaining vehicles in good working order. During the decommissioning and closure phases, management actions as outlined in Table 5-3 will be implemented.	Low	Very low
Visual	Negative visual views	Prospecting activities have the potential to alter the visual environment and aesthetics of the site. Prospecting activities will present mechanical structures and activities to an otherwise natural farming landscape characterised by the Kuruman River and open views of the bushveld. Mining related structures do occur in the landscape further south of the proposed project area and the R380 traverses the north eastern corner of the proposed project area.	Very low	Insignificant

Aspect	Potential impact	Impact discussion and reference to mitigation measures	Significance	
			Unmitigated	Mitigated
		Given the small scale (provision for four boreholes) of the project, it is not expected that the visual landscape will be materially altered by the proposed project. Management actions focus on limiting the footprint of disturbance, implementing dust control measures and rehabilitation. During the decommissioning and closure phases, management actions as outlined in Table 5-3 will be implemented.		
Heritage/cultural and palaeontological resources	Loss of heritage/cultural and Palaeontological resources	Prospecting related activities have the potential to damage heritage, cultural, and palaeontological resources, if present, either directly or indirectly, and result in the loss of the resource for future generations. Numerous heritage/cultural sites are located on the farm Boerdraai 228 along the Kuruman River. These sites include a combination of Stone Age sites, a grave (and a historical farmhouse. The location of the boreholes has not been determined. The exact location of the boreholes will be decided on once the ground penetrating radar and handheld ground magnetic mapping have been completed. Management actions focus on avoiding heritage/cultural sites. In the event that this is not achievable the necessary permits need to be obtained. It is considered unlikely that any fossils occur in the project area because the rock is too old and volcanic in origin. Management actions focus on chance find procedures. During the decommissioning and closure phases, management actions as outlined in Table 5-3 will be implemented.	Very High (not applicable for palaeontological resources)	Insignificant (not applicable for palaeontological resources)
Socio-economic	Inward migration and economic impact	In the broadest sense, prospecting projects contribute towards a positive economic impact through direct benefits derived from wages and taxes. Given that prospecting forms part of exploration, no profits would be derived from the activities. Indirect benefits would be derived through the procurement of goods and services (albeit limited), and the increased spending power of employees. Positive economic impacts have the potential to improve the livelihoods of people benefiting from the project and contribute to the development and status of a region. Given the relatively small scale and temporary nature of the proposed prospecting activities, and where mitigations measures are applied, negative economic loss associated with existing land uses is not anticipated. Inward migration is not expected as a result of the proposed project and therefore related social ill impacts are not expected. Management actions focus on using local contractors and procurement of local goods and services.	Medium positive	Medium positive

Aspect	Potential impact	Impact discussion and reference to mitigation measures	Significance	
			Unmitigated	Mitigated
		During the decommissioning and closure phases, management actions as outlined in Table 5-3 will be implemented.		
Land use	Change in land use	Prospecting related activities have the potential to affect land uses both within the project area and in the surrounding areas. This can be caused by physical land transformation and through direct or secondary impacts. The farm Boerdraai 228 is utilised for cattle grazing. In addition to this the owner of the farm resides on the property along with farm workers. Prospecting related activities have the potential to impact on land uses within the project area through the following activities: • Presence of infrastructure that could be hazardous to people and animals; • Noise generation from drilling activities; • Generation of dust; • Visual disturbance; • Temporary loss of grazing land for the establishment of the drill sites however, this will be limited in extent; and Land uses surrounding the project area; on adjacent farms include a combination of isolated farmsteads, a guesthouse facility, and cattle grazing. Prospecting related activities have the potential to impact on these land uses because of impacts from noise, dust generation and negative visual views. Management actions focus on compensation for loss of agricultural land, fencing off each drill site for the safety of cattle and third parties, no contractors residing on property, agreement of state of rehabilitation with landowner and consultation of borehole placement with landowner. During the decommissioning and closure phases, management actions as outlined in Table 5-3 will be implemented.	Medium	Insignificant

Table 5-3: Strategies to manage and mitigate impacts and risks

Potential impact	Aspects affected	Phase	Management actions type
Loss of soil resources and land capability through physical disturbance and contamination	Soil and land capability	Decommissioning Closure	• Remedy through rehabilitation • Manage through monitoring
General and physical disturbance of biodiversity	Biodiversity	Decommissioning Closure	• Manage through monitoring • Remedy through rehabilitation
Contamination of surface water	Surface water	Decommissioning Closure	• Manage through soil management measures • Remedy through rehabilitation
Contamination of groundwater resources	Groundwater	Decommissioning Closure	• Management through soil management measures
Air pollution	Air	Decommissioning Closure	• Remedy through rehabilitation • Manage through monitoring
Increase in disturbing noise levels	Noise	Decommissioning Closure	• Remedy through rehabilitation • Manage through monitoring
Negative visual views	Visual	Decommissioning Closure	• Remedy through rehabilitation • Manage through monitoring
Loss of heritage/ cultural resources and palaeontological resources	Heritage/ cultural resources and palaeontological	Decommissioning Closure	• Control through avoidance of grave and historical farmhouse • Control through implementation of 20m buffer zone around stone age sites • Remedy spillages through emergency response procedures
Inward migration and economic impact	Socio-economic	Decommissioning Closure	• Manage through use of local labour where possible • Manage through use of local goods and services
Change in land use	Land use	Decommissioning Closure	• Remedy through rehabilitation • Manage through monitoring

5.3 IDENTIFICATION OF INDICATORS

Vegetative cover can be used as an indicator to facilitate the evaluation of the ongoing environmental impacts and associated risk to closure (risk triggers).

Vegetative cover is highly correlated with all the other major environmental parameters of the area, including erosion, dust, physical stability, chemical stability, soil quality, and hydrology. 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. This is an extremely important indicator because it provides a simple, very effective and relevant measure of the lands' current and future capability.

5.4 REASSESSMENT OF RISKS

Following the completion of decommissioning and rehabilitation i.e. active phase as described in Section 4.2.1, a period of passive monitoring will be undertaken. During this period, Khwara will continually reassess the risks to determine whether, after the implementation of re-vegetation efforts, this has resulted in the successful rehabilitation of the drill sites and related access tracks.

5.5 FINANCIAL PROVISION FOR LATENT ENVIRONMENTAL IMPACTS

The costs associated with the post closure management and monitoring of environmental impacts has been estimated and included in the overall closure cost liability calculations (see Section 13). No specific residual or latent environmental impacts have been costed for at this stage. Additional remediation activities i.e. remediation activities not currently anticipated, and if required will be identified once prospecting activities are underway, through monitoring, environmental audits and/or updated risk assessment.

