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CANYON SPRINGS INVESTMENTS 82 (PTY) LTD

PROPOSED CANYON SPRINGS COAL MINE

ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME

VOLUME 2 OF 4: DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

JUNE 2014

Prepared for:

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CANYON SPRINGS INVESTMENTS 82

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE PROPOSED CANYON SPRINGS COAL MINE

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LIST OF ACRONYMS

ABA	Acid Base Accounting
AMD	Acid Mine Drainage
CHPP	Coal Handling and Preparation Plant
COD	Chemical Oxygen Demand
COGTA	Department of Co-operative Governance and Traditional Affairs
DAFF	Department of Agriculture Forestry and Fisheries
DEA	Department of Environmental Affairs
DLA	Department of Land Affairs
DMR	Department of Mineral Resources
DRJSMLM	Dr. JS Moroka Local Municipality
DWA	Department of Water Affairs
EC	Electrical Conductivity
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
FRAI	Fish Response Assessment Index
HDSA	Historically Disadvantaged South Africans
HGM	Hydro-Geomorphic
HRD	Human Resources Development
HSA	Hazardous Substances Act (No. 15 of 1973)
IAPs	Interested and Affected Parties
ICP	Inductively Coupled Plasma
ICP–MS	Inductively Coupled Plasma Mass Spectrometer
LOM	Life of Mine
MDARDLA	Mpumalanga Department of Agriculture Rural Development and Land Administration
MHSA	Mine Health and Safety Act (No. 29 of 1996)
MIRAI	Macro-Invertebrate Response Assessment Index
MPRDA	Mineral and Petroleum Resources Development Act No. 28 of 2002
MSDS	Material Safety Data Sheets
NEMA	National Environmental Management Act No. 102 of 1998
NEMAQA	National Environmental Management Air Quality No. 39 of 2004
NEMBA	National Environmental Management Biodiversity Act No. 10 of 2004
NEMWA	National Environmental Management Waste Act No. 59 of 2008
NFA	National Forest Act No. 84 of 1998
NHRA	National Heritage Resources Act
NWA	National Water Act
PCD	Pollution Control Dam
PES	Present Ecological State
PPE	Personal Protection Equipment
R/O	Reverse Osmosis
ROM	Run of Mine

SA NAAQS	South African National Ambient Air Quality Standards
SAHRA	South African Heritage Resource Agency
SANAS	South African National Accreditation System
SANS	South African National Standards
SASS5	South African Scoring System Version 5
SCD	Stormwater Control Dam
SHEQ	Safety, Health, Environmental and Quality
SLP	Social and Labour Plan
SPL	Sound Pressure Level
STP	Sewage Treatment Plant
TDS	Total Dissolved Solids
TSE	Treated Sewage Effluent
VEGRAI	Riparian Vegetation Response Assessment Index
WUL	Water Use Licence
WWTP	Wastewater Treatment Plant

1. INTRODUCTION AND BACKGROUND

1.1. Applicant

Name of Applicant:	Canyon Springs Investments 82 (Pty) Ltd
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Commodity:	Coal

HolGoun Investment Holdings (Pty) Ltd. is a family owned, South African investment holding company, established in 2003. The company's activities and investments straddle a range of sectors including Mining and Exploration, Engineering, Property, Healthcare, Lifestyle & Leisure, Finance and Risk Management.

Canyon Springs Investments 82 (Pty) Ltd "Canyon Springs (Pty) Ltd" is a subsidiary of HolGoun Mining and its parent company, HolGoun Investment Holdings (Pty) Ltd. Canyon Springs has submitted an application for a Mining Right to the Department of Mineral Resources (DMR) which was accepted by the DMR on 19 March 2012 for **coal** but also including all precious and base-metals, uranium, molybdenite, copper, limestone and rare earths. It is the intention of Canyon Springs to establish an opencast coal-mining operation on the farm Roodekoppies 167 JR. The mining right was granted by the DMR on the 31st of May 2013.

1.2. Details of the Environmental Assessment Practitioner

Name of Environmental Assessment Practitioner	Prime Resources (Pty) Ltd
Physical Address:	70 - 7th Avenue, Parktown North, Johannesburg
Postal Address:	PO Box 2316, Parklands, 2121
Telephone Number:	011 447 4888
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As required in terms of Section 17 of GNR543, the Environmental Impact Assessment (EIA) Regulations of 2010, the applicant has appointed Prime Resources (Pty) Ltd to conduct the research associated with this Environmental Management Programme (EMP). Prime Resources (Pty) Ltd is an environmental consulting specialist firm providing environmental and related services and which was established in 2003. Prime Resources (Pty) Ltd was founded by Peter

Theron, the Managing Director of the firm, who has over 26 years' experience in the field of environmental science and engineering. Jonathan van de Wouw, the Project Manager and Senior Scientist for the Canyon Springs Project, has six years' experience in the field of environmental science. Below are short *Curricula Vitae* of the project team.

1.3. Legislative Requirements

The following legislation was utilised in preparation of this EMP:

- Mineral and Petroleum Resources Development Act (MPRDA, No. 28 of 2002);
- National Environmental Management Act (NEMA, No. 107 of 1998);
- National Environmental Management: Air Quality Act (NEMAQA, No. 39 of 2004);
- The National Heritage Resources Act (NHRA, No. 25 of 1999);
- The National Water Act (NWA, No. 36 of 1998);
- The National Environmental Management: Waste Act (NEMWA, No. 59 of 2008);
- The National Environmental Management: Biodiversity Act (NEMBA, No. 10 of 2004);
- The National Forest Act (NFA, No. 84 of 1998);
- The Mine Health and Safety Act (MHSA, No. 29; of 1996); and
- The Hazardous Substances Act (HSA, No. 15 of 1973).

This EMP has further been prepared to meet the requirements of GNR543 Section 33, as indicated in Table 1 below:

Table 1: Environmental Management Programme requirements in terms of GNR543

GNR543 SECTION 33	CONTENTS	CHAPTER
(a)	Details of (i) the person who prepared the EMP; and (ii) the expertise of that person to prepare an EMP;	1.2
(b)	Information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in a report contemplated by these Regulations, including environmental impacts or objectives in respect of (i) planning and design; (ii) pre-construction and construction activities; (iii) operation or undertaking of the activity; (iv) rehabilitation of the environment; and (v) closure, where relevant.	3 and 4
(c)	A detailed description of the aspects of the activity that are covered by the draft EMP;	2
(d)	An identification of the persons who will be responsible for the implementation of the measures contemplated in paragraph (b);	4
(e)	Proposed mechanisms for monitoring compliance with and performance assessment against the EMP and reporting thereon;	5
(f)	As far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development,	9

GNR543 SECTION 33	CONTENTS	CHAPTER
	including, where appropriate, concurrent or progressive rehabilitation measures;	
(g)	A description of the manner in which it intends to (i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) remedy the cause of pollution or degradation and migration of pollutants; (iii) comply with any prescribed environmental management standards or practices; (iv) comply with any applicable provisions of the Act regarding closure, where applicable; (v) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;	4.2 - 4.16, 7.2, 7.3, 10, 11
(h)	Time periods within which the measures contemplated in the EMP must be implemented;	6
(i)	The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity;	4.5, 4.6, 4.7, and 4.8
(j)	An environmental awareness plan describing the manner in which (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment;	8
(k)	Where appropriate, closure plans, including closure objectives	10

2. PROJECT DESCRIPTION

This chapter provides a detailed description of the aspects of the activities at the proposed Canyon Springs Coal Mine that are covered by the draft EMP.

2.1. Mining Method

The mineable coal resources identified have been targeted for opencast pit development. Four opencast pits (see the general arrangement in Appendix 17) were delineated as follows: pit 1 covering 324 Ha, pit 2 covering 92 Ha, pit 3 covering 40 Ha and pit 4 covering 45 Ha. The opencast pits will be mined in strips by truck-and-shovel rollover mining with blast development:

- Initially, strips will be cleared of vegetation, and topsoil will be removed and stockpiled.
- Thereafter, soft overburden (comprising calcrete and shale material) will be removed by means of an excavator until competent rock is encountered and separately stockpiled.
- Hard rock overburden (mostly shale material) will then be removed following blasting and temporarily stockpiled.
- Finally, the coal seam will be blasted and removed to the beneficiation plant.

The position of the temporary stockpile areas is over future mining areas so as to minimise the overall footprint and promote the correct sequencing of concurrent rehabilitation. All carbonaceous stockpiles will be surrounded by catchment paddocks to collect and evaporate dirty run-off.

2.2. Processing Plant

Run of Mine (ROM) will be transported to the plant site via truck along the purpose built haul road and fed via an apron feeder through a jaw crusher. Crushed coal will be stockpiled and then washed in a Coal Handling and Preparation Plant (CHPP).

All discard (coarse and fine) will be placed onto the temporary discard dump. The temporary discard dump will be surrounded by catchment paddocks to collect and evaporate dirty run-off. The size of the catchment paddocks will allow more than sufficient capacity to contain a 1:100 year flood event. The temporary discard dump is planned to only operate during the early stages of the Life of Mine (LOM). After approximately two years, when the strip mining operations are fully operational, the discard will be placed in the bottom of the worked out pits.

2.3. Additional Infrastructure

The mine infrastructure will comprise of typically a change-house, workshops, mine store and salvage yard (for hazardous industrial materials, hydrocarbon materials, biodegradable materials, domestic waste and materials for repair and re-use in the plant), security, weighbridges and administration offices.

2.3.1. Roads

Primary light vehicle access to the site will be gained via the existing series of district roads traversing the project area including D2740 and D1944. An additional 1.7km of internal roads will be constructed of compacted gravel and will cater for mine vehicles; these roads will be 10m wide. The main coal haul road linking Pit 1 and 3 crosses the D1944 district road. A traffic circle will be constructed at the intersection of the two such that haul trucks can have right of way and vehicles on D1944 will be controlled by Yield signs in both directions. This haul road will be 15m wide and of a more competent design to cater for heavier vehicles than general internal mine roads. Final product haulage trucks will enter the site via the D1944 and then utilise the same section of the haul road 900m long and 15m wide.

2.3.2. Culvert

A stream crossing / culvert will need to be constructed across the No-Name stream in order for pit 1 to be accessed, this crossing will be approximately 3m high at the deepest point, 20m wide and 300m long. Embankments for the 15m roadway will be constructed on either side of the No-Name stream. Culvert pipes will be sized to allow for the flow within the No-Name stream to be unimpeded. This culvert crossing is typical in design and size to the exiting crossing for the D1944 provisional road immediately to the north.

2.3.3. Hydrocarbons

Fuel storage facilities will comprise two bulk fuel depots installed by a selected fuel supplier, one close to the ROM stockpile, and next to the mining contractor's laydown area, while the second will be situated next to the weighbridges. Each one will be approximately 226 m^2 and adequate to house 1 x 23 m^3 fuel tank required to keep the haul and mining fleets fuelled for about 7 days.

2.3.4. Sewage Treatment and Disposal

A packaged Sewage Treatment Plant (STP) sized for approximately 350 people will be constructed within the dirty water catchment. It will treat sewage to a final effluent quality acceptable to the DWA. Treated Sewage Effluent (TSE) will report to the Pollution Control Dam (PCD).

2.4. Water Management

The Mine water balance has identified that the total water demand (for process and potable water) at the Mine equates to an average of 1 740m^3 water per day. Calculations carried out on the water balance indicate that an additional water supply will be needed to make up the required 1 740 m^3/day for approximately the first 8 to 9 years of mining operations, as precipitation cannot be relied upon year round.

2.4.1. Wastewater Treatment

The existing Wastewater Treatment Plant (WWTP) at Siyabuswa will be upgraded for the purposes of providing the necessary process and potable make-up water required for the Mine. While the TSE that leaves the Siyabuswa WWTP will be acceptable for Mine CHPP water, it will not yet be fit for human consumption. It has been calculated that a total of 50 m^3 of potable water will be required per day, 45 m^3 used as service water on-site, and an additional 5 m^3 per day for the local community as compensation for any borehole water lost through dewatering activities at the proposed mine.

A two-stage Reverse Osmosis (R/O) WWTP at the Mine will serve to treat the TSE to a suitable quality for human consumption.

2.4.2. Clean and Dirty Water Handling

The CHPP, including the workshop and coal handling areas, are centrally situated at the proposed Canyon Springs Coal Mine and will be considered dirty water catchment areas. Diversion berms will be constructed around the strip mining pits and utilised to ensure that minimal surface water run-off comes into contact with mining activities.

2.4.2.1. Stormwater Control Dam

The purpose of the Stormwater Control Dam (SCD) is to contain any dirty water run-off from the extended CHPP area. The SCD will have the capacity to contain run-off from the entire 25 ha plant area in the event of a 1:50 year flood. A stormwater diversion trench will be constructed down gradient (to the south) of the plant area and will be responsible for channelling all dirty water flow to the SCD. A clean water diversion berm will be constructed along the northern section of the plant to channel clean run-off away from the CHPP plant area. Prior to entering the SCD, the diversion trench will enter a twin silt trap. The purpose of the double silt trap is to allow water to be channelled through one silt trap while leaving the second open for cleaning. A downstream spillway with energy dissipater will be constructed in the event of emergency overtopping for a greater than 1 in 50 year event, without compromising the safety of the dam wall.

2.4.2.2. Pollution Control Dam

The PCD will receive groundwater inflow from the opencast pits during mine operation and act as the process water storage dam. The PCD has been designed with sufficient capacity to handle all inflow water (both groundwater and precipitation, approximately 184 m^3/day) from all operational opencast pits during the maximum operating capacity of the mine. A pump system will allow this water in the PCD to be used as mine process water, and with a capacity of 120 000 m^3, the PCD has the ability to provide plant process water for 69 days, if full. During the initial mine stages there will be insufficient groundwater inflow to provide the required process water to the plant and additional water will be required from Siyabuswa as discussed below. The PCD will be located up gradient and adjacent to the SCD. A pump system will be in place to allow excess water to be pumped from the SCD to the PCD when necessary.

3. IMPACTS AS IDENTIFIED IN THE ENVIRONMENTAL IMPACT ASSESSMENT AND ACCOMPANYING MITIGATION MEASURES

3.1. Introduction

The biophysical impacts identified as per the EIA (Volume 1) include potential impacts associated with:

- Soil, land use and land capability;
- Biodiversity (Fauna and Flora);
- Surface water;
- Groundwater; and
- Air quality.

The socio-economic impacts which have been identified include those that affect:

- Ambient noise;
- Archaeological, cultural and heritage;
- Physical structures or the health and safety of people;
- Traffic; and
- Socio-economic conditions.

The above have been further separated by mining phase (construction, operation, decommissioning and post-closure).

3.2. Impact Assessment

The following tables highlight the significance of potential impacts as identified per the EIA (Volume 1), any mitigation measures applicable by which to reduce the significance of the potential impacts identified, and the resultant significance of impacts by implementing the suggested mitigation measures; all throughout each of the phases (construction, operation, decommissioning and post-closure) at the proposed Canyon Springs Coal Mine

3.2.1. Construction Phase

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
Terrestrial Ecology			
▪ Destruction of floral and faunal habitat and vegetation, and stripping of topsoil, due to the clearance of surface areas for construction of the pit, roads and infrastructure e.g. discard dump, PCD, STPs and the TSE pipeline	High 75	▪ The biodiversity management plan (Section 4.4), soil management plan (Section 4.10) and hydrocarbon management plan (Section 4.9) must be implemented to mitigate potential impacts to biodiversity and soil resources which may affect terrestrial ecology.	High 75
▪ Exposure to erosion due to the removal of vegetation	Medium 40		Low 21
▪ Increase in dust due to construction activities	Medium 48		Low 27
▪ Potential increase in invasive vegetation due to the removal of natural vegetation	Medium 48		Low 27
▪ Faunal interactions with structures and personnel, noise, vibration and light disturbance, i.e. increase in noise levels due to vehicles	Medium 56		Medium 36
Aquatic Ecology			
▪ Sedimentation of watercourse due to the clearing of natural vegetation which leads to soil erosion ▪ Altered runoff regime of water body affects aquatic fauna	Medium 50	▪ The design of the PCD and SCD, as discussed in Section 2.4.2 will ensure no overflow or seepage of water can occur; and ▪ The soil management plan (Section 4.10) and the aquatic ecology management plan (Section 4.5) must be implemented to mitigate potential impacts to minimise the potential for erosion and sedimentation of runoff.	Low 24
Wetlands			

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
▪ Sedimentation of watercourse due to heavy machines clearing vegetation for construction of the opencast pit and surface infrastructure	Low 24	▪ The wetland management plan (Section 4.8), soil management plan (Section 4.10), surface water management plan (Section 4.7) and biodiversity management plan (Section 4.4) must be implemented to mitigate potential impacts to surface water, biodiversity and soil resources which may affect wetlands.	Low 16
▪ Increased erosion and increased run-off received by water courses due to the removal of natural vegetation	Medium 48		Low 14
▪ Introduction and spread of invasive vegetation due to the disturbance / destruction of indigenous vegetation making ecosystem vulnerable to invasions.	High 60		Low 24
▪ A stream crossing / culvert to be constructed across the No-Name stream in order to access pit 1, which will be through a wetland, wetland buffer and within the 100 year floodline	Medium 32		Low 24
Soil Quality			
▪ Compaction of soils and loss of land capability due to the movement of heavy vehicles destroying the structure of the soils	High 65	▪ The soil management plan (Section 4.10) must be implemented to mitigate potential impacts to soil resources which may affect land capability.	Low 27
▪ Lost of resource (soil sterilisation) due to the destruction of the soil profile ▪ Loss of resource due to covering or removal of soil ▪ Contamination of soils due to	High 70		Medium 36

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
spillage and dirty water			
▪ Compaction of soils and loss of land capability due to the movement of heavy vehicles	Medium 52		Low 27
Groundwater			
▪ Impact on groundwater volumes due to the dewatering of the opencast pit	Medium 32	▪ Reports of decreased water levels will be investigated through comparison with the results noted during the hydrocensus – in instances where dewatering has indeed affected borehole groundwater levels, the mine will be responsible with providing the affected user with an equivalent volume of water of a similar or better quality; ▪ The hydrocarbon management plan (Section 4.9) must be implemented to avoid and manage the negative impacts of hydrocarbon spills on groundwater resources; and ▪ The groundwater management plan (Section 4.6) must be implemented to mitigate potential impacts to groundwater resources which may affect groundwater quality and quantity.	Low 28
▪ Groundwater contamination due to potential hydrocarbon spills	Low 14		Low 7
Surface Water			
▪ Greater erosion potential causing siltation resulting in increased turbidity and suspended solids in local rivers and streams ▪ Contamination of water due to hydrocarbons spills	Low 8	▪ Section 21c and 21i water uses, as per the NWA, must be authorised prior to the commencement of any mining activities; and ▪ The surface water management plan (Section 4.7) must be implemented to mitigate potential impacts to surface water resources which may affect surface water quality.	Low 8
▪ A stream crossing / culvert to be constructed across the No-Name stream in order to access pit 1. The crossing will be through a wetland and within the 100 year	Medium 32		Low 24

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
floodline			
Cultural / Heritage			
▪ Loss of remains of old farmyard at Site 1 due to site clearance for construction	Low 28	▪ The heritage and palaeontological management plan (Section 4.13) must be implemented to avoid and mitigate potential impacts to heritage and palaeontological resources.	-
▪ Loss of Middle and Late Stone Age tools and Iron Age Pottery at Site 2 due to site clearance for construction			
▪ Loss of Middle as well as Late Stone Age tools at Site 3 due to site clearance for construction			
Air Quality			
▪ Emissions and particulate matter from machinery / vehicles which results in a local reduction in air quality ▪ Wind erosion from exposed areas	High 60	▪ Wind-breaks and wind speed reduction through sheltering should be introduced and control measures to reduce the potential for fugitive dust emissions in opencast coal mines have to be adopted. The extent of exposed areas must be reduced through careful planning and progressive vegetation; and ▪ The air quality management plan (Section 4.2) must be implemented to mitigate potential impacts to air quality which may affect surrounding communities.	Medium 40
▪ Increased dust fallout due to materials relocation and transport ▪ Emissions and particulate matter from machinery / vehicles resulting in a local reduction in air quality ▪ Wind erosion from topsoil and overburden stockpiles	High 60		Medium 48
Traffic			
▪ Additional traffic due to heavy vehicles transporting construction materials ▪ Damage to local roads due to	Medium 30	▪ There are residential areas along the identified coal truck routes in the vicinity of the mine. Some long term treatment of unpaved roads may be required to minimise dust generated by haul trucks, however, this will be addressed in ongoing consultation with the Dr. JS Moroka Local Municipality (DRJSMLM);	Low 24

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
presence of heavy vehicles ▪ Impacts associated with road safety		and ▪ The traffic management plan (Section 4.12) must be implemented to mitigate potential impacts to road traffic which may affect surrounding communities.	
Noise			
▪ Increase in noise levels due to use of heavy machinery in pit excavation, overburden removal and surface infrastructure construction	High 70	▪ The design of all major plans for the mine must incorporate the necessary acoustic design aspects to ensure that the overall noise level generated from the infrastructure, pits and operations does not exceed a maximum equivalent continuous day / night rating level (70 dBA); ▪ The design process is to be done in such a way as to minimise the transmission of noise from the inside of the buildings to the outside, and the insulation of particularly noisy plant and equipment; ▪ The design should also to take into account the maximum allowable equivalent continuous day and night rating levels of the land use type of potentially impacted sites outside the mine boundary; ▪ Ideally, plant and equipment sound power level should be such that the Sound Pressure Level (SPL) should not exceed 85 dBA; ▪ The noise footprint of each discrete element should be established by measurement in accordance with the relevant standards. The character of the noise should be checked to ascertain whether there is any nuisance factor associated with the operations; ▪ In general, construction activities should meet the noise standard requirements of the Occupational Health and Safety Act (No. 85 of 1993); ▪ Once the final route of the external coal haul is determined and finalised, the noise impact assessment conducted should be updated to take cognisance thereof; ▪ Any updates to the noise impact assessment as contemplated above should also take cognisance of the final layout of infrastructure at the proposed mine in order to improve confidence in the noise contours as calculated and the any management measures revised as necessary; and ▪ The noise management plan (Section 4.11) must be implemented to mitigate potential impacts to noise levels which may affect surrounding communities.	Medium 48
▪ Increase in noise levels due to use of vehicles to transport construction personnel and materials	Low 24		Low 24

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
Blasting and Vibrations			
▪ Ground vibrations due to pit excavation and the removal of overburden	High 80	▪ Measures should be taken to minimise the amount of air-blast produced by a blast to less than 130 dB in the region of the livestock; ▪ In view of the close proximity of the villages of Dihekeng, it is recommended that permanent seismic and acoustic monitoring stations be established on the boundaries of these villages closest to the mine; ▪ Blast vibrations and deterioration of buildings should be carefully monitored (see blasting and vibrations monitoring in Section 5.9); and ▪ The blasting management plan (Section 4.3) and air quality management plan (Section 4.2) must be implemented to mitigate potential impacts to surrounding communities and structures and mine personnel as a result of blasting activities.	Medium 56
▪ Air-blasting due to pit excavation and the removal of overburden	High 80		Medium 48
▪ Dust and smoke due to pit excavation and the removal of overburden	Medium 70		Medium 40
▪ Fly-rock due to pit excavation and the removal of overburden	High 80		Medium 48
Socio-economic			
▪ Loss of land; surface and groundwater pollution; loss of sense of place; damage to property through blasting; increased noise disturbance and decreased air quality due to the various mining activities	High 60	▪ Procedures and commitments outlined in the Social and Labour Plan (SLP) must be adhered to; ▪ Issues related to land ownership should be addressed between the affected parties, Co-operative Governance Traditional Affairs (COGTA) and the National Department of Land Affairs (DLA). Should this matter not be resolved before mining is to commence, the Applicant, together with COGTA and the DLA must agree to an interim solution with the affected parties to allow access to the land with a compensation protocol implemented as required. Mitigation measures relating to the loss of land for grazing, agriculture and natural resources which should be further investigated include: o Potentially securing alternative grazing land for use by the communities. This can be achieved by utilising separate portions of land within the mining area, and which are not being mined at a specific point in time, being fenced off and retained as pastures until mining progresses towards that portion, at which time a separate grazing area should be fenced off, which could include a rehabilitated opencast strip returned to grazing potential; o Should this not prove possible, a rate per hectare for the loss of grazing land will have to be agreed upon with the relevant stakeholders who will	Medium 39
▪ Increased job opportunities due to commencement of mining activities	Medium 39		High 60 **[Positive]**

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
		then have to be adequately compensated for the loss of grazing land over the time affected. This could take the form of a rental agreement with the relevant persons; and o All trees and vegetation cleared during mine infrastructure construction should be made available for use by members of the community.	
Visual			
▪ Alteration of natural landscape due to Clearance of land / site for opencast pit excavation and surface infrastructure and services	High 60	▪ The visual impact management plan (Section 4.14) must be implemented to mitigate the potential impact of the proposed Canyon Springs Coal Mine on the visual / aesthetic environment.	Medium 44

3.2.2. Operational Phase

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
Terrestrial Ecology			
▪ Destruction of floral and faunal habitat and stripping of topsoil leading to loss of biodiversity and increase in alien invasive species	Medium 56	▪ The biodiversity management plan (Section 4.4), soil management plan (Section 4.10) and hydrocarbon management plan (Section 4.9) must be implemented to mitigate potential impacts to biodiversity and soil resources which may affect terrestrial ecology.	Medium 36
▪ Increase in dust due to operational activities	Medium 56		Medium 33
▪ Potential increase in invasive vegetation due to the removal of natural vegetation	Medium 56		Medium 33
▪ Faunal interactions with structures and personnel, noise, vibration and light disturbance	Medium 56		Medium 33
▪ Contamination by stored chemicals and hazardous materials that threaten faunal and floral species	Medium 56		Medium 36
Aquatic Ecology			
▪ Increased salinity and water pollution due to runoff from contaminated areas including the overburden and temporary discard dump, SCD/PCD, STPs and the TSE pipeline	High 60	▪ Ensure that all Best Management Guidelines as published by the Department of Water Affairs (DWA) are employed and strictly adhered to during all phases of the mining process; and ▪ The soil management plan (Section 4.10) and the aquatic ecology management plan (Section 4.5) must be implemented to mitigate potential impacts to minimise the potential for erosion and sedimentation of runoff.	Medium 39
▪ Sedimentation of the watercourse due to erosion cause by the removal of vegetation	Medium 33		Low 18
Wetlands			