6. CLOSURE AND DESIGN PRINCIPLES

6.1 LEGAL AND GOVERNANCE FRAMEWORK

This report has been drafted in accordance with the Financial Provisioning Regulations, 2015 (GNR 1147 of 20 November 2015), for inclusion into the BAR for the proposed project.

It is a requirement of the Environmental Impact Assessment Regulations, 2014 (GNR 982 of 4 December 2014) (as amended) that a closure plan must contain the information set out in Appendix 4 of these Regulations (GNR 982), and, where the application for an environmental authorisation is for prospecting, mining, exploration, extraction and primary processing of a mineral or petroleum resource or activities directly related thereto, the closure plan must address the requirements as set in the Financial Provisioning Regulations, 2015 (GNR 1147).

It is a requirement of the Mineral and Petroleum Resources Development Amendment Bill, 2013 (Bill 15 of 2013) that the holder of a prospecting right must make the prescribed financial provision for the rehabilitation and management of any negative environmental impacts due to mining activities.

6.2 VISION, OBJECTIVES AND TARGETS FOR CLOSURE

The vision, objectives, and targets for closure have been developed against local environmental and socio-economic context of the proposed project, as well as, regulatory requirements. No stakeholder issues and concerns have been raised to date.

Stakeholders will continuously be involved in the closure planning process throughout the prospecting operations. Khwara will strive to maintain a good working relationship with stakeholders and the local

communities in which it operates. Agreements and final approval will be sought from authorities as prospecting right closure approaches.

6.2.1 Vision for closure

The overall vision for closure for the project is to minimise the impacts associated with the closure and decommissioning of the prospecting right and to restore the land as close as is practically possible to its pre-prospecting state.

6.2.2 Objectives for closure

The closure plan objectives and principles have been developed for the proposed project against the background of the mine location in the Kuruman region of the Northern Cape, and includes the following:

- That environmental damage is minimised to the extent that it is acceptable to all parties involved;
- That contamination beyond the project area site by surface run-off, groundwater movement, and wind will be prevented;
- That prospecting right closure is achieved efficiently, cost effectively, and in compliance with the law;
- That the social and economic impacts resulting from prospecting right closure are managed in such a way that negative socio-economic impacts are minimised; and
- The land is rehabilitated to achieve an end use of livestock grazing and game farming to the extent reasonably possible.

Additional and more specific closure objectives may be determined in collaboration with local communities and other stakeholders during the public participation phase of the project.

6.2.3 Targets for closure

The closure target outcomes for the project area are therefore assumed to be as follows:

- Achieve chemical, physical, and biological stability for an indefinite, extended time period over disturbed landscapes;
- Protect surrounding surface water, groundwater, soils, and other natural resources from loss of utility value or environmental functioning;
- Limit the rate of emissions to the atmosphere to the extent that degradation of the surrounding areas' land capability or environmental functioning does not occur;
- Maximise visual 'harmony' with the surrounding landscape; and
- Create a final land use that has economic, environmental, and social benefits for future generations.

6.3 ALTERNATIVE CLOSURE OPTION

Given the nature of the project i.e. prospecting operations, no alternative closure and post closure options have been considered.

6.4 MOTIVATION FOR PREFERRED CLOSURE OPTION

The current on site land use within the project area is livestock grazing, game farming, mining, and associated sparsely situated residences. Taking this into account and given the short duration of the project i.e. the four boreholes will be drilled within a period of two years, the preferred closure option for the project is to return the drill sites to their pre-prospecting status i.e. an end use of livestock grazing, game farming, mining and sparsely situated residences.

6.5 MOTIVATION FOR CLOSURE AND POST CLOSURE PERIOD

A 2 to 3 year period for maintenance and aftercare is considered reasonable given that this is time required for revegetation to re-establish provided there is sufficient rainfall to support such re-vegetation.

6.6 ON-GOING RESEARCH FOR PROPOSED CLOSURE OPTIONS

Given the nature of the project i.e. prospecting activities over a period of only two years, no on-going research for closure options is deemed necessary.

6.7 CLOSURE PLAN ASSUMPTIONS

The following assumptions are made for the development of the closure plan at this stage of the proposed project:

- Khwara will follow and adhere to the commitments made in the BAR;
- Khwara will follow the prospecting plan layout to minimise the potential for additional disturbed areas;
- Runoff water quality from rehabilitated areas will be acceptable and will not require any treatment;
- No consideration of the social closure costs has been included in this report;
- No assessment of any socio-economic/shared value/community based programmes being implemented and whether these would continue post-closure of the operation; and
- All costs associated with auditing and reporting are presumed to be covered under the operations expenditure of the prospecting right, and have not been included in this closure plan.

Where necessary, assumptions will be reviewed during the prospecting operations, and any required technical work conducted in order to reduce information gaps and uncertainty prior to prospecting right closure.

7. POST CLOSURE LAND USE

With reference to Section 6.3, post closure land use for the drill sites is livestock grazing and game farming amidst existing mining activities and sparsely situated residences.

8. CLOSURE ACTIONS

Generally accepted good international practice closure methods have been used as the basis for determining the closure cost liability. The closure action is to allow the drill sites to naturally re-vegetate. Further detail is provided below.

8.1 REVEGETATION

Re-vegetation of disturbed areas will be undertaken by replacing topsoil where removed, ripping soil where it has been compacted, and allowing vegetation to naturally re-establish itself.

Assuming that the project area receives its annual average rainfall, it is assumed that vegetation will re-establish itself within a period of 2-3 years i.e. the period of aftercare and maintenance.

8.2 MAINTENANCE AND AFTERCARE

The rehabilitated drill sites will require some form of maintenance and aftercare to ensure closure success. During this period of 2-3 years, activities will include the monitoring of erosion, vegetation establishment, and control and eradication of alien invasive plants.

9. SCHEDULE OF CLOSURE ACTIONS

A 2 to 3 year aftercare and maintenance period has been provided for. Refer to Section 15.2 for further detail.

10. ORGANISATIONAL CAPACITY

The key personnel who will ensure compliance with the EMP commitments are the project's environmental specialists and superintendent. As a minimum, these roles as they relate to the implementation of monitoring programmes and management activities will include the following:

- Minimise the areas of possible disturbance by prospecting activities;
- Monitor erosion;
- Monitor vegetation re-establishment;
- Control and eradication of alien invasive plants;
- Inform and commit to follow the rehabilitation plan;
- Integrate closure planning into the overall prospecting operations;
- Liaise with the relevant structures in terms of the commitments in the Closure Plan;
- Ensure that commitments in the Closure Plan are undertaken and implemented;
- Establish and maintain good working relations with surrounding communities and landowners; and
- Facilitate stakeholder communication, information sharing and grievance mechanism.

11. GAP IDENTIFICATION

Current gaps associated with the closure plan, include the following:

- Exact location of boreholes have not yet been sited;
- Maintenance and aftercare is assumed to be for a period of 2-3 years, however this could be longer under drought circumstances i.e. if the project area does not receive adequate rainfall to support re-vegetation of the drill sites; and
- No allowance has been made for unforeseen disasters such as veld fires, which could delay rehabilitation at the drill sites.

12. RELINQUISHMENT CRITERIA

Relinquishment criteria will be developed in communication with the regulatory authorities and project stakeholders to define specific end points that demonstrate the closure objectives have been met. The key indicator that will facilitate evaluation of closure objectives for the prospecting operations is vegetative cover.

Vegetative cover, is highly correlated with all the other major environmental parameters of the area, including erosion, dust/air quality, physical stability, chemical stability, soil quality, and hydrology. 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 protection of the surrounding environment. This is an extremely important indicator because it provides a simple, very effective, and relevant measure of the lands' current and future capability.

13. CLOSURE COST ESTIMATION

13.1 CLOSURE COST ASSUMPTIONS

The closure plan and cost estimate assumptions are outlined in Section 6.7.

13.2 CLOSURE COST METHODOLOGY

13.2.1 Quantities

The quantities are calculated from the conceptual prospecting site layout plan (Figure 2) and project plan.

13.2.2 Unit rates

In accordance with GNR 1147, 3rd party independent contractor rates have been used to calculate the financial closure liability. The 3rd party independent contractor rates used for the determination of the financial closure liability are derived from SLR's own database of rates*. This database is considered to be a national average of rates for South African mining operations, since the rates have been obtained from various sources throughout the country, mainly in the gold, platinum, coal and base metal 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. The rates used for the financial closure liability calculations are provided in Appendix B.

*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 90% cost accuracy when the remaining life of the operation is 5 years or less, as per GNR 1147.

13.2.3 TIME, FEE AND CONTINGENCY COSTS

The following time, fee and contingency costs have also been included in the closure cost estimate based on SLR's experience with similar projects.

Table 13-1: Time, fee and contingency costs

Description	Quantity and unit
Contingency	10.0%
P&G's	20.0%

13.3 CLOSURE COST CALCULATION

The closure cost calculation for the life of the project amounts to **R 55 579.62 (inclusive of VAT).** The detailed calculations are included in Appendix B.

14. ANNUAL REHABILITATION PLAN

It is assumed that 2 boreholes will be drilled per year. In this regard, the annual rehabilitation plan objectives (according to the Financial Provisioning Regulations, 2015 (GNR 1147)), plan will be to:

- Cap and seal each borehole once it has been completed i.e. capping and sealing of two boreholes per annum;
- Removal of any drilling equipment, chemicals, and waste from each drill site as it is completed i.e. removal from two drill sites per annum;
- Removal and filling of sumps as each borehole is completed i.e. removal and filling of two sumps per annum; and

- Ripping of compacted soils at each drill sites and access track to allow for re-vegetation of the site i.e. ripping of soils at two drill sites and two access tracks per year.

The above activities will take place immediately after exploration work at each drill site has been completed. This usually takes a period of two days at the most.

Typically, a period of aftercare and maintenance is applied to each rehabilitated drill site to ensure closure objectives are being met. The aftercare and maintenance activities will include the monitoring of erosion and vegetation establishment and control and eradication of alien invasive plants. This period of aftercare and maintenance will also form part of the annual rehabilitation plan.

15. MONITORING, AUDITING AND REPORTING

15.1 PRE-CLOSURE MONITORING, AUDITING AND REPORTING

Audit requirements will be specified as per the environmental authorisation.

In accordance with the Financial Provisioning Regulations, 2015 (GNR 1147), financial provision for closure, as well as, unforeseen premature closure will be updated on an annual basis. This update will be carried out by external and independent environmental consultants.

15.2 POST-CLOSURE MONITORING, AUDITING AND REPORTING

Post-closure care and maintenance, auditing and reporting will comprise:

- Post-closure care and maintenance activities for a 2 to 3 year period as outlined below;
- Audit requirements as outlined in the environmental authorisation; and
- The continuation of annual financial provision updates by external and independent environmental consultants until such time as a closure application is applied for.

Table 15-1: Post closure aftercare and maintenance programme

Rehabilitation targets	Method of monitoring	Frequency of monitoring	Aftercare and maintenance period	Actions to be taken if target is not reached
Vegetation cover	Visual biodiversity inspections to ensure that vegetation cover has re-established.	On-going monitoring	Aftercare and maintenance will take place for 2 to 3 years.	If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the soil will need to be analysed and the area be seeded with a seed mix of indigenous species.
Erosion control	Visual inspections to ensure that no erosion is taking place.	On-going monitoring	Aftercare and maintenance will take place for 2 to 3 years.	Erosion management measures and/or mitigation measures to be confirmed through on-going field trials.
Removal of	Visual biodiversity	On-going	Aftercare and	All illegal invader plants and

Rehabilitation targets	Method of monitoring	Frequency of monitoring	Aftercare and maintenance period	Actions to be taken if target is not reached
alien and invasive species	inspections by a qualified person to ensure that alien invasive species have not established	monitoring	maintenance will take place for 2 to 3 years.	weeds shall be dealt with as required in terms of the relevant legislation.

Vegetative cover monitoring is designed to verify that rehabilitated areas are successfully developing a productive, self-sustaining ecosystem, which facilitates the post closure land use. The success of the vegetative cover is an important aspect in rehabilitation because of its impact on other parameters such as the extent of soil development, soil chemistry, and surface erosion by water and wind.

The major potential concerns with vegetative cover on rehabilitated areas are related to the adequacy of ground cover, the overall density of tree/shrub species, and species composition i.e. promoting the growth of indigenous species and limiting the spread of alien invasive species. Vegetative cover monitoring should be done in a manner which evaluates these parameters where appropriate to ensure long term environmental protection and the suitability of rehabilitated areas for post closure land use.

Further detail pertaining to the vegetation monitoring programme is provided below. The success of the monitoring programme will be evaluated taking into account the vegetation cover indicators outlined in Section 12.

15.2.1 Vegetation monitoring schedule

Vegetative cover monitoring will be undertaken during the maintenance and aftercare period. Should vegetative cover monitoring after the first year of the aftercare period on any rehabilitated area indicate, even with average or above average rainfall, the vegetation in that area is not developing in a manner that will lead to achieving vegetative cover success criteria, then necessary remedial measures will be undertaken to enhance vegetative growth in that area to the extent that required standards can be expected to be met.