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
▪ Contamination of watercourse and soils; and the persistence of flora and fauna affected due to hazardous materials used in mining operations	High 70	▪ No activities may be undertaken within wetland areas or within 500 m of wetlands until a Water Use Licence (WUL) is granted by DWA; ▪ The wetland management plan (Section 4.8), soil management plan (Section 4.10), surface water management plan (Section 4.7) and biodiversity management plan (Section 4.4) must be implemented to mitigate potential impacts to surface water, biodiversity and soil resources which may affect wetlands.	Medium 36
Soil Quality			
▪ Loss of resource due to collapse of unconsolidated workings during roll over mining	High 80	▪ The soil management plan (Section 4.10) must be implemented to mitigate potential impacts to soil resources which may affect land capability.	Medium 70
▪ Loss of resource due to ponding of surface water on collapsed areas and due to cracking of poorly consolidated rehabilitation.	High 80		Medium 70
▪ Compaction of soils resulting on reduction in soil potential and destruction of the soil horizon and soft overburden	Medium 44		Low 24
▪ Sterilisation of seed pool and discard dump footprint due to the destruction of the soil profile	High 65		Medium 33
▪ Sterilisation of haulage ways and access routes due to the destruction of the soil profile	Medium 44		Low 22
▪ Contamination due to uncontrolled dirty water runoff	High 70		Medium 44
▪ Contamination due to spillage of product and hydrocarbons	High 70		Medium 48

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
▪ Contamination due to uncontrolled dumping outside of dump footprint	Medium 56		22
Groundwater			
▪ Impact on groundwater volumes due to dewatering of the opencast pit	High 80	▪ The numerical groundwater model must be updated with the information obtained during ongoing monitoring to continually improve the long-term strategy in terms of groundwater management. Cognisance of new technologies that may become available must be taken account of; and ▪ The hydrocarbon management plan (Section 4.9) must be implemented to avoid and manage the negative impacts of hydrocarbon spills on groundwater resources; and ▪ The groundwater management plan (Section 4.6) must be implemented to mitigate potential impacts to groundwater resources which may affect groundwater quality and quantity.	High 80
▪ Groundwater quality is negatively impacted due to contamination from the discard dump	Low 18		Low 7
▪ Groundwater is polluted due to hydrocarbon spills	Medium 52		Medium 33
Surface Water			
▪ Contaminated surface runoff from storage and infrastructure areas may pollute watercourses	Medium 36	▪ The surface water management plan (Section 4.7) must be implemented to mitigate potential impacts to surface water resources which may affect surface water quality.	Low 4
▪ Interception of surface run-off to the Ghotwane and Elands Rivers by the opencast pit	Low 7		Low 7
Cultural / Heritage			
▪ Loss of remains of old farmyard at Site 1 due to site clearance for operational activities	Low 28	▪ The heritage and palaeontological management plan (Section 4.13) must be implemented to avoid and mitigate potential impacts to heritage and palaeontological resources.	-
▪ Loss of Middle and Late Stone Age tools and Iron Age Pottery at Site 2 due to site clearance for operational activities			

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
▪ Loss of Middle as well as Late Stone Age tools at Site 3 due to site clearance for operational activities			
Air Quality			
▪ Increased dust fallout due to disturbance and blasting of land cover in mining of the opencast pit ▪ Emissions and particulate matter from machinery / vehicles which results in a local reduction in air quality ▪ Blasting and vibration leading to an increase in dust fallout	High 70	▪ As the main road running through the property is tarred, a very large potential emission source has been reduced at the proposed Canyon Springs Coal Mine; and ▪ The air quality management plan (Section 4.2) must be implemented to mitigate potential impacts to air quality which may affect surrounding communities.	Medium 40
▪ Increased dust fallout due to coal relocation and transport ▪ Wind erosion from topsoil and overburden stockpiles	High 70		Medium 48
Traffic			
▪ Additional traffic due to heavy vehicles transporting product on-site and off-site ▪ Damage to local roads due to an increase in heavy vehicles on the roads ▪ Impacts associated with road safety (mortalities)	Medium 40	▪ It may be appropriate for the mine to negotiate a contribution to the upgrading of the D1944 road (Ramotsho Road) and D626 after the mine has been established. Upgrading the road ought to ensure that the road section will have the ability to carry increase in traffic; and ▪ The traffic management plan (Section 4.12) must be implemented to mitigate potential impacts to road traffic which may affect surrounding communities.	Medium 32
Noise			

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
▪ Increase in noise levels due to the mining activities at the opencast pit	High 70	▪ The noise management plan (Section 4.11) must be implemented to mitigate potential impacts to noise levels which may affect surrounding communities; and ▪ In general, operations should meet the noise standard requirements of the Occupational Health and Safety Act (Act No 85 of 1993).	Medium 48
▪ The removal and transport of overburden to waste rock dumps	High 70		Medium 48
▪ Machinery and equipment at the CHPP	Medium 48		Medium 30
▪ The use of vehicles to transport coal product	Low 24		Low 16
Blasting / Vibrations			
▪ Ground vibrations due to blasting activities occurring at the opencast pit	High 80	▪ The blasting management plan (Section 4.3) and air quality management plan (Section 4.2) must be implemented to mitigate potential impacts to surrounding communities and structures and mine personnel as a result of blasting activities.	Medium 56
▪ Air-blasting due to blasting activities occurring at the opencast pit	High 80		Medium 48
▪ Dust and fumes due to blasting activities occurring at the opencast pit	Medium 70		Medium 40
▪ Fly-rock due to blasting activities occurring at the opencast pit	High 80		Medium 48

3.2.3. Decommissioning / Closure Phase

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
Terrestrial Ecology			
▪ Deterioration of natural vegetation and faunal habitat and the subsequent loss of ecological function due to unsuccessful rehabilitation	High 60	▪ The biodiversity management plan (Section 4.4) must be implemented to mitigate potential impacts to biodiversity and soil resources which may affect terrestrial ecology; ▪ During the decommissioning phase, projects that increase biodiversity within the rehabilitated areas should be implemented by suitably qualified ecologists or organisations such as the Endangered Wildlife Trust or South African National Biodiversity Institute; and ▪ At the closure of the mine, the closure measure defined in Section 10.2.1 must be implemented.	Medium 36
Wetlands			
▪ Erosion which leads to alien species invasion due to unsuccessful rehabilitation of disturbed areas	High 70	▪ There is the opportunity to use a diffused and steady flow regime to enhance wetland functionality and use the flows to enhance surface roughness and vegetation structure. This will have biodiversity and flow regulation benefits to the system; ▪ If grazing regimes, burning frequencies and cultivation are substantially reduced accompanied by the above rehabilitation measures (especially plugging of drains and erosion gullies) a slight improvement in wetland health could be expected; and ▪ The wetland management plan (Section 4.8), soil management plan (Section 4.10) and biodiversity management plan (Section 4.4) must be implemented to mitigate potential impacts to surface water, biodiversity and soil resources which may affect wetlands.	Medium 36
Soil Quality			
▪ Reduction in soil capability; increased erosion potential; disturbance of soil horizons; and soil compaction due to heavy vehicle movement	Medium 52	▪ The biodiversity management plan (Section 4.4), soil management plan (Section 4.10) and hydrocarbon management plan (Section 4.9) must be implemented to mitigate potential impacts to soil resources which may affect land capability.	Medium 33

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
▪ Contamination of soil and reduced soil quality due to hydrocarbon or chemical spillages	Medium 55		Low 22
▪ Unprotected areas of ground yet to be re-vegetated experiencing erosion and loss of soil resource	Medium 52		Low 22
▪ Loss of resource through contamination and the incorrect order of soil replacement during backfilling of soils into the opencast pits	High 65		Medium 33
▪ Loss of resource due to incorrect or inadequate fertilisation of replaced soils and vegetation.	Medium 44		Medium 33
▪ Loss of vegetation cover due to animal and human impacts (over grazing and movement over rehabilitated lands).	Medium 44		Low 22
▪ Contamination /salinisation of soils during the dismantling of infrastructure, and the inclusion of infrastructural debris and waste (carbonaceous coal) above the due to regional water level	Medium 44		Low 22
▪ Contamination of soils due to the spillage of waste from dams	High 65		Low 22
Groundwater			
▪ Recovery of groundwater levels due to mine dewatering being stopped	High 80	▪ The groundwater monitoring programme implemented during the LOM must be ongoing during the rehabilitation phase; ▪ Any external users whose boreholes have been affected in terms of volume	High 80 [Positive]

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
▪ Impacts on groundwater quality due to contaminant migration from hydrocarbon spillages	Medium 44	(lower water levels or drying out of boreholes) or quality must be provided with an equivalent volume of water of a similar- or better quality than that noted pre-mining; ▪ The numerical groundwater model must be updated with the information obtained during ongoing monitoring to continually improve the long-term strategy in terms of groundwater management. Cognisance of new technologies that may become available must be taken account of; and ▪ The groundwater management plan (Section 4.6) must be implemented to mitigate potential impacts to groundwater resources which may affect groundwater quality and quantity.	Low 21
▪ Impacts on groundwater quality due to contaminant migration from seepage of backfilled material	Low 18		Low 6
Surface Water			
▪ Infiltration of polluted surface water into surface water bodies due to dirty water system removed before pollution sources have been removed	Medium 30	▪ The surface water management plan (Section 4.7) must be implemented to mitigate potential impacts to surface water resources which may affect surface water quality.	Low 21
Air Quality			
▪ Emissions and particulate matter from machinery / vehicles which results in a local reduction in air quality ▪ Wind erosion from exposed areas	Medium 32	▪ The air quality management plan (Section 4.2) must be implemented to mitigate potential impacts to air quality which may affect surrounding communities.	Low 21
Traffic			
▪ Road safety impacts; damage to local roads; and additional traffic due to the use of heavy vehicles during decommissioning activities	Medium 40	▪ The traffic management plan (Section 4.12) must be implemented to mitigate potential impacts to road traffic which may affect surrounding communities.	Low 32
Noise			
▪ Increase in ambient noise levels due to the Use of heavy machinery in pit rehabilitation and to remove surface infrastructure	Medium 55	▪ In general, decommissioning activities should meet the noise standard requirements of the Occupational Health and Safety Act (Act No 85 of 1993); and ▪ The noise management plan (Section 4.11) must be implemented to mitigate	Medium 36

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
		potential impacts to noise levels which may affect surrounding communities.	
Socio-economic			
▪ Loss of mining jobs due to retrenchments and downscaling	High 85	▪ It is important to ensure that the rehabilitation measures proposed in this EMP are incorporated into a formal closure and rehabilitation plan for the proposed Canyon Springs Coal Mine once operational. This plan should be updated on an ongoing basis so as to ensure that it remains relevant. At closure, this plan should be implemented to ensure that land affected by mining activities are returned as near as possible to the original state or an end land use agreed upon wherever possible. This will ensure that the land may be used for agricultural practices and provide grazing land for livestock; ▪ The various commitments made in the SLP (Appendix 14) as regard skills development should be implemented during operation to ensure that as many employees as possible are provided with permanent skills to aid them in their future search for employment; ▪ Procedures outlined in the SLP for the downscaling and retrenchment process must be adhered to.	High 60
▪ Land returned to agricultural land ▪ Cessation of nuisance impacts such as noise and blasting.	Medium 39		High 60 [Positive]

3.2.4. Post - Closure Phase

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
Wetlands and Aquatic Ecology			
▪ Negative effect on aquatic biota due to contaminant migration ▪ Increased volumes of water entering the catchment due to water decanting from rehabilitated mine workings	Medium 52	▪ The conceptual closure design as per Section 10.2.1 of the EMP will accommodate for future decant and also be a self-contained passive system requiring no further input after closure. Should this system be successfully implemented, decant of Acid Mine Drainage (AMD) is not foreseen to have a negative impact on wetland systems; ▪ There is the opportunity to use a diffused and steady flow regime to enhance wetland functionality and use the flows to enhance surface roughness and vegetation structure which could in turn have biodiversity and flow regulation benefits to the system; ▪ Rehabilitation programmes should be advised by biodiversity management plans to increase species diversity in rehabilitated areas; ▪ Water should be treated to a degree representative of the natural water quality found within the catchment; ▪ The wetland management plan (Section 4.8 of the EMP), aquatic ecology management plan (Section 4.5) and biodiversity management plan (Section 4.4 of the EMP) must be implemented to mitigate potential impacts to surface water and biodiversity which may affect wetlands and aquatic ecology.	Low 30
▪ Recovery of groundwater levels and the decreased water quality due to mine dewatering deceasing	High 70		Medium 36
▪ Wetland degradation and alien invasive species encroaching due to unsuccessful rehabilitation of wetlands	High 80		Medium 60
Groundwater			
▪ Recovery of groundwater levels due to mine dewatering activities ceasing	High 80	▪ The groundwater management plan (Section 4.6) must be implemented to mitigate potential impacts to groundwater resources which may affect groundwater quality and quantity. ▪ The relevant closure measures described in Section 10.2.1 must be implemented.	-
▪ Impacts on groundwater quality due to contaminant migration	Low 18		Low 6
▪ Potential generation of AMD and pollution of surface water resources due to decant from the rehabilitated mining area	Medium 52		Medium 33

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
Surface Water			
▪ AMD due to water decanting from rehabilitated mine workings ▪ Remaining infrastructure on-site may pollute surface water resources	Medium 33	▪ The surface water management plan (Section 4.7) and groundwater management plan (Section 4.6) must be implemented to mitigate potential impacts to surface water resources which may affect surface water quality.	Low 18

4. MANAGEMENT OF ENVIRONMENTAL IMPACTS

This Section details the management plans to be implemented to manage the impacts of the proposed development on the environment.

4.1. Environmental Control Officer

An Environmental Control Officer (ECO) must be appointed at the Canyon Springs Coal Mine for the aspects of the proposed activity described in Section 2, in order to ensure that the various management plans contemplated herein are implemented and that the necessary auditing, reporting and monitoring are conducted as described. The ECO should have an appropriate 3-year Bachelor's degree / National Diploma in Natural, Engineering or Environmental Sciences or related field and preferably experience in a related or similar field. Until such time as it is possible to employ a suitably qualified ECO, the services of a contracted specialist should be employed to perform the necessary management / monitoring procedures.

4.2. Air Quality Management Plan

4.2.1. Objectives

Minimise, reduce and, where possible, avoid negative impacts on air quality standards in the receiving environment.

4.2.2. Goals

The goals to accomplish the above objective are to:

- reduce the amount of dust and particulate matter generated by activities at the proposed Canyon Springs Coal Mine;
- ensure that the concentrations of dust and particulate matter generated fall within the applicable National standards; and
- mitigate the impact on the surrounding sensitive receptors.

4.2.3. Management Measures

The following table contains Air Quality Management (AQM) measures to meet the above goals. The table indicates the person responsible to ensure that these commitments are adhered to and implemented as necessary.

Table 2: Air quality management measures

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
Construction and Operational Phase			
AQM 1	Vegetation	▪ The frequency of vegetation disturbance must be kept to a minimum.	Site manager / ECO
AQM 2	Dust suppression methods	▪ Surface treatments such as wet suppression can be employed to limit dust generation through the use of water, but this is considered to be an expensive option.	ECO
AQM 3		▪ Other surface treatments include the use of chemicals such as calcium chloride or magnesium chloride. These chemicals attract moisture – drawing moisture out of the air during periods of high humidity, and also reducing the evaporation rate of water during hot periods. Another approach to dust control involves the application of organic or synthetic compounds that physically bind the dust particles together. Calcium lignosulphonate can significantly reduce fugitive dust emissions from gravel roads because of their gluing and waterproofing action on soil particles. Other products act as surfactants which act as wetting agents. The products not only reduce the amount of water required for wetting the roads, but also have slight binding properties.	ECO
AQM 4		▪ Another approach to dust control involves the application of organic or synthetic compounds that physically bind the dust particles together - decrease of about 50-80% can be achieved by surface treatments.	Site manager / ECO
AQM 5	Dust control	▪ Ensure that disturbed soil is compacted and stabilised either through the use of chemical or vegetative method.	ECO
AQM 6		▪ Wet suppression or chemical stabilisation of unpaved roads, avoiding track-on onto neighbouring paved roads; as well as drop height and mass transfer reduction will aid in the reduction of dust generation due to construction activities.	Site manager
AQM 7		▪ The reduction of unnecessary traffic and the implementation of strict speed control will mitigate the amount of vehicular generated dust and particulate matter.	Site manager
AQM 8		▪ The way materials are handled e.g. moving soil, transporting waste rock, and extracting ore will affect the amount of dust and particulate matter present in the air. Reducing mass transfer: by dropping the height of overburden dumps and the discard dump, and reducing wind speed over the dumps e.g. through sheltering, the amount of dust may be reduced.	ECO / Site manager

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
Decommissioning Phase			
AQM 9	Dust and Particulate Matter Generation	▪ Wet suppression of dust on roads being used for decommissioning purposes will reduce dust amounts on-site.	Site manager / ECO
AQM 10	Rehabilitation	▪ Rehabilitate exposed areas with topsoil and ensure the re-vegetation of the topsoil is conducted as soon as possible.	ECO

4.3. Blasting Management Plan

The blasting management plan was informed by the Blasting Impact Assessment that was undertaken by Blast Analysis Africa in 2013.

4.3.1. Objectives

Minimise, reduce and, where possible, avoid negative impacts on air quality standards and noise levels in the area while maintaining safety standards so as to reduce the risk of loss or injury to people, property and animals due to blasting activities.

4.3.2. Goals

The goals to accomplish the above objective are to:

- minimise the impact of the seismic force generated i.e shockwaves / vibrations;
- reduce the amount of dust and particulate matter generated as a result of blasting activites;
- ensure the dust, particulate matter and fly rock generated by blasting events remain within the calculated safety radius;
- ensure that the baseline structural analysis and study are taken into account prior to any blasting to determine the baseline characteristic of the area to verify any future claims of structural damage; and
- mitigate the impact on the surrounding sensitive receptors.

4.3.3. Management Measures

The following table contains Blasting Management (BM) measures to meet the above goals. The table indicates the person responsible to ensure that these commitments are adhered to and implemented.

Table 3: Blasting management measures

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
Construction and Operation Phase			
BM 1	Tulip Plugs	▪ It is a requirement that the blast design(s) proposed for the Canyon Springs Coal Mine should make use of a blasting accessory known as a "Tulip Plug" which should be used in all blasts. The Tulip Plug is designed to contain the explosive energy released in a blast by altering the mechanics of the rock-breaking process. Tulip plugs have been shown to reduce the impact of: o Ground vibrations (by reducing the mass of explosives in all blast-holes); o Fly-rock (by directing more explosive energy down-wards); and o Air blast (by containing more explosive energy within the blast).	Site / blasting manager
BM 2		▪ Tulip Plugs will achieve the above benefits provided all other blasting parameters are strictly controlled. Incorrect drilling, charging, stemming and/or timing of the blast holes may still result in a dangerous situation where incidents may occur. In view of this, it is a requirement that all blast designs are overseen by a qualified engineer who is familiar with the Tulip Plug technology. Blasters and their crews should be trained in the use of the Tulip Plug in order to achieve the desired results.	Site / blasting manager
BM 3	High Definition Recordings	▪ It is recommended that all blasts are recorded on a suitable HD video camera to record any fly-rock that may be thrown into the air by any blast. ▪ These digital videos of blasts must be kept on record by the mine and given referenced by the date and time and allocated a reference number of the particular blast concerned. ▪ After a minimum of ten blasts are fired and an analysis of the recordings by the blast engineer illustrate that the blasts have not thrown any fly-rock beyond the mine boundaries (i.e. blast-design and utilisation of tulip plugs achieve adequate safety parameters), the appointed engineer and the appointee may agree to reduce the radius of the area to be cleared before all subsequent blasts.	ECO / Specialist
BM 4		▪ If the analysis of the HD video recording show that the blast design and management measures have failed to achieve the desired safety parameters in terms of fly-rock, all livestock and residents should be cleared to a radius of 500 m in order to avoid the danger	Site / blasting manager

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
		of fly rock injuries or deaths. Additionally, at this distance the effects of ground vibrations will be minimal.	
BM 5	Ground vibration	▪ The ground vibration generated by any blast should not be allowed to exceed 12.7 mm / s at any building in order to limit the risk of cosmetic or any other damage. These lower frequencies are achieved by ensuring large hole diameters and long timing delays between holes. Additionally, the maximum mass of explosives that can be fired per delay must not be greater than 950 kg at a distance of 500 m from the village of Dihekeng.	Site / blasting manager / ECO
BM 6	Dust	▪ Minimise the effects of dust and smoke by blasting when the wind is blowing in the opposite direction to sensitive receptors such as Dihekeng.	Site / blasting manager
BM 7	Blast-holes	▪ The setting out and drilling of all blast-holes must be supervised by a suitably qualified blast engineer to ensure proper distribution of explosives throughout the blast.	Site / blasting manager and ECO
BM 8		▪ All blast-holes must be timed with detonators fitted with sufficiently accurate delays in order to ensure that the optimal blast timing is achieved; additionally, it is recommended that electronic detonators are used.	ECO
BM 9	Fly Rock	▪ Measures that should be taken to further minimise fly rock include: o Ensure that all blast holes are stemmed to at least 25 times their diameter; o All loose rocks should be cleared before blasting; o All blast-holes should be initiated at or near the toe; and o The position and drilling of each blast-hole should be supervised to ensure that no hole or part-hole is overburdened or under-burdened.	Site / blasting manager
BM 10	Traffic	▪ All traffic on the D2740 and the D1944 must be stopped during blasting operations.	Site / blasting manager

4.4. Biodiversity Management Plan

The biodiversity management plan was informed by the Terrestrial Ecological Assessment that was undertaken by Strategic Environmental Focus in 2012 and the follow-up survey conducted in 2013.

4.4.1. Objectives

Minimise, reduce and, where possible, avoid potential negative impacts on biodiversity characterising the receiving environment.

4.4.2. Goals

The goals to accomplish the above objective are to:

- minimise the loss of natural habitat;
- prevent the destruction of sensitive and protected faunal / floral species associated with the proposed area for development;
- allow for faunal movement across the site;
- avoid the reduction in the intrinsic biodiversity value of the receiving environment; and
- ensure that all impacts upon surrounding biodiversity are minimised, reduced and where possible avoided.

4.4.3. Management Measures

The following table contains Biodiversity Management (BDM) measures to meet the above goals. The table indicates the person responsible to ensure that these commitments are adhered to and implemented.

Table 4: Biodiversity management measures

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
Construction Phase			
BDM 1	Construction activities	▪ The extent of the site and associated mining and construction areas and camps must be identified and demarcated e.g. using danger tape with steel droppers. These areas must be maintained until the cessation of construction work.	ECO / Construction manager
BDM 2		▪ As far as possible, construction should be limited to the daylight hours in order to minimise the need for lights.	ECO
BDM 3	Faunal species	▪ Construction should take place in the winter months where possible in order to minimise the impacts on the breeding activities of the terrestrial faunal species.	Construction manager
BDM 4	Education	▪ Compile an education programme for all mine workers to ensure compliance to all aspects of the EMP as well as educating personnel in the safe and proper conduct within areas of natural habitat. This education programme should be included in the environmental awareness plan. Refer to Section 8.	ECO
Construction and Operation Phase			
BDM 5	Floral Species	▪ No activities should take place within areas zoned as Optimal or Irreplaceable Critical Biodiversity Areas (CBA), as per the Mpumalanga Biodiversity Sector Plan (MBSP).	ECO / Site manager
BDM 6		▪ Vegetation must be retained in position for as long as possible and removed immediately ahead of construction / earthworks in that area.	ECO
BDM 7		▪ Make use of existing roads and tracks where feasible rather than creating new routes through vegetated areas.	ECO
BDM 8	Plant Rescue and Relocation Plan	Based on the occurrence of floral species of conservation concern, it is recommended that a rescue and relocation operation be implemented, with the following stipulations: ▪ A floral rescue operation should take place prior to commencement of mining activities.	ECO / Specialist
BDM 9			
BDM 10		▪ The mine should clearly demarcate the area to be mined in advance for the purpose of the rescue operation.	Site manager
BDM 11		▪ A suitably qualified botanist should conduct a thorough examination of all areas where loss of habitat is to occur and mark specimens that are to be relocated.	Specialist
BDM 12		▪ The suitably qualified botanist should be contacted at least one month in advance and	Specialist

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
		provided with a map and a list of species to be relocated.	
BDM 13		▪ Floral rescue operations should be conducted from November to January.	ECO / Specialist
BDM 14		▪ Sufficient time should be made available for the rescue operation. The duration of the operation should be discussed with the botanist scheduled to conduct the operation.	ECO / Specialist
BDM 15		▪ Locality of specimens collected is to be mapped and notes taken on the microenvironment in which the specimen is located.	ECO / Specialist
BDM 16		▪ Specimens should be translocated to an area identified as suitable by the botanist conducting the flora rescue operation in consultation with Mpumalanga's Directorate Nature Conservation.	ECO / Specialist
BDM 17		▪ Flora rescue operation must continue for the life-span of the mining operation rather than be conducted as a single operation as this will allow ecological processes based on wind and faunal movement to continue for the natural vegetation over the lifespan of the mine.	ECO / Site manager
BDM 18		▪ Where the declining and protected plants occur within the footprint of the activity, the plants should be removed and / or removal supervised by a suitably qualified specialist and replanted as part of vegetation rehabilitation after the activity has ceased (Note: Nationally Protected Tree Species that have to be relocated, pruned or destroyed requires a permit from the Department of Agriculture, Forestry and Fisheries (DAFF) while plants listed as Declining or provincially protected that are moved within the property do not require any permits).	ECO
BDM 19		▪ Plants removed for transplanting which are not immediately re-planted must be kept under approved nursery conditions. Only the vegetation directly affected by operational activities may be removed and any disturbance to the adjoining natural vegetation cover must not be allowed.	ECO
BDM 20		▪ All threatened and protected plants not directly affected by the proposed development, must be cordoned off as no-go areas during construction of infrastructure.	ECO / Site manager
BDM 21	Alien invasive eradication and monitoring plan	▪ During construction, the construction area and immediate surroundings should be monitored regularly for emergent invasive vegetation. All alien seedlings and saplings must be removed as they become evident for the duration of construction.	ECO