Achievement of the rehabilitation success criteria for vegetative cover will ensure that a productive, self-sustaining vegetative community has been established which facilitates a sustainable post closure land use.

16. CONCLUSION

Khwara Manganese (Pty) Ltd (Khwara) proposes to conduct prospecting activities for Iron Ore and Manganese in respect of the Farm Boerdraai 228 near Black Rock in the Joe Morolong Local Municipality, located in the John Taolo Gaetsewe District Municipality, Northern Cape Province (Figure 1).

The prospecting activities will include non-invasive and invasive activities. Non-invasive activities will comprise analysing existing core, ground penetrating radar, and hand held ground magnetic mapping. Invasive activities would comprise drilling of four exploration boreholes.

This report provides a closure plan and financial provision for the planned prospecting project. This report has been compiled in accordance with GNR 1147 of the National Environmental Management Act (107/1998):

Regulations pertaining to the financial provision for prospecting, exploration, mining or production operations, published 20 November 2015 (Financial Provisioning Regulations, 2015).

Based on closure costs outlined in this document, the closure cost calculation amounts to R 55 579.62 (inclusive of VAT) and meets the 70% accuracy requirement.

Caitlin Hird
(Report Author)

Steve van Niekerk
(Reviewer/Professional Engineer)

Edward Perry
(Reviewer)

17. REFERENCES

GNR 982 of the National Environmental Management Act (107/1998). Environmental Impact Assessment Regulations, 2014. December 2014.

National Environmental Management Act (107/1998): Regulations pertaining to the financial provision for prospecting, exploration, mining or production operations, published 20 November 2015, GNR 1147.

SLR, Basic Assessment Report and Environmental Management Programme Report for the Prospecting Right Application in respect of Boerdraai Farm, December, 2019.

Statistics South Africa (StatsSA).

Appendix A: Curriculum Vitae

CURRICULUM VITAE

CAITLIN HIRD

ENVIRONMENTAL ASSESSMENT PRACTITIONER

EMPA, South Africa

QUALIFICATIONS

Honours Degree	2010	Honours Degree in Environmental Economics (University of Cape Town)
EGS	2009	Degree in Environmental & Geographical Sciences (EGS) (University of Stellenbosch)

EXPERTISE

- Legal Permitting
- Project Management
- Environmental Impact Assessments for mineral extraction operations and industrial development projects
- Report compilation
- Stakeholder engagement management
- Management of specialists

Caitlin is a Project Manager with SLR and is responsible for SLR's EIA projects throughout Southern Africa. Caitlin has 8 years' experience within the Minerals and Industrial sectors, 4 years of which have been in a management position.

Caitlin has managed and assisted in the management of a range of Environmental Impact Assessment projects for major mineral developments throughout Southern Africa for many of the key operators within the minerals industry. Since 2011 Caitlin has managed 6 full scope Environmental Impact Assessments processes and has assisted in the management of other major Environmental Impact Assessments for minerals extraction operations.

Prior to joining SLR in 2011, Caitlin studied at the University of Stellenbosch after which she completed her Honours in Environmental Management and Economics at the University of Cape Town.

PROJECTS

Key aspects of Caitlin's recent project experience are summarised below.

The environmental permitting process associated with a processing plant for AB InBev & CCBSA, Gauteng, (2018)	Project Manager. Compilation of basic assessment report. The management of the stakeholder engagement process and specialists.
The environmental permitting process associated with amendments to Craton Mining's Omitiomire Copper Mine, Namibia (2018)	Project Manager. Compilation of scoping and environmental impact assessment and environmental management programme amendment report. The management of the stakeholder engagement process and specialists.

The environmental permitting process associated with amendments to the Taung Gold Evander Shaft 6 Mine, Mpumalanga (2018)	Project Manager. Compilation of scoping and environmental impact assessment and environmental management programme amendment reports. The management of the stakeholder engagement process and specialists.
Post-construction Audit for the Taung Gold Evander Shaft 6 Mine, Mpumalanga (2018)	Project Manager. Compilation of audit report.
Prospecting Right Renewal for the Afplats Wolwe-Karee operation, North-West (2018)	Project Manager. Compilation of PR renewal report.
Prospecting EMP Performance Assessment and Financial Provision Update for Marula Platinum's Hackney operation, North-West (2017)	Project Manager. Compilation of EMP performance assessment and closure liablity update.
Prospecting EMP Performance Assessment and Financial Provision Update for Inkosi Platinum's Greater Inkosi Area, North-West (2017)	Project Manager. Compilation of EMP performance assessment and closure liablity update.
Prospecting EMP Performance Assessment and Financial Provision Update for Imbasa Platinum, North-West (2017)	Project Manager. Compilation of EMP performance assessment and closure liablity update.
The environmental permitting process associated with a new ferrochrome smelter for Siyanda Chrome Smelting Company, Limpopo (2014-2017)	Project Manager. Compilation of scoping and environmental impact assessment and environmental management programme reports and WUL. The management of the stakeholder engagement process and specialists.

The environmental permitting process associated with a new mining right, mining right amendment and WUL for Kudumane Manganese Resources, Northern Cape (2013-2017)	Project Manager. Compilation of scoping and environmental impact assessment and environmental management programme reports and WUL. The management of the stakeholder engagement process and specialists.
The environmental permitting process associated with the proposed Coza (Jenkins Section) Mine, Northern Cape (2016)	Project Manager. Compilation of scoping and environmental impact assessment and environmental management programme reports. The management of the stakeholder engagement process and specialists.
The environmental permitting process associated with a Section 102 Consolidation at Shanduka Colliery, Kwazulu-Natal (2014-2015)	Project Manager. Compilation of scoping and environmental impact assessment and environmental management programme reports. The management of the stakeholder engagement process and specialists
The environmental permitting process associated with a Section 102 amendment for Keaton Mining, Mpumalanga (2014)	Project assistant. Assistance with the stakeholder engagement process.
The environmental permitting process associated with an EIA/EMP Amendment at Hernic Ferrochrome, North-West (2012-2013)	Project assistant. Assistance with the compilation of the environmental impact assessment and environmental management programme report. Assistance with the stakeholder engagement process.
The environmental permitting process associated with a Prospecting EMP Amendment at Inkosi Platinum, North-West (2012)	Project manager. Compilation of Prospecting EMP amendment report. Assistance with stakeholder engagement.
The environmental permitting process associated with a Fluorspar Bulk Sampling EMP Amendment for SA Fluorite, North-West (2012)	Project manager. Compilation of bulk sampling EMP amendment report. Assistance with stakeholder engagement.