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
BDM 22		▪ Where possible, use manual labour to remove alien plants, instead of chemicals. If chemicals have to be used, the manufacturer's instructions must be specifically adhered to in terms of quantities, time of application etc. Ensure that only trained individuals handle chemicals. Do not spray in the proximity of any protected or declining plants species. Also, do not spray chemicals on windy days as the drift could kill indigenous vegetation. Ensure that no chemicals enter the watercourses.	ECO
BDM 23		▪ Rehabilitate all areas cleared of invasive plants as soon as practically possible.	ECO
BDM 24		▪ Any material that is transported should be covered with a tarpaulin sheet as far as possible. Dispose of eradicated plant material at an approved solid waste disposal site.	ECO / Site manager
BDM 25		▪ All construction vehicles, equipment, and material should be free of plant material. All equipment and vehicles should be cleaned prior to initial access onto the construction site. This should be verified by the ECO.	Site manager
BDM 26	Faunal relocation	▪ Any faunal species located on the site, which cannot relocate themselves (e.g. burrowing mammals), should be moved in an ecologically acceptable manner to a more suitable location. This should be undertaken by a qualified faunal relocation expert.	ECO/ Specialist
BDM 27	Wild and domestic animals	▪ No wild animal may be fed on-site; or be hunted, snared, captured, injured or killed. This includes animals perceived to be vermin. Checks of the surrounding natural vegetation must be regularly undertaken to ensure no traps have been set. Any snares or traps found on or adjacent to the site must be removed and disposed of.	ECO / Site manager
BDM 28		▪ No domesticated animals must be allowed on-site.	ECO
BDM 29		▪ To prevent possible collisions with animals, drivers of construction vehicles must remain vigilant to the possibility of animals crossing their paths and a strict speed limit should be adhered to.	ECO / Site manager
Decommissioning Phase			
BDM 30	Rehabilitation	▪ Re-vegetation should include seeds from the adjacent natural areas and any rescued protected plants and / or plants of conservation concern that might have been impacted upon by the emergency / unforeseen event. Use only indigenous plant species naturally occurring in the area during rehabilitation.	ECO / Specialist

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
BDM 31		▪ All overburden / soils utilised for rehabilitation purposes must be placed in a configuration which is in accordance with accepted conservation practices suitable for proposed subsequent / end use of the land.	ECO
BDM 32		▪ The land must be cleared of waste and should be left in a condition as close as possible to that prior to use.	Site manager
BDM 33		▪ Cordon off areas that are under rehabilitation as no-go areas using danger tape and steel droppers. If necessary, these areas should be fenced off to prevent vehicular, pedestrian and livestock access until such time that rehabilitation was found to be successful and the disturbed area covered with perennial growth (at least two years).	ECO / Site Manager
BDM 34		▪ The re-introduction of livestock to all rehabilitation areas must be delayed until an acceptable level of re-vegetation has been reached, this is done to ensure that no alien invasive plants are allowed to colonise the site whilst rehabilitation is taking place.	ECO / Site manager
BDM 35	Infrastructure	▪ All infrastructure should be dismantled and fuel storage facilities should be removed immediately by completion of the decommissioning phase.	Site manager

4.5. Aquatic Ecology Management Plan

The aquatic ecology management plan was informed by the Aquatic Ecological Assessment that was undertaken by Strategic Environmental Focus in 2013.

4.5.1. Objectives

Minimise, reduce and, where possible, avoid potential negative impacts on aquatic ecological diversity characterising the receiving environment.

4.5.2. Goals

The goal to accomplish the above objective is to:

- limit impacts to watercourses which could alter the habitat for associated species or otherwise lower the intrinsic biodiversity thereof.

4.5.1. Management Measures

The following table contains Aquatic Ecology Management (AEM) measures to meet the above goals. The table indicates the person responsible to ensure that these commitments are adhered to and implemented.

Table 5: Aquatic ecology management measures

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
Construction and Operational Phase			
AEM 1	Management of Siltation	▪ The slopes of all dumps must remain compacted and shaped to retain a 1:5 slope.	Site manager / ECO / Soil specialist
AEM 2		▪ Exposed areas on all dumps which have reached capacity must be re-vegetated as far as practicably possible.	ECO / Site manager
AEM 3		▪ Contour drains will be maintained to limit erosion and avoid soil losses.	Site manager
AEM 4	Prevention of Contamination	▪ Clean and dirty water systems are separated as per the surface water management plan in Section 4.7	Site manager
AEM 5		▪ SCD and PCD must be constructed according to the design report (Appendix 15)and design drawings (Appendix 17) in order to effectively separate clean and dirty water.	ECO / Site manager
AEM 6		▪ Do not allow any discharge or seepage from the mined area and / or associated structures to occur within the catchment.	ECO
AEM 7		▪ Ensure that any measures taken support the natural hydrological cycle within the catchment, both in terms of volume and timing of natural flows.	ECO / Site manager
Decommissioning / Closure Phase			
AEM 8	Decant AMD	▪ For management measures pertaining to decant of groundwater as well as AMD problems potentially occurring at the proposed Canyon Springs Coal Mine, please refer to the groundwater management plan in Section 4.6.	ECO

4.6. Groundwater Management Plan

The groundwater management plan below was informed by the Groundwater Impact Assessment that was undertaken by Rison Groundwater consulting in 2011 and the follow-up numerical modelling study prepared by Future Flow GPMS in 2013.

4.6.1. Objectives

Minimise, reduce and, where possible, avoid potential negative impacts on groundwater resources characterising the receiving environment.

4.6.2. Goals

The goals to accomplish the above objective are to:

- minimise the volume of contaminated water produced at the proposed mine;
- mitigate the impact of dewatering on external users' boreholes;
- effectively manage any poor quality decant arising so as to To effectively monitor up- and downstream groundwater quality to ascertain the development of any contamination plumes with sufficient lead time so as to stage the necessary interventions;
- prevent the mixing thereof with clean surface water resources, as well as surrounding wetlands.

4.6.3. Management Measures

The following table contains Groundwater Management (GM) measures to meet the above goals. The table indicates the person responsible to ensure that these commitments are adhered to and implemented.

Table 6: Groundwater management measures

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
Operation Phase			
GM 1	Rollover mining	▪ Progressive rehabilitation during the LOM should ensure that discard is placed at the bottom of the excavation to a point not above the elevation of the original coal seam. Consecutive layers must be placed back in the same order as they were removed.	Site manager
GM 2	Dewatering	▪ Any users falling within the zone of influence of dewatering where a reduction in water level or the complete drying up of a borehole is noted must be provided with an equivalent quantity of water of a similar- or better quality than that noted during the hydrocensus.	ECO / Site manager
GM 3	Monitoring	▪ Ensure that the groundwater monitoring programme described in Section 5.5 is implemented. This programme will also monitor the effects of dewatering within the zone of influence as well as the quality of regional groundwater resources.	ECO
GM 4	Maintenance	▪ The surface water management plan (Section 4.7) should be implemented to prevent contamination of groundwater resources from the ingress of contaminated water on surface.	ECO / Site manager
Decommissioning and Post-Closure Phase			
GM 5	Rehabilitation	▪ Contamination from the rehabilitated area can be reduced by placing carbonaceous material (i.e. discard) used for backfilling the pit at the bottom where oxygen will first be displaced by rising groundwater levels. This will also reduce the risk of seasonal exposure of the carbonaceous material and sulphide minerals to oxygen when the groundwater level drops during the dry season.	ECO
GM 6	Decant and AMD	▪ There is potential for groundwater to become contaminated as it recharges during post-closure. This is as a result of interactions between the geology and groundwater being exposed to oxygen. In order to manage the impact of this evaporation pans have been designed to capture contaminated decant before it is exposed to the natural environment (see Section 10.2.1 for further detail).	ECO / Specialist / Site Manager
GM 7	Modelling	▪ In order to address the problems of AMD, the numerical groundwater and long-term AMD model must be refined by implementing the following: o Conduct kinetic leach tests on coal material to determine whether forecast contaminant concentrations associated with decant will abate in long-term; and o Ongoing updating of the numerical groundwater model with the results of ongoing groundwater monitoring to better define the potential future impact.	Specialist

4.7. Surface Water Management Plan

The surface water management plan below was informed by the Surface Water Impact Assessment that was undertaken by African Environmental Development in 2012.

4.7.1. Objectives

Minimise, reduce and, where possible, avoid potential negative impacts on surface characterising the receiving environment.

4.7.2. Goals

The goals to accomplish the above objective are to:

- minimise the volume of contaminated water produced at the proposed mine;
- ensure that the interaction between clean and dirty stormwater runoff is prevented;
- avoid reducing the baseline quality of the receiving catchment;
- limit alteration of the baseline hydrological characteristics of the receiving catchment; and
- limit the contamination of groundwater resources by contaminated surface water runoff.

4.7.3. Management Measures

The following table contains Stormwater Management (SWM) measures to meet the above goals. The table indicates the person responsible to ensure that these commitments are adhered to and implemented.

Table 7: Surface water management measures

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
Construction and Operational Phase			
SWM 1	Dirty water run-off	▪ The construction phase should be undertaken during the dry months if possible.	Construction manager
SWM 2		▪ Small earth dams should be created to intercept any surface run-off during construction until such time as the dirty water containment system is completed. These dams could be located in the same place the final SCD / PCD would be located to intercept silt.	ECO / Construction manager
SWM 3	Erosion prevention	▪ The stream crossing / culvert will be constructed using a row of suitably sized pre-cast concrete pipes. The total length of each pipeline will be approximately 30m in length, laid in the direction of the stream flow, wrapped in geotextile and then backfilled with selected fill material from nearby SCD dam construction. In order to prevent any erosion stone pitching or gabion baskets will be placed upstream and downstream of the inlet and outlet of the culvert pipes.	ECO / Construction manager
SWM 4	Surface infrastructure	▪ Ensure that berms are constructed along all up-gradient areas i.e. along the boundaries of the areas where potentially contaminated surfaces may develop so as to divert all surface runoff from uncontaminated up-gradient areas around the surfaces into the local streams.	Construction manager
SWM 5		▪ All contaminated water will be diverted into the SCD and PCD as described in Section 2.4.2).	Construction and site manager
SWM 6		▪ Locate any sanitary convenience, fuel depots, reservoir or depots for any substance, which is likely to cause pollution of a water resource, outside the 1:50 year flood-line of any watercourse.	ECO and construction manager
SWM 7	Culvert	▪ Construction of the culvert should be carried out in winter and be limited to the 20m x 300m footprint across the No-Name stream.	Construction manager
Decommissioning Phase			
SWM 8	Surface Infrastructure	▪ The dirty water management system must be kept in place and maintained until all point sources of pollution on surface are removed.	ECO
SWM 9		▪ The stream crossing / culvert across the No-Name stream should be removed with	Site manager

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
		care, all sediment and pipes placed into the stream and wetland should be fully removed in order to return the stream and wetland to their original functionality. Monitoring should be conducted as proposed in Section 5.6 to ensure the stream returns to its original state once the stream crossing / culvert is removed.	
SWM 10		▪ Ensure that the SCD and PCD are adequately dismantled and rehabilitated, and that the contents of the dams are adequately treated / disposed of and not directly discharged into any surface water resource.	ECO / Site manager
SWM 11	Floodlines	▪ No decommissioning activities may occur within the 100 year floodline and any spillage into any watercourses must be reported to the DWA.	ECO / Site manager
SWM 12	Decant AMD	▪ For management measures pertaining to decant and AMD potentially problems experienced at the proposed Canyon Springs Coal Mine, please refer to the Closure Measures in Section 10.2.1.	-

4.8. Wetland Management Plan

The wetland management plan was informed by the Wetland Impact Assessment that was undertaken by Strategic Environmental Focus in 2012 and 2013.

4.8.1. Objectives

Minimise, reduce and, where possible, avoid potential negative impacts on riparian wetlands characterising the receiving environment.

4.8.2. Goals

The goals to accomplish the above objective are to:

- ensure contaminated run-off does not come into contact with wetlands;
- mitigate the siltation of- and retain integrity of the surrounding wetlands.

4.8.3. Management Measures

The following table contains wetland management (WM) measures to meet the above goals. The table indicates the person responsible to ensure that these commitments are adhered to and implemented.

Table 8: Wetland management measures

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
Construction and Operation Phase			
WM 1	Floral cover	▪ By increasing the basal cover and surface roughness through the removal of livestock grazing within the development footprint, or from areas which receive run-off water, sedimentation received by wetlands can be reduced.	ECO / Site manager
WM 2		▪ This can be enhanced through a seeding program, especially downslope of any mining activities. Species to be used on vertic soils associated with a seeding program for the wetlands include: *Ischaemum afrum; Sehima galpinii; Setaria incrassate; Panicum coloratum; Bothriochloa insculpta; Aristida bipartite; and Sorghum versicolor.*	ECO / Specialist
WM 3		▪ Surrounding natural vegetation should not be disturbed to minimise chances of invasion by alien vegetation. All alien seedlings and saplings must be removed as they become evident for the duration of construction and operational phase; it must be noted that manual or mechanical removal is preferred to the chemical control of alien species.	ECO / Site manager
WM 4	Construction vehicles	▪ All construction vehicles, equipment and material should be free of plant material. All equipment and vehicles should be cleaned prior to access on to the site.	ECO / Site manager
WM 5	Surface and stormwater control	▪ Implement erosion control of all banks i.e. energy dissipaters and canal flow designs, to reduce erosion and sedimentation into river channels or wetlands.	ECO / Site manager
WM 6		▪ The release of clean water from site (if any) must be diffused and not reach the wetland as concentrated flows, which can negatively impacts on wetland soils.	ECO / Site manager
WM 7		▪ Create diversion berms as soon as possible, once construction commences to divert clean surface run-off around the site. These berms should be vegetated as soon as possible to minimise erosion and sedimentation of watercourses.	ECO / Site manager
WM 8		▪ Design measures as described in Section 2.4 must be implemented	Site manager
WM 9		▪ The re-release of clean water from clean and dirty water separation infrastructure must be diffused and not reach the wetland as concentrated flows where it will have serious negative impacts on the wetlands soils. In the case the results of any on-going monitoring illustrate that pollution of any surface or groundwater resources has occurred, or as a result of an emergency situation, the Regional Representative of the DWA must be	ECO / Suitable surface water and / or wetland specialist

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
		informed immediately.	
WM 10		▪ The Environmental Procedures Related to Emergencies and Remediation (Section 7) must be adhered to in case of spillage or pollution of watercourses. The Regional Representative of the DWA must be informed immediately should an emergency arise.	ECO
WM 11	Water Use Licence	▪ No construction / activities may be undertaken within the wetland areas or within 500m form the edge of the wetlands without a WUL for activities in terms of Section 21 (C) and (I) of the NWA is granted by the DWA.	Construction manager
Operation Phase			
WM 12	Wetland buffer	▪ No activities should occur within the 30 m buffer of the wetlands.	ECO
WM 13	Coal	▪ Coal spillage should be dealt with rapidly to prevent excessive build-up of material. The spillage should be removed as soon as possible by hand shovel or mechanical means and the coal should then be added to stockpiles.	ECO / Site manager
WM 14		▪ Trucks transporting the coal may not be overloaded and the coal load must be spread evenly within the truck to prevent coal falling from trucks.	ECO / Site manager
WM 15	Stream Crossing	▪ As soon as mining of pit 1 has ceased, the stream crossing over the No-Name stream must be removed and the area rehabilitated (Appendix 13 and 15).	ECO / Site manager
WM 16		▪ Erosion control for the banks and bed of any watercourses crossed (stream crossing) must be implemented so as to reduce erosion and sedimentation thereof.	ECO
Decommissioning			
WM 17	Rehabilitation	▪ The stream crossing / culvert across the No-Name stream should be removed as described in the closure measures (Section 10.2.1)	Site manager
WM 18		▪ Before the decommissioning can be signed off by the ECO an appropriately qualified wetland ecologist should be consulted to ensure the portion of wetland affected by the culvert has been rehabilitated effectively	Specialist / ECO
WM 19		▪ Where possible, rehabilitation should be done systematically throughout the operational phase into the decommissioning phase of the mine. Cognisance must be taken of future decant when rehabilitation plans are being developed.	ECO

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
WM 20		▪ All alien vegetation emerging during the decommissioning phase should be removed before it becomes established. A qualified botanist should be consulted to assist during the rehabilitation to increase species diversity.	ECO / Specialist
WM 21		▪ Fuel storage facilities should be removed immediately upon completion of decommissioning phase.	Site manager
WM 22		▪ Berms should be removed and their footprint areas vegetated with indigenous plant species as soon as mining is complete.	ECO / Suitable specialist / botanist
WM 23		The rehabilitation of surface areas affected by mining activities must structurally allow for the attenuation of peak flows so as to not cause negative impacts on wetlands. More specifically as a guideline: ▪ Post development flows for frequent, average every afternoon type storm event 6 mm over 2 hours, will not exceed pre development flows; and ▪ Post development velocities associated with the 1:5 year return event storm will be within 25% of predevelopment velocities.	ECO / Site manager
WM 24	Decant AMD	▪ For management measures pertaining to decant of groundwater as well as AMD problems potentially occurring at the proposed Canyon Springs Coal Mine, please refer to the groundwater management plan in Section 4.6.	-
WM 25		▪ The proposed conceptual closure design (see Appendix 15) must be adhered to in order to manage the potential for AMD through the construction of four evaporation plans.	ECO / Site manager

4.9. Hydrocarbon Management Plan

4.9.1. Objectives

Minimise, reduce and, where possible, avoid potential negative impacts hydrocarbons pose on the receiving environment.

4.9.2. Goals

The goals to accomplish the above objective are to:

- ensure that any spills are quickly contained, cleaned and the affected area rehabilitated;
- adhere to best practice standards regarding hydrocarbon management;
- ensure effective separation of clean and contaminated areas thoughout the LOM.

4.9.3. Management Measures

The following table contains hydrocarbon management (HCM) measures to meet the above goals. The table indicates the person responsible to ensure that these commitments are adhered to and implemented.

Table 9: Hydrocarbon management measures

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
Construction, Operation and Decommissioning Phase			
HCM 1	Drip trays and storage	▪ All mine and contractor-owned generators will be placed on drip trays to catch all spills and leaks, while all maintenance work on equipment, vehicles, machinery, etc. will be done over a plastic tarpaulin or steel drip trays situated within dirty water catchment areas.	ECO
HCM 2		▪ Any pumps, machinery or other equipment that require oil, diesel, etc., that are to remain in one position for longer than two days will be placed on drip trays which are to be emptied regularly. Any effluent from the drip trays and any spilled oils and fuels will be collected and stored in 210 litre drums within the service-bay area before being collected and disposed of by a licensed waste removal company.	ECO / Site manager
HCM 3		▪ The servicing of vehicles and equipment will only be permitted at designated areas such as the workshop.	ECO
HCM 4		▪ Store oils and other lubricants in a bunded storeroom with a capacity to contain 110% of the total volume thereof.	ECO
HCM 5		▪ Ensure that all mechanical equipment and vehicles used during operation are kept in good working order to prevent any leakage of oil, petrol, diesel, hydraulic and other associated fluids.	ECO
HCM 6	Disposal	▪ The Environmental Department must keep copies of all disposal certificates on-site.	ECO
HCM 7	Fuel and lubricants	▪ Above surface diesel tanks and their associated bund walls will be operated and maintained according to the South African National Standards (SANS) for the "storage and distribution of petroleum products in above ground bulk installations" (SANS 10089-1:2003, edition 4.1).	ECO
HCM 8		▪ The contractor(s) supplying fuel and lubricants to the Mine are required to have an emergency management system in place in order to deal with possible vehicle accidents or accidental spillage. This would typically involve emergency teams that would have the capacity to neutralise spills and begin rehabilitation of the affected area within hours.	ECO / emergency personnel
HCM 9	Spills	▪ Keep spill kits or sorp materials on hand to clean up hazardous hydrocarbon spills. Once used, this material will be treated as hazardous waste and disposed of accordingly at a	ECO

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
		permitted hazardous waste site.	
HCM 10		▪ Should an oil spill occur as a result of leaking equipment, machinery or vehicles, it is to be cleaned utilising oil remediation solvents or commercial hydrocarbon spill kits of which the Mine is to maintain a supply on-site.	ECO
HCM 11		▪ A 210 litre drum for the collection of spilled oils and fuels, together with a drip tray to catch spills and leaks before they can contaminate soil and underlying groundwater, must be available on-site at all times.	ECO
HCM 12		▪ Implement a spill response plan and train employees to react efficiently to address any spillage.	ECO
HCM 13	Dirty water	▪ The catchment berms demarcating the dirty water catchment will be maintained at a minimum height of 0.5m to ensure that any spilled hydrocarbons transported by stormwater will not enter areas of accelerated infiltration to underground.	ECO / Site manager
HCM 14	Remediation and rehabilitation	▪ Soil contaminated with hydrocarbons should be moved to an allocated area where it will be rehabilitated and soil that cannot be rehabilitated should be disposed of at an appropriate landfill site.	ECO
HCM 15		▪ In the case of pollution of any surface or groundwater, the Regional Representative of the DWA must be informed immediately.	ECO

4.10. Soil Management Plan

The soil management plan was informed by the Soil Impact and Land Capability Assessment that was prepared by Earth Science Solutions in 2012.

4.10.1. Objectives

Minimise, reduce and, where possible, avoid potential negative impacts on soil and agricultural resources characterising the receiving environment.

4.10.2. Goals

The goals to accomplish the above objective are to:

- avoid and mitigate soil erosion;
- limit impacts arising from physical and structural soil changes;
- retain soil fertility throughout the LOM;
- avoid and mitigate soil contamination; and
- ensure effective rehabilitation to restore pre-mining land capability.

4.10.3. Management Measures

The following table contains soil management (SM) measures to meet the above goals. The table indicates the person responsible to ensure that these commitments are adhered to and implemented.

Table 10: Soil management measures

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
Construction and Operation Phase			
SM 1	Stripping	▪ Utilisable soil (topsoil and upper portion of subsoil B2/1) must be removed and stockpiled separately from the lower B horizon, with the ferricrete layer being separated from the soft/decomposed rock, and wet based soils separated from the dry soils if they are to be impacted. The utilisable soil be stripped to a depth of 700 mm or until hard rock/ferricrete is encountered.	ECO / Construction manager
SM 2		▪ The depths of utilisable materials at the Canyon Springs Coal Mine vary between 150 mm and 800 mm. However, due to the shallow soil depths on the more rocky areas, albeit that these are a small percentage of the overall area, it is recommended that sufficient materials are removed from the areas where the soil depths are present and do exist, so that the shallow areas can be adequately restored during rehabilitation and at closure.	ECO / Construction manager
SM 3		▪ Only large vegetation is to be removed prior to stripping. It is recommended that all vegetation is stripped and stored as part of the utilisable soil.	ECO / Construction manager
SM 4		▪ Stripping must only occur where soils are to be disturbed by activities as described in the design report (Appendix 15), and where a clearly defined end rehabilitation use for stripped soil has been identified.	ECO / Construction manager
SM 5	Stockpiling	▪ Ensure all topsoil is stored in such a way and in such a place that it will not cause the damming up of water, the creation of erosion gullies, or be washed away.	ECO
SM 6		▪ Topsoil is to be handled twice only – once to strip and stockpile, and once to replace and level.	ECO
SM 7		▪ Topsoil should not be stripped when it is still wet.	ECO
SM 8		▪ Topsoil must at no point in time be buried, mixed with spoil (excavated subsoil), rubble or building material, or subjected to compaction or contamination by vehicles, machinery or contaminated surface water runoff. This will render the topsoil unsuitable for use during rehabilitation.	ECO / Construction manager
SM 9		▪ Stockpiling areas will be identified in close proximity to the source of the soil to limit handling and to promote the re-use of soils in the correct areas. All stockpiles will be	ECO

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
		founded on stabilised and well-engineered pads.	
SM 10		▪ Soil stockpile and berm heights have to be restricted where possible to less than 1.5 m so as to avoid compaction and damage to the soil seed pool. Each bench should ideally be 1.5 m high and 2 m wide. Where stockpiles higher than 1.5m cannot be avoided, a maximum height of 15 m will only be allowed.	ECO
SM 11		▪ The topsoil stockpile side slopes should be stabilised at a slope of 1 in 6. This will promote vegetation growth and reduce run-off related erosion.	ECO
SM 12		▪ Stockpiles must be protected from erosion, stored on flat areas where runoff is minimised surrounded by bunds; and they should only be stored for as little time as necessary.	ECO
SM 13		▪ Equipment, human and animal movement on the soil stockpiles must be limited to avoid topsoil compaction and subsequent damage to the soils and seed bank.	ECO / Site manager
SM 14		▪ Install silt traps or silt-fences around topsoil stockpiles to capture topsoil before it enters the dirty water system and becomes contaminated.	ECO / Site manager
SM 15	Subsidence	▪ Areas of potential subsidence will be managed / engineered with storm water controls (trenches and berms) in place to prevent ingress and inundation of surface ponding, run-off and erosion. The monitoring of collapse and cracking to surface will be an operational requirement, with the free draining of surface water being the ultimate goal.	ECO / Site manager
SM 17	Stockpile re-vegetation	▪ For storage periods greater than 3 years, vegetative or rock cover will be essential, and should be encouraged through the use of fertilisation and induced seeding with water and/or the placement of waste rock.	ECO
SM 18		▪ If the vegetative growth is impractical or not viable due to lack of water for irrigation etc. only inert waste rock material will be placed on the soil stockpiles. This will aid in protecting the stockpiles from wind and water erosion until the natural vegetative cover can take effect.	ECO
SM 19		▪ If exotic or invasive plants and weeds emerge on topsoil stockpiles ensure that they as subsequently removed as part of the alien invasive eradication and monitoring plan described further in the biodiversity management plan (Section 4.4). Then re-vegetate the stockpiles with indigenous legumes or grasses.	

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
SM 20	Contamination	▪ Infrastructure should be placed as far away from the wetland's edge as possible, not closer than 30 m; no construction or activities may be undertaken within wetlands or within 500 m from the edge of the wetlands until a Water Use Licence is granted by the DWA.	ECO / Site manager
Decommissioning Phase			
SM21	Stockpiled soils	▪ Stockpiled soil will be used to rehabilitate disturbed sites. The first 500 mm to 700 mm of the utilisable soil, removed during the construction phase, must be redistributed in a manner that achieves an approximate uniform stable thickness consistent with the approved post development end land use, and will attain a free draining surface profile. A minimum layer of 300 mm of soil will be replaced.	ECO
SM 22		▪ A representative sample of the stripped and stockpiled soils must be analysed to determine the nutrient status and chemistry of the utilisable materials. As a minimum the following elements will be tested for: EC, CEC, pH, Ca, Mg, K, Na, P, Zn, Clay percentage and Organic Carbon.	ECO
SM 23	Contamination of soils	▪ If soil is polluted, the first management priority is to treat the pollution by means of *in situ* bioremediation. The acceptability of this option must be verified by an appropriate soils expert and by the local water authority on a case by case basis, before it is implemented ▪ If *in situ* treatment is not possible or acceptable then the polluted soil must be classified according to the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste (according to the Department of Environmental Affairs (DEA)) and disposed of at an appropriate, permitted, off-site waste disposal facility.	-
SM 24	Rehabilitation	▪ The following maintenance is recommended for all rehabilitated areas: o The area must be fenced, and all animals kept off the area until the vegetation is self-sustaining; o Newly seeded or planted areas must be protected against compaction and erosion through the use of e.g. Vetiver hedges etc.; o Traffic should be limited were possible while the vegetation is establishing itself; o Plants should be watered and weeded as required on a regular and managed basis	ECO

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
		were possible and practical; o Pests and diseases should be checked for at least once every two weeks and treated if necessary; o Unhealthy or dead plant material must be replaced; o Repair any damage caused by erosion, bulking or cracking; and o Fertilise, hydro seed and grass areas soon after germination.	