The environmental permitting process associated with the expansion of the Shaft 16 Waste Rock Dump and new Pit8C for Impala Platinum, North-West (2012)	Project Manager. Compilation of scoping and environmental impact assessment and environmental management programme reports. The management of the stakeholder engagement process and specialists.
The environmental permitting process associated with a Section 102 amendment at Hernic Ferrochrome, North-West (2011)	Project assistant. Assistance with the compilation of the environmental impact assessment and environmental management programme report. Assistance with the stakeholder engagement process.
The environmental permitting process associated with a mining right application for Leeuw Mining and Exploration, Kwazulu-Natal (2011)	Project assistant. Assistance with the compilation of the environmental impact assessment and environmental management programme report. Assistance with the stakeholder engagement process.
The environmental permitting process associated with a Mining Right amendment for Turquoise Moon, Limpopo (2011)	Project assistant. Assistance with the compilation of the environmental impact assessment and environmental management programme report. Assistance with the stakeholder engagement process.
The environmental permitting process associated with a Mining Right amendment for Keaton Energy, Mpumalanga (2011)	Project assistant. Assistance with the compilation of the environmental impact assessment and environmental management programme report. Assistance with the stakeholder engagement process.
The environmental permitting process associated with the Tuschenkomst Pit Extensionat Pilansberg Platinum Mine, North-West (2011)	Project assistant. Assistance with the compilation of the environmental impact assessment and environmental management programme report. Assistance with the stakeholder engagement process.
The environmental permitting process the new Mining Right Application at the Everest Hoogland Platinum Mine, North-West (2011)	Project assistant. Assistance with the compilation of the environmental impact assessment and environmental management programme report. Assistance with the stakeholder engagement process.

The environmental permitting process associated with the new salvage yard at Impala Platinum, North-West (2011)	Project assistant. Assistance with the compilation of the basic assessment report. Assistance with the stakeholder engagement process.
The environmental permitting process associated with the Swakop Uranium, Namibia (2011)	Project assistant. Assistance with the compilation of the environmental impact assessment and environmental management programme report. Assistance with the stakeholder engagement process.

CURRICULUM VITAE

STEPHEN VAN NIEKERK PR. ENG.

TECHNICAL DIRECTOR (CLOSURE & REHABILITATION)

Mine Waste Engineering, Africa

QUALIFICATIONS

NEBOSH	2015	International General Certificate in Occupational Health and Safety
SAFETRAC	2014	Safety Management Training Certificate
Pr. Eng.	2001	Professional Engineer, Engineering Council of South Africa (ECSA) , # 20010256
MSc (Civil)	2000	Civil Engineering, University of the Witwatersrand, South Africa
BSc (Civil)	1995	Civil Engineering, University of the Witwatersrand, South Africa

EXPERTISE

- Mine closure liability estimates
- Mine closure and rehabilitation planning
- Design of mine residue deposits (MRD's)
- Construction supervision and operations management of MRD's
- Flood hydrology
- Health and safety management

Stephen has over 20 years' consulting experience and is currently the technical director responsible for the development and management of SLR's closure and rehabilitation team across South Africa and Africa. He has been with SLR (previously called Metago Environmental Engineers) since 2002. During this time his work has focussed primarily on:

- The development of mine closure plans, environmental risk assessments and the estimating of mine closure and rehabilitation liabilities.
- The design, construction supervision, operations management and closure of MRD's (i.e. tailings storage facilities, heap leach pads and waste rock dumps).

Stephen was previously a company director from 2007 to 2016, and he was also responsible for the development and management of the health and safety system within SLR's South Africa and Africa operations from 2011 to 2016. Prior to 2002 he worked as an engineering graduate and an assistant resident engineer for Knight Piesold specialising in the design, construction and operation of MRD's. He has been registered as a professional engineer in South Africa since 2001.

MINE CLOSURE PROJECTS

Preliminary Mine Closure Plans, Environmental Risk Assessments, Annual Rehabilitation Plans and Closure Liability Estimates.

Mostly for ESIA/ESMP reports and amendments. For submission to the DMR or other Local Authorities.

In accordance with the Financial Provisioning Regulations, 2015/2017.

Projects in South Africa:

2016 - 2018	Tshipi Borwa Manganese Mine. For Tshipi é Ntle Manganese Mining.
2017	Evander 6 Shaft Project. For Taung Gold.
2017	Khwara Managense Mine. For Khwara Managanese.
2016, 2017	UMK Manganese Mine. For United Manganese of Kalahari.
2016	Jeanette Gold Mine. For Taung Gold.
2016	Siyanda Ferrochrome Smelter. For Siyanda Chrome Smelting Company.
2016	Alexander Coal Mine. For Anglo American Inyosi Coal.
Projects elsewhere in Africa:	
2018	Husab Uranium Mine. For Swakop Uranium (Namibia).

	2017	Otjikoto Gold Mine. For B2Gold (Namibia).
Mine Closure Bi-Annual and/or Annual Liability Updates. **For the DMR and/or company accounting purposes.** **(From 2012 to date only)**	**Projects in South Africa:**	
	2012 - 2018	Tharisa Platinum Mine. For Tharisa Minerals.
	2012 - 2018	Tshipi Borwa Manganese Mine. For Tshipi é Ntle Manganese Mining.
	2012 - 2018	UMK Manganese Mine. For United Manganese of Kalahari.
	2016 - 2018	Morokwa Manganese Mine. For National Manganese Mines.
	2018	Vanggatfontein Coal Mine. For Wescoal.
	2018	Velddrift Saltworks. For Velddrift Salt Company.
	2018	Morula PGM Plant. For Hernic Ferrochrome.
	2012 - 2017	Pilanesberg Platinum Mine. For Pilanesberg Platinum Mines.
	2014 - 2017	Sedibelo Platinum Mine. For Itereleng Bakgatla Mineral Resources.
	2012 - 2017	Vanggatfontein Coal Mine, Vaalkrantz Coal Mine, Boomlaer Siding, and Moabsvelden Coal Project. For Keaton Mining.
	2017	Jeanette Gold Mine, and Evander 6 Shaft Project. For Taung Gold.
	2012 - 2015	Lesedi Chrome Mine, Sky Chrome Mine, and Rooderand Chrome Operations. For International Ferro Metals.
	2014, 2015	Morula Chrome Mine, and Bokone Chrome Mine. For Hernic Ferrochrome.
	2014, 2015	Marikana Platinum Mine, Kroondal Platinum Mine, and Everest South Platinum Mine. For Aquarius Platinum.
	2014, 2015	Kudumane Manganese Mine. For Kudumane Manganese Resources.
	Projects elsewhere in Africa:	
	2018	Kombat Copper Mine. For Manila Investments (Namibia).
	2013 – 2018	Husab Uranium Mine. For Swakop Uranium (Namibia).
Mine Closure Liability Assessments for ESIA/ESMP reports and amendments. **For submission to the DMR or other Local Authorities.** **(From 2012 to date only)**	**Projects in South Africa:**	
	2018	PPM Plant Expansion. For Pilanesberg Platinum Mines.
	2018	Zondereinde Mine Smelter. For Northam Platinum.
	2015, 2018	Mokala Manganese Mine. For Mokala Manganese.
	2015, 2016	COZA Iron Ore – Driehoekspan Project, and Jenkins Project. For COZA Mining.
	2015	Jeanette Gold Mine Project. For Taung Gold.