4.11. Noise Management Plan

The noise management plan was informed by the Noise Impact Assessment that was undertaken by Jongens Keet Associates in 2012.

4.11.1. Objectives

Minimise, reduce and, where possible, avoid potential negative impacts on baseline ambient noise levels characterising the receiving environment.

4.11.2. Goals

The goals to accomplish the above objective are to:

- ensure blasting is controlled as discussed in 4.3;
- prevent the generation of unpleasant ambient noise conditions to surrounding sensitive receptors; and
- ensure good noise practices are maintained.

4.11.3. Management Measures

The following table contains noise management (NM) measures to meet the above goals. The table indicates the person responsible to ensure that these commitments are adhered to and implemented.

Table 11: Noise management measures

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
Construction, Operation and Decommissioning Phase			
NM 1	Good practice	▪ Construction site yards and other noisy fixed facilities should be located well away from noise sensitive areas adjacent to the development sites.	ECO / Site manager
NM 2		▪ All vehicles and equipment are to be kept in good repair.	Site manager
NM 3		▪ Where possible, stationary noisy equipment (for example compressors, pumps, pneumatic breakers etc.) should be encapsulated in acoustic covers, screens or sheds. Portable acoustic shields should be used where the utilisation thereof could affect surrounding communities, in the case where noisy equipment is not stationary (for example drills, angle grinders, chipping hammers, poker vibrators etc.).	Site manager
NM 4		▪ Noise-generating construction activities are to be contained to hours during the day and early evening.	Site manager
NM 5		▪ Machines in intermittent use should be shut down in the intervening periods or throttled down to a minimum.	Site manager
NM 6		▪ Diesel powered equipment should be fitted with silencers, these silencers should be properly designed and maintained.	Site manager
NM 7		▪ A careful selection of routes on the internal road network at the mine will reduce the noise impact felt by the sensitive receptors.	Site manager
NM 8		▪ The overburden dumps from the opencast pit excavations should, where possible, be used as interim or long-term noise attenuation berms.	Site manager
NM 9		▪ The crusher and front end loaders supplying the transport trucks should be centred within the coal stockpiles which should be maintained at a height of 4 - 5 m so as to act as noise diversion berms.	Site manager
NM 10	Personal Protection Equipment (PPE)	▪ Construction staff working in areas where the 8-hour ambient noise levels exceed 75dBA should wear ear protection equipment.	Site manager

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
NM 11	Communities	▪ With regard to unavoidable construction activities in the vicinity of noise sensitive areas, the mine should liaise with local residents on how best to minimise the impact and retain a complaints register where surrounding residents can lodge complaints regarding nuisance noise.	ECO
NM 12		▪ Berms should be constructed, where necessary, around all four of the planned opencast pits to protect the communities surrounding the mining site.	Site manager

4.12. Traffic Management Plan

The traffic management plan was informed by the Traffic Impact Assessment that was undertaken by Goba Consulting Engineers and Project Managers in 2012.

4.12.1. Objectives

Minimise, reduce and, where possible, avoid potential negative impacts on the internal mine roads, national road network and road users characterising the receiving environment.

4.12.2. Goals

The goals to accomplish the above objective are to:

- implement road safety measures for all existing- and proposed new roads utilised by the Mine;
- continually liaise with Roads Officials regarding the upgrade of the affected National roads; and
- prevent a decline in the level of service offered by the roads in question.

4.12.3. Management Measures

The following table contains traffic management (TM) measures to meet the above goals. The table indicates the person responsible to ensure that these commitments are adhered to and implemented.

Table 12: Traffic management measures

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
Construction Phase			
TM 1	Intersection	▪ Ensure that sufficient safety signage is installed and clearly visible for road users on-site.	ECO / Construction manager
TM 2		▪ At least 80 m of the haul/access road should be paved starting from the intersection.	Construction manager
TM 3		▪ Provision of exclusive/protected turning lanes at intersections.	Construction manager
TM 4		▪ It is also recommended that high mast lighting be provided at these intersections to enhance the safety of traffic operations during the night time hours of the haul operations.	ECO / Construction manager
TM 5		▪ Incorporate pedestrian safety measures e.g. use of appropriate safety signage to clearly indicate where pedestrians are allowed to cross roads.	ECO / Construction manager
TM 6		▪ The two points, where the mine haul roads cross the public road, should be designed to accommodate turning movements of both light and heavy traffic.	Construction manager
Construction, Operation and Decommissioning Phase			
TM 7	Maintenance	▪ Access and haul roads associated with the proposed mine must be maintained throughout the LOM (i.e. grading, compacting, filling potholes, wet suppression etc.). The roads must further be well signposted.	Site manager
TM 8	Road safety	▪ All vehicles are to adhere to the legal speed limits within the mining area and on public roads, this will decrease dust generation and lower the risk of accidents occurring. The speed of haul trucks will be restricted to a maximum speed of 40 km / h on the access road and 20 km / h on internal roads.	Site manager
TM 9		▪ Drivers must not be permitted to deviate from the designated access roads on-site.	Site manager
TM 10		▪ Traffic calming measures such as speed bumps must be established along the haul road to reduce speed.	Site manager
TM 11		▪ Truck drivers must be instructed to drive with their headlights on at all times.	Site manager
TM 12		▪ An accident register must be maintained, and accident reports compiled, which can be used to monitor the safety of the haul road on an on-going basis. This should be	ECO / Site manager

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
		submitted to the safety and security forum on a monthly basis.	
TM 13		▪ The increase in traffic volumes experienced at the entrance of the Canyon Springs Coal Mine due to transport trucks turning onto- and away from the mining site may be remedied by reducing the speed that small vehicles are allowed to travel at when approaching the access point to 60 km / hr.	Site manager
Decommissioning			
TM 14	Maintenance	▪ All measures related to the maintenance of roads and signposts must be retained until all activity on site has ceased.	ECO / Site manager

4.13. Heritage and Palaeontology Management Plan

The heritage management plan was informed by the Heritage Impact Assessment that was undertaken by Archaetnos Culture and Cultural Resource Consultants in 2011 and 2012. A Palaeontological Impact Assessment was conducted by Prof Marion Bamford of the Evolutionary Studies Institute of the University of the Witwatersrand in 2013.

4.13.1. Objectives

Minimise, reduce and, where possible, avoid potential negative impacts on heritage and palaeontological resources (comprising cultural resources and archaeological artefacts) characterising the receiving environment.

4.13.2. Goals

The goal to accomplish the above objective is to:

- ensure that all heritage and palaeontological resources that are discovered are adequately cordoned off or relocated.

4.13.3. Management Measures

The following table contains heritage and palaeontological management (HPM) measures to meet the above goals. The table indicates the person responsible to ensure that these commitments are adhered to and implemented.

Table 13: Heritage management measures

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
Construction and Operation Phase			
HPM 1	Heritage Sites	▪ Should graves or other features of potential cultural and heritage significance, e.g. chance finds, be discovered during the construction phase, no further activity should be conducted in that area until an archaeologist / heritage specialist is commissioned to assess the significance of the find. Based on the findings, a management plan / monitoring programme would have to be developed which specifically manages the resource discovered.	ECO / Site manager
HPM 2		▪ To date, no fossils have been recorded in the area of the proposed Canyon Springs Mine. However should chance finds occur, it is recommended that the ECO contact a South African Heritage Resource Agency (SAHRA) representative, and a professional archaeologist or palaeontologist must be contacted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance a Phase 2 rescue operation might be necessary, i.e. removing the fossils off-site.	SAHRA / ECO / Specialist

4.14. Visual Impact Management Plan

The visual impact management plan outlines the best practice for minimising of visual impacts associated with the proposed Canyon Springs Coal Mine.

4.14.1. Objectives

Minimise, reduce and, where possible, avoid potential negative impacts on visual quality characterising the receiving environment.

4.14.2. Goals

The goal to accomplish the above objective is to:

- ensure that mining infrastructure and activities are placed and conducted in such a way to reduce potential impacts on the visual environment.

4.14.3. Management Measures

The following table contains visual management (VM) measures to meet the above goals. The table indicates the person responsible to ensure that these commitments are adhered to and implemented.

Table 14: Heritage management measures

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
Construction and Operation Phase			
VM 1	Visibility	▪ In order to reduce the negative visual impact the proposed mine should place strategic berms (utilising overburden material, topsoil stockpiles etc.) to reduce the visibility of the proposed development from the surrounding communities.	ECO / Site manager
VM 2		▪ Where possible, mine infrastructure should be painted in neutral colours.	ECO / Site manager

4.15. General Waste Management Plan

The general waste management plan outlines the best practice for the temporary handling and transfer of general waste at the proposed Canyon Springs Coal Mine.

4.15.1. Objectives

The objective relating to general waste management for the proposed Canyon Springs Coal Mine is to promote effective general waste management measures so as to reduce the potential for impacts to the environment due to waste generation, handling and disposal activities.

4.15.2. Goals

The goal to accomplish the above objective is to establish, implement and maintain an effective waste management system, which will contribute to the control of waste and prevention of pollution through reduction, recovering, re-using, recycling and safe legal disposal as a last resort.

4.15.3. Management Measures

The following table contains general waste management (GWM) measures to meet the above goal. The table indicates the person responsible to ensure that these commitments are adhered to and implemented.

Table 15: General waste management measures

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
Construction, Operation and Decommissioning Phase			
GWM 1	Waste drums / bins / skips	▪ The mine will ensure that an adequate number of waste drums / bins / skips are available within the dirty water catchment area on-site (i.e. within an area upon a suitably hardened surface surrounding by trenches / berms and reporting to a PCD and thereby preventing the mixing of clean storm water runoff from polluted water arising on-site). The suggested location in this regard is the workshop / material handling area.	ECO / Site manager
GWM 2		▪ Waste drums / bins / skips will be collected regularly and disposed of by the appointed contractor at the nearest landfill site, suitably licensed in terms of NEMWA. Domestic waste includes, but is not limited to plastics, cans, food remains, foil and glass.	ECO
GWM 3	Burning	▪ No waste is permitted to be buried or burned on site.	ECO
GWM 4	Washing	▪ The washing of clothing, lunch dishes or vehicles is prohibited on site, except within specifically demarcated areas.	ECO
GWM 5	Recycling	▪ Applicable waste streams should be recycled or re-used (where possible) before disposal is considered. Recyclable material should be collected by a licensed recycling contractor.	ECO
GWM 6	Storage	▪ The temporary storage capacity of general waste management / transfer facilities must be limited to 100 m^3 in total. The volumes being temporarily stored should be monitored on a continuous basis and the relevant contractor contacted to clear the temporary facilities on a regular basis or on an ad-hoc basis if it is evident that the facilities are reaching capacity.	ECO / Site manager
GWM 7		▪ In such instances, new storage containers should not be placed on-site as this will only serve to increase the storage capacity on-site, thereby requiring a license in terms of NEMWA. If, however, it becomes evident that 100 m^3 is insufficient in terms of required capacity, the relevant licensing process must be engaged.	ECO / Site manager
GWM 8	Waste transport	▪ In order to avoid waste blowing away or falling while stored or transported, the following should be implemneted: – Ensure that the waste is loaded securely for transport when it leaves the site; – Skips must be constructed of steel and possess sealable drain outlet.	ECO

4.16. Hazardous Waste Management Plan

The hazardous waste management plan outlines the best practice for the temporary handling and transfer of hazardous waste material at the Canyon Springs Coal Mine.

4.16.1. Objectives

The objective relating to hazardous waste for the proposed Canyon Springs Coal Mine is to ensure that persons and the environment are not exposed to hazardous materials to such an extent as to cause unacceptable risk.

4.16.2. Goals

The goal to accomplish the above objectives is to:

- employ procedures to effectively handle any hazardous waste arising on-site and to ensure that the final disposal thereof takes place in such a manner as to avoid environmental contamination and employee safety risks.

4.16.3. Management Measures

The following table contains hazardous waste management (HWM) measures to meet the above goal. The table indicates the person responsible to ensure that these commitments are adhered to and implemented.

Table 16: Hazardous waste management measures

MANAGEMENT MEASURE REF NO.	ASPECT	MANAGEMENT MEASURE	RESPONSIBLE PARTY
Construction, Operation and Decommissioning Phase			
HWM 1	Legal and permitting	▪ The mine will comply with the Hazardous Substances Act, No. 15 of 1973 and apply for the necessary permits from the Department of Health if required.	ECO
HWM 2	Data	▪ The mine will comply with the requirements of all Material Safety Data Sheets (MSDS).	ECO
HWM 3	Certificates	▪ The mine will request a safe disposal certificate for all hazardous waste streams removed by external contractors that will be kept on-file for the life of the mine.	ECO
HWM 4	Explosives	▪ Old explosives and the explosives packaging will be dealt with as legally required by industry practice, in an explosive destruction facility (this should form a condition of contract for any blasting contractors utilised).	ECO / Site manager
HWM 5	Spills	▪ Any large spills of hazardous substances will initially be controlled by on-site emergency response personnel, who will be aided by professional contractors depending on the nature of the waste in question. Hydrocarbon spills should be managed as per the hydrocarbon management plan detailed in Section 4.9.	ECO / Emergency personnel
HWM 6	Disposal	▪ Any other hazardous waste generated on-site for disposal will be collected by a licensed hazardous waste contractor for disposal at a licensed landfill site.	ECO
HWM 7	Storage capacity	▪ Bund walls for all storage facilities containing any industrial or related hazardous wastes will have sufficient storage capacity of 110% from combined storage capacity of the tanks.	ECO / Site manager
HWM 8		▪ Temporary storage of hazardous waste on site is limited to 80m^3 at any given time, after which a licence must be obtained to temporarily store hazardous waste. The volumes being temporarily stored should be monitored on a continuous basis and the relevant contractor contacted to clear temporary facilities on a regular basis or on an ad-hoc basis if it is evident that the facilities are reaching capacity. Should the mine require a hazardous waste storage capacity greater than 80m^3 a licence must be obtained prior to storage.	ECO
HWM 9	Waste transport.	▪ In order to avoid sotred waste blowing away / falling, the following should be implemneted: – Ensure that the waste is loaded securely for transport when it leaves the site; – Skips must be constructed of steel and possess sealable drain outlet.	ECO

5. MONITORING AND MANAGEMENT OBJECTIVES OF ENVIRONMENTAL IMPACTS ACCORDING TO REGULATION 50 (E) AND (H)

5.1. Terrestrial Ecology

5.1.1. Monitoring Programme

An alien invasive eradication and monitoring plan must be compiled and implemented whereby all emergent invasive species are removed during construction. The monitoring plan must also ensure that the re-emergence of invasive species is monitored continuously during the operational and decommissioning phases and that monitoring and eradication continues post decommissioning.

5.1.2. Monitoring Objectives

To ensure that alien and invasive species do not colonise the site the following objectives are to be met:

- Monitor all sites disturbed by mining activities for colonisation by exotics or invasive plants and control these as they emerge;
- Monitor regularly for any re-sprouting or emerging seedlings. Monitoring should continue after decommissioning of the mine; and
- Regular monitoring along haul roads and loading areas must be undertaken to ensure problems are identified and mediated as quickly as possible.

5.1.3. Monitoring Time Frame

Consistent alien invasive eradication and monitoring should be conducted throughout the LOM as strips of vegetation are cleared until decommissioning is complete. The ecology should be monitored from the construction phase right through to post closure to ensure proper rehabilitation.

5.1.4. Responsible Officer

The on-site ECO is responsible for conducting or appointing a specialist to conduct the alien invasive eradication and monitoring as well as maintaining the Plant Rescue & Relocation Plan and Biodiversity Action Plan (Section 4.4).

5.1.5. Monitoring Costs

Monitoring costs are estimated at R 120 000.00 on an as and when needed basis. These costs will largely be incurred during the construction and decommissioning phases for vegetation removal and rehabilitation, respectively.

5.2. Aquatic Biodiversity

5.2.1. Monitoring Programme

The purpose of an aquatic monitoring program is to directly measure, assess and report on the health status and trends of the aquatic ecosystem associated with Canyon Springs Coal Mine. A further purpose of a monitoring program is to assess the compliance of Canyon Springs Coal Mine with the Resource Quality Objectives of the water resources of the catchment (identified by means of a Reserve Determination) as well as compliance with conditions stipulated in the Water Use Licence. It should be noted that the approach suggested below is regarded as, and a more definitive monitoring plan should be developed by a suitably qualified aquatic specialist following approval of the various government departments, most notably the DWA.

Sampling sites should be selected so as to identify trends regarding the occurrence of species present within the study area, as well as to provide a comparative basis by which current and future impacts can be evaluated. The selected sampling sites assessed within the study could be revised at a time when the systems are inundated, but it is most probable that located within the non-perennial systems associated with the present study area which are characteristic of the watercourses within the larger area.

5.2.2. Monitoring Objectives

In order to meet the Resource Quality Objectives and the requirements of the Water Use Licence, it is recommended that a responsibility-driven approach towards the management of the aquatic ecosystem associated with Canyon Springs Coal Mine be followed. The proposed monitoring approach is outlined in Figure 1. In order to enable an adequate description of the aquatic environment and monitor the Present Ecological Status (PES), several stressor, habitat and response indicators may be evaluated, depending on location of infrastructure, DWA requirements, etc. Indictors likely to be utilised during the monitoring assessments may include:

Stressor indicatorS

- Water quality assessment, including the measurement of in situ water quality parameters (pH, electrical conductivity (EC), temperature and dissolved oxygen), the evaluation of existing water quality results (conducted by means of an independent South African National Accreditation System (SANAS) accredited laboratory) and the identification of variables of concern to the aquatic environment.

Habitat indicators

- Invertebrate Habitat Assessment System,

Response indicators

- Macroinvertebrate assessment - the determination of PES is to be done utilising the South African Scoring System Version 5 (SASS5) and the Macro-Invertebrate Response Assessment Index (MIRAI);

- Ichthyofaunal assessment - the determination of PES is to be done utilising the Fish Response Assessment Index (FRAI);
- A diatom assessment and the determination of PES by means of the Specific Pollution sensitivity Index; and
- In the event of any discharges or pollution sources with the potential for point source discharges, a Direct Estimate of Ecological Effect Potential approach should be taken.

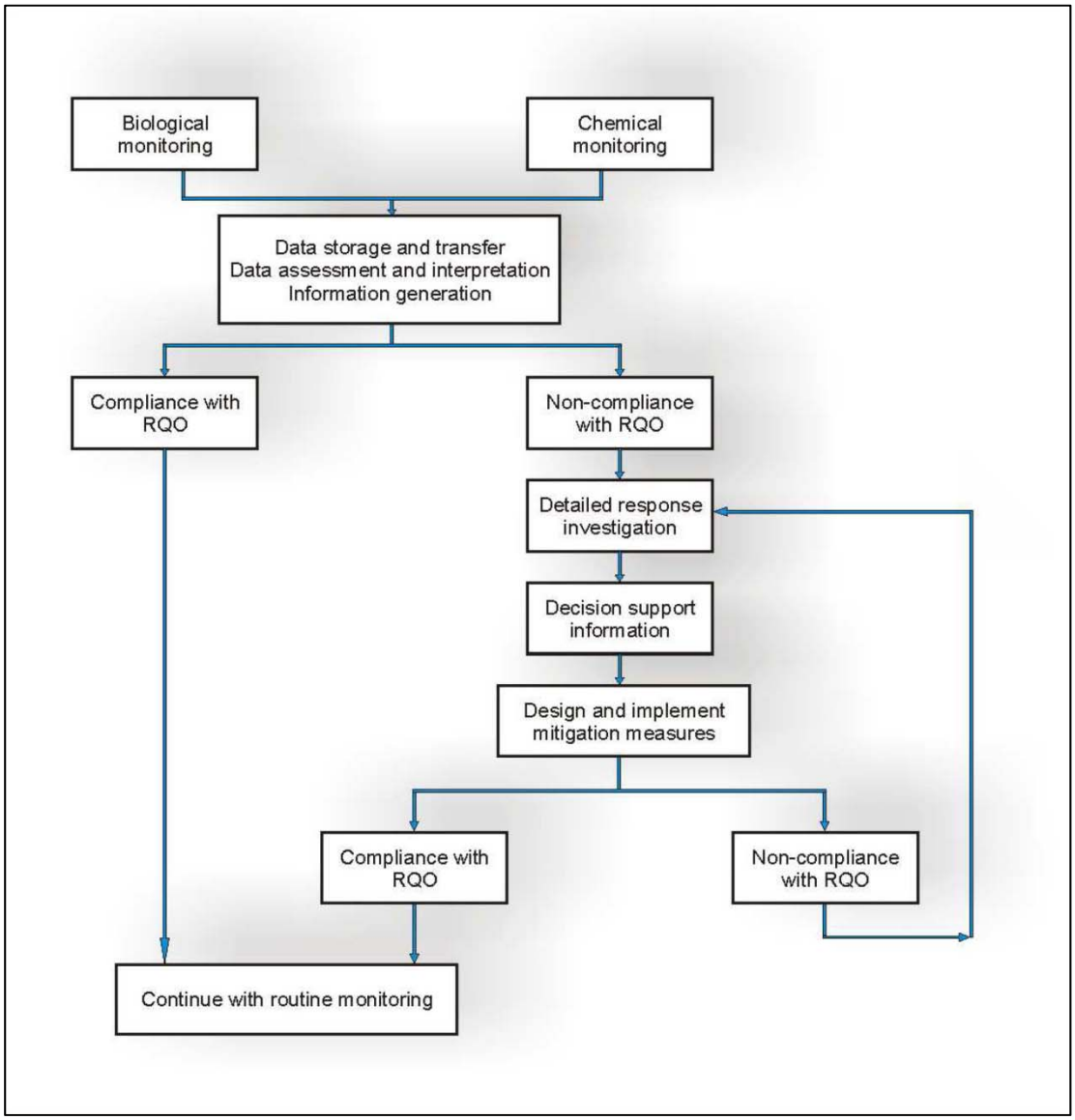

Figure 1: Aquatic Biodiversity Monitoring Approach.

5.2.3. Monitoring Time Frames

Due to the non-perennial nature of the watercourses associated with the proposed activity, the timing of the future monitoring assessments will be important for the accurate determination of the Present Ecological State. As indicated previously, aquatic macroinvertebrate species typical of permanent streams are expected to return to non-perennial watercourses within one month of inundation in pools and within 4-6 weeks in streams. As such, it is recommended that aquatic monitoring commence only once watercourses associated with the proposed activity have been

inundated for a period of no less than 6 weeks so as to allow for the colonisation of taxa that would be suitable for the determination of the Present Ecological State using the MIRAI model. Further, the presence of fish species within the watercourses associated with the proposed activity is likely to vary throughout the wet season as species migrate following periods of high rainfall. It is therefore recommended that future monitoring assessments be conducted at least six weeks after the first significant rains within the catchment (providing that watercourses remain inundated during the time), and again at the end of the wet season (during the month of March/April) on an annual basis.

It is further suggested that the frequency of monitoring be adjusted should any significant pollution event occur, either as a direct result of Canyon Springs Coal Mine or from another source so that the effect of the pollution event can be identified and mitigated accordingly. It is strongly recommended that investigation of the integrity of the aquatic macroinvertebrates (SASS5 and MIRAI) and fish assemblage (FRAI) be conducted as soon as possible following such a pollution event in order to identify the magnitude of such an event on the integrity of the aquatic resource. Thereafter, it is recommended that a follow-up survey be conducted approximately two months later in order to determine the effectiveness of the applied mitigation measures.

In the event of a fish kill involving more than 25 individual fish, a fish kill investigations should be conducted as soon as the incident is identified. In order to determine the mechanism and cause of the fish kill, a suitably qualified aquatic specialist with experience in fish kill assessments should be on-site within 24 hours after the identification of the incident, and should, at a minimum, undertake the following:

- Assessment of major inorganic constituents (e.g. NH_3, NO2, NO3, Total Nitrogen, SO_4, PO_4, Total Alkalinity, pH, Total Dissolved Solids (TDS), F, K, etc.);
- Minor inorganics, including trace metal analysis (B, Al, V, Cr, Mn, Fe, Ni, Cu, Zn, As, Sr, Mo, Cd, Ba, Pb, etc.);
- Chemical Oxygen Demand (COD);
- Phytoplankton Enumeration and Microcystin analysis
- Acute Toxicity Screening Tests utilising Daphnia (Water Flea) and Poecilia (Guppy); and
- Post mortem examination of a moribund (dying) fish specimen, including autopsy, histological analysis and bacterial determination.

5.2.4. Responsible Officer

The on-site ECO is responsible for conducting or appointing a specialist to conduct the aquatic biodiversity monitoring.

5.2.5. Monitoring Costs

Aquatic biodiversity monitoring is expected to cost roughly R50 000 per annum right through the LOM from the construction phase through to decommissioning.

5.3. Wetlands

5.3.1. Monitoring Programme

Wetland monitoring should be undertaken by a suitably qualified wetland ecologist with the aim to measure, assess and report on the health status and trends of the wetlands associated with the study area. It is further recommended that the wetland monitoring program should:

- Assesses the PES of the Hydro-Geomorphic (HGM) units using Wet-Health or latest available methodology;
- Includes species abundance and distribution monitoring whereby a representative number of sites are selected and fifteen randomly selected plots surveyed at each site. Abundance of all species within each plot is then recorded in three abundance classes. Depending on the complexity of the species occurrence, three to four sites can be done per day. This determines the composition of the fauna found in the wetlands areas. The number of species and the abundance of the individual species will help to determine the ecological health of the wetland;
- Include vegetation structure monitoring which should be conducted to determine the composition of the vegetation structure and assess whether exotic species have encroached on the indigenous vegetation. Ensure that the monitoring sites are fixed photo-points. The composition of the vegetation in the wetland will help determine to what degree the wetland has been impacted or whether the wetland health is being sustained. Riparian Vegetation Response Assessment Index (VEGRAI) should be conducted to determine whether the proposed mining activities are exerting an impact upon the riparian vegetation of the wetlands;
- Include the assessment of exotic species composition in the wetland habitat which must be targeted for eradication. An alien invasive eradication and monitoring plan must be compiled and implemented whereby all emergent invasive species are removed during construction (see Appendix 1B). The monitoring plan must also ensure that the re-emergence of invasive species is monitored continuously during the operational and decommissioning phases and that monitoring and eradication continues post decommissioning;
- Assesses hydrological and geomorphic stability of wetlands by monitoring specific geomorphic signatures in detail (e.g. erosion channels and areas of sediment deposition); and
- The surface water monitoring programme (Section