	2015	Commissiekraal Coal Project. For Tholie Logistics.
	2014	Kudumane Manganese Mine. For Kudumane Manganese Resources.
	2012, 2014	Sedibelo Platinum Mine. For Itereleng Bakgatla Mineral Resources.
	2012	PPM Chrome Mine, and Magazynskraal Platinum Mine. For Pilanesberg Platinum Mines.
	2012	Hoogland Extension, and Project Fairway. For Aquarius Platinum.
	Projects elsewhere in Africa:	
	2013, 2016	Manica Gold Project. For Auroch Minerals NL /Xtract Resources (Mozambique).
	2013, 2014	Kinsenda Copper Mine, and Musonoi Copper Mine. For Metorex (DRC).
	2013, 2014	Letlhakane Diamond Mine Tailings Resource Treatment Project. For Ecosurv Environmental Consultants (Botswana).
	2013	Omitiomire Copper Mine. For Craton Mining and Exploration (Namibia).
3rd Party Review of Closure Liability Estimates and/or QRA. **For company accounting purposes and/or transactional due diligence.**	**Projects in South Africa:**	
	2018	Thabazimbi Iron Ore Mine. For Sishen Iron Ore Company.
	2016	2 x Chrome Mines. Confidential Client.
	2015	Thabazimbi Iron Ore Mine. For ArcelorMittal.
	2010	Zinc Mine. Confidential Client.
	2010	Impala Platinum Rustenburg Operations. For Impala Platinum.
	2008	15 x Gold TSF's. Confidential Client.
	Projects elsewhere in Africa:	
	2018	2 x Gold Mines. Confidential Client (Senegal, Burkino Faso).
	2010	Zinc Mine. Confidential Client (Namibia).
Preliminary Mine Closure Plan and Closure Liability Estimates (prior to Financial Provisioning Regulations, 2015). **For company accounting purposes and/or submission to Local Authorities.**	**Projects in South Africa:**	
	2003	Oaks Diamond Mine. For De Beers.
	Projects elsewhere in Africa:	
	2003, 2009, 2015	Botash Soda Ash Operations. For Botswana Ash (Botswana).
	2005, 2015	Damang Gold Mine. For Abosso Goldfields (Ghana).
	2015	Tarkwa TSF3. For Goldfields Ghana (Ghana).

MRD & FLOOD HYDROLOGY PROJECTS

Projects in South Africa:

Evander 6 Shaft Project	2011 - 2017	Conceptual and bankable TSF and WRD designs, and storm water management. For Taung Gold.
AMT's Chrome Operations	2013	Legal compliance review of TSF's. For African Mining and Trust Company.
Tharisa Platinum Mine	2012	Conceptual design of future WRD's. For Tharisa Minerals.
Goldfields Group	2010, 2012	Analysis of present and future stability of TSF's. For Gold Fields South Africa Group Operations.
Spitzkop Platinum Mine	2007 - 2012	Detailed TSF design, construction specifications, contract document and part-time construction supervision. For Eastplats.
Turquise Moon Iron Project	2011	Conceptual and bankable TSF design, and storm water management for ESIA/ESMP and feasibility study. For Ferrum Crescent.
AngloGold Ashanti	2010	Review of stability of TSF's at Vaal River Operations. For AngloGold Ashanti.
Kalkfontein Platinum Mine	2009	Conceptual TSF design, and storm water management for ESIA/ ESMP study. For Kameni.
Voorspoed Diamond Mine	2007 - 2008	Recommended operations management, Code of Practice compilation, and construction supervision of thickened tailings / paste facility and WRD. For De Beers / Murray and Roberts.
Crocodile River Platinum Mine	2007 - 2008	TSF and RWD safety monitoring inspections, RWD registration and recommended operations management. For Eastplats.
Voorspoed Diamond Mine	2005 - 2007	Detailed design and construction specifications for thickened tailings / paste facility and WRD. For Murray and Roberts / De Beers.
Crocodile River Platinum Mine	2004 - 2007	TSF audit, TSF and RWD safety monitoring inspections, Code of Practice, conceptual deposition strategy and design for IWWMP. For Eastplats.
Dominion Reef Uranium Mine	2006	Audit of TSF. For SRK Consulting.
Blyvooruitzicht Gold Mine	2005	Inspection and review of dormant TSF's adjacent to new township development. For Schwartz Tromp and Associates.
Everest South Platinum Mine	2002	Bankable TSF feasibility study. For Aquarius Platinum.
RCM Chrome Mine	2000 - 2002	Detailed TSF design, contract documentation, tender adjudication, construction supervision, dam complex safety monitoring inspections, Code of Practise. For Bayer.
Vergenoeg Flourspar Mine	2000 - 2002	TSF and RWD safety monitoring inspections, stability analyses, design of remedial measures and recommended operations management. For Metorex.
Rooiwal Power Station	2000 - 2002	Ash dam safety monitoring inspections. For Pretoria City Council.

BRPM Platinum Mine	1998 - 2000	TSF risk assessment, stability analyses, construction supervision, dam safety monitoring inspections, recommended operations management. For Anglo Platinum.
Durnacol Coal Mine	1997 - 1999	Conceptual and detailed design of coal discard complex, pollution control investigations and rehabilitation optimisation. For Iscor Mining.
Transalloys Slag Treatment Project	1998	Detailed TSF design, contract documentation, construction supervision and hand-over. For Titaco Projects.
Driefontein Wastewater Treatment Works	1997 - 1998	Detailed design of Spills dam, contract documentation, construction supervision and hand-over. For Greater Johannesburg Metropolitan Council.
Klipwal Gold Mine	1997 - 1998	TSF stability analyses, design of remedial measures and recommended operations management. For Duiker Mining.
Heritage Coal Mine	1997	Detailed design of discard dump and rehabilitation optimisation. For Duiker Mining.
	Projects elsewhere in Africa:	
Bokouma Uranium Mine	2007 - 2009	Stream diversion design (incl. hydrological and geotechnical investigation) for bankable feasibility study. For Uramin Inc. (Central African Republic).
Farim Phosphate Mine	2007	Hydrological investigation for ESIA/ESMP. For Time Mining (Guinea Bissau).
Tarkwa Gold Mine	2003 - 2007	Contract documentation, tender adjudications, construction supervision, spillage containment / flood routing investigation for numerous heap leach pads. For Goldfields Ghana (Ghana).
Liqhobong Diamond Mine	2004 - 2005	Geotechnical site investigation and storm water control design for TSF design. For European Diamonds PLC (Lesotho).
Lubengle Copper Mine	2001	Recommended TSF operations management. For Konkola Copper Mines (Zambia).

MEMBERSHIPS

LaRSSA	Member of the Land Rehabilitation Society of South Africa (LaRSSA)
GIGSA	Member of the International Geosynthetics Society – South African Chapter (GIGSA)

PUBLICATIONS

Civil Engineering Magazine	Van Niekerk, S., 2014, "*Questions around Mine Closure*", Civil Engineering Magazine, Vol. 22 No. 7, South African Institution of Civil Engineering, August 2014.
Mining Magazine	Interviewed and quoted in "*Closing the Deal*", Mining Magazine, December 2013.
SA Career Focus Magazine	Interviewed and quoted in "*Environmental Engineer*", SA Career Focus Magazine, Vol. 5 No. 8, May 2011.
Civil Engineering Magazine	James, A., Van Niekerk, S., and Stobart, B., 2005, "*Mine Closure Planning – Time for a Holistic Approach*", Civil Engineering Magazine, Vol. 13 No. 8, South African Institution of Civil Engineering, August 2005.

Civil Engineering Magazine	Marsden, R., Van Niekerk, S., and Kachrillo, J., 2003, "*Harnessing the Forces of Nature – Active Barrier Technology*", Civil Engineering Magazine, Vol. 11 No. 7, South African Institution of Civil Engineering, August 2003.

CURRICULUM VITAE

ED PERRY

OPERATIONS MANAGER

Environmental Management Planning & Approvals, South Africa

QUALIFICATIONS

Postgrad Cert.	2016	Postgraduate Certificate in Occupational Health and Safety, University of Cape Town
Postgrad Cert.	2012	Postgraduate Certificate in Envionmental Law, Centre for Environmental Management, Potchefstrom
Postgrad Cert.	2008	Postgrduate Certificate in Environmental Assessment, Oxford Brookes University
MSc	1994	MSc Applied Hydrobiology, Cardiff University
BSc (Hons)	1990	BSc (Hons) Environmental Science, Plymouth University

EXPERTISE

- Environmental and Social Impact Assessments
- EHSS Auditing
- Environmental Compliance
- Management Systems
- Due Diligence

Ed Perry joined SLR as the Operations Manager for the Environmental Management Planning and Approvals (EMPA) team in Africa in August 2019. He has worked in environmental consultancy for over twenty years for a wide range of public and private sector clients.

Ed is a registered Environmental Auditor with the Institute for Environmental Management and Assessment and a Lead Auditor with the International Cyanide Management Institute. Prior to moving to South Africa in 2011 Ed worked in the UK on a wide range of projects including EIAs and Integrated Pollution and Prevention Permits. This included permitting the first hazardous waste landfill in the UK under the new integrated permitting mechanism and undertaking a study for the European Commission on the implementation of the Landfill Directive in 15 European countries.

Since moving to South Africa, Ed has been involved with ESIAs and environmental authorisations throughout Africa. Ed has been Project Director / Partner in Charge of EIAs for a wide range of facilities including: Renewable Energy Facilities; Metal Extractive Industries; Large Water Storage Schemes; and New Mine and Extensions to Mines.

Ed has also undertaken a wide range of environmental audits including; due diligence audits, EMPR audits, and over 20 international cyanide code audits of mines throughout Africa.

PROJECTS

A sample of Ed's project experience, summarised by sector, is provided below.

Mining

Anglo-American – Polokwane Smelter, Polokwane

Ed was the Project Manager responsible for undertaking an external compliance audit for the Anglo-American Polokwane Smelter as stipulated in the slag stockpile permit for the Polokwane Metallurgical Complex. This included a review of the permit for the temporary stockpile of ash as part of the expansion of the Complex.

Eurasian Natural Resources Corporation – Kakanda Mine, DRC	Ed was the Project Manager for the review of a Safety, Health, Environment and Community Management System for Kakanda Mine in the DRC.
Continental Coal Limited – Penumbra, South Africa	Ed was the Lead Auditor undertaking review of EIA, EMP and site procedures against the requirements of the IFC Procedures.
Ruighoek Mine, South Africa	Ed was the Project Manager for an ESIA associated with the expansion of this chromium mine in South Africa.
AngloGold Ashanti – Yatela, Sadiola, Siguri Gold Mines, Mali and Guinea	Ed was the Lead Auditor and Project Manager undertaking a re-certification audit against the requirements of the International Cyanide Code for three gold mines.
Freda Rebecca Gold Mine - Zimbabwe	Ed was the Lead Auditor and Project Manager for a gap audit to ascertain the status of the gold mine with regards to its ability to comply with the International Cyanide Code
Gold Fields Ghana – Tarkwa and Damang Gold Mines	Ed was the Lead Auditor and Project Manager undertaking a re-certification audit against the requirements of the International Cyanide Code for the two gold mines.
Goldfields, Harmony, AngloGold Ashanti – South Africa	Ed was the Lead Auditor and Project Manager undertaking a re-certification audit against the requirements of the International Cyanide Code for 5 gold mines for AngloGold Ashanti, 4 gold mines for Harmony, and a gold mine for Gold Fields.
Maamba Collieries Limited – Maamba Coal Mine, Zambia	Ed was the lead auditor leading the creation and implementation of an integrated management system in accordance with the requirements of the IFC performance standards, ISO 14001, ISO 9001, and OHSAS 18001.
Eramet - Senegal	Lead Auditor for a due diligence audit of a mineral sands mining operation. The operation was the subject of a possible joint venture. The environmental audit, which included 3 days on site, was to establish if what environmental risks were involved with the project, which was just about to enter the construction phase.
Nyoto Minerals – Tula Kapi Mine, Ethiopia	Ed was the technical reviewer for the ESIA undertaken on behalf of Nyoto Minerals for the Tula Kapi Gold Mine in Ethiopia.
Riversdale Capital – Zambeze Coal Mine, Zambia	Ed was the Technical Reviewer for an ESHIA for the development of the Zambeze Coal Mine on behalf of Riversdale Capital.
Confidential – proposed mine, South Africa	Ed was the Project Manager for an ESIA for a new proposed iron ore mine in South Africa. This application was withdrawn following baseline studies by specialist showing the existence of fatal flaws with regards to water use and location of the TSF.
	Industry
Distell – South Africa	Ed was Project Manager for a number of projects for Distell in order to obtain various environmental authorisations for their brewing facilities including the one for the siting of a new waste water treatment works.

SPAR – South Africa	Ed was Project Manager for a number of energy projects undertaken for SPAR in South Africa including looking at Science Based Targets, Internal Carbon Pricing, and an ISO 50001 Energy Management System.
SCAW – South Africa.	Ed was the Project Manager for a range of Environmental Authorisations, including ESIAs, Air Emssions Licences, Water Use Licences and contaminated land assessments. These studies were undertaken for SCAW ata number of their smelter sites in Gauteng over a 5 year period.
Confidential – South Africa	Ed lead an EHS audit of a cable tie manufacturer using plastic extrusion as part of a due diligence project.
Pfizer – South Africa	Ed was the Project Manager and Lead Auditor for an EHS audit of the head offices of Pfizer in South Africa.
Sasol - Sasolburg	Ed was the Project Manager and Lead Auditor for International Cyanide Code recertification audit for the Sasol cyanide production facility at Sasolburg.
Sohar Aluminium - Oman	Ed was the Lead Auditor of Sohar Aluminium's environmental management system auditing the system against the requirements of ISO 14001 and benchmarking this facility against international requirements.
Confidential – KZN, South Africa	Lead Auditor for a due diligence audit of a white goods manufacturing company in Kwa-Zulu Natal.
Sasol – Secunda	Ed was the Lead Auditor for a third party audit of waste contractors operating on behalf of Sasol. The audit investigated compliance with South African environmental legislation and environmental best practice.
Confidential – South Africa, Kenya, UAE	Ed was the project manager for a due diligence audit of a packaging company's facilities in South Africa, Kenya and UAE.
	Infrastructure
Lesotho Highlands Development Agency - Lesotho	Ed took over as Project Manager undertaking an ESIA for the Polihali Reservoir and Western Access Road in Lesotho on behalf of the Lesotho Highlands Development Agency.
Freight Forwarders Group – Kenya and Tanzania	Ed was the Lead Auditor undertaking a re-certification audit against the requirements of the International Cyanide Code for the Freight Forwarders transportation group of companies.
Transnet Pipelines – South Africa	Ed was the Project Manager responsible for the creation and implementation of an Energy Management System for all of the pumps stations, workshops and offices for Transnet Pipelines, who pump crude oil and petroleum products from Durban to Johannesburg.
Vehrad Transportation - Ghana	Ed was the Project Manager and Lead Auditor undertaking a re-certification audit of Vehrad Transportation against the requirements of the International Cyanide Code.

	Oil and Gas
Shell – South Africa	Ed was the Project Manager for various environmental authorisations in South Africa associated with the Shell GUESS program. This program related to the closure and clean up of Shell service stations.
Vopak – Richards Bay, South Africa	Ed was the Project Manager for an ESIA for a new terminal operated by Vopak at Richards Bay for the handling and storage of Liquid Petroleum Gas and Clean Petroleum Products.
Vopak – Durban, South Africa	Ed was the Project Manager for an ESIA for the expansion of the Vopak terminal at Durban Docks for the handling and storage of Liquid Petroleum Gas and Clean Petroleum Products.
Bidvest – Durban South Africa	Ed was the Project Manager for an ESIA for the expansion of the Bidvest terminal at Durban Docks for the handling and storage of Liquid Petroleum Gas and Clean Petroleum Products.
	Power
Department for International Development – UK Government	The UK Department for International Development is providing support to medium sized renewable energy facilities (mainly hydroelectric power plants) in Uganda through the Global Energy Transfer Feed in Tariff programme (GET FiT). The project was to assess how local communities in the vicinity of these facilities could obtain power and how environmental and social safeguards for these types of facilities could be improved in the future. Ed was the lead environmental and social advisor undertaking a review of the environmental and social safeguards.
Confidential - Angola	Ed was Project Manager for a project undertaking a Strategic Environmental Assessment of locations for renewable energy facilities in Angola.
Confidential - Mozambique	Ed was the Project Manager for an ESIA to be submitted to the Mozambican authorities for the development of a unique renewable energy pilot facility.

MEMBERSHIPS

IEMA	Practitioner for the Institute of Environmental Management and Assessment
IEMA	Registered Environmental Auditor

PUBLICATIONS

- The Role of Socio-Economic Factors, Seasonality and Geographic Differences on Household Waste Generation and Composition in the City of Tshwane. 2016 (Wastcon).
- EMS as a Tool for Integrated Business Risk Management. 2005 (various journals).
- Golder Associates EMS Roadmap. 2004 (CD ROM).

	• Incentives to Encourage Recycling. 2002. Materials Recycling Week
	• Recycle of Life. 2002. Government Business
	• New Approaches to Management of Waste. 2002 (various journals)
	• Minimise the Waste – Maximise the Message. 2001
	• Guide to Waste Reduction on Construction Sites. 1999. Construction Confederation

Appendix B: Detailed closure cost calculation

Prospecting Operations					
Current Closure and Rehabilitation Costs (at Nov 2019)					
Item	Description	Quantity	Unit	Rate	Amount
1	Sealing of boreholes	4	No.	R 1 500,00	R 6 000,00
2	Demolish and remove concrete drilling platform	4	No.	R 3 000,00	R 12 000,00
3	Removal of portable ablition facilities	4	No.	R 1 000,00	R 4 000,00
4	Demolish and backfill sumps	4	No.	R 1 500,00	R 6 000,00
Item	Description	Quantity	Unit	Rate *	Amount
5	General surface rehabilitation of **current** drilled sites	0,04	ha	R 133 000,00	R 5 320,00
6	General surface rehabilitation of **recently rehabilitated** sites	0	ha	R 133 000,00	R 0,00
7	General surface rehabilitation of **previously** rehabilitated sites	0	ha	R 0,00	R 0,00
8	General surface rehabilitation (rip and vegetate) of access tracks	0,02	ha	R 133 000,00	R 2 660,00
9	Demobilise and general surface rehabilitation (rip and vegetate) of camp sites	0,0	ha	R 133 000,00	R 0,00
10	2 to 3 years of maintenance & aftercare of all areas	0,06	ha	R 19 950,00	R 1 197,00
				SUB TOTAL 1	R 37 177,00
11	Preliminary and General	20	%	of Sub Total 1	R 7 435,40
12	Contingencies	10	%	of Sub Total 1	R 3 717,70
				SUB TOTAL 2	R 48 330,10
13	VAT	15	%	of Sub Total 2	R 7 249,52
				GRAND TOTAL	R 55 579,62

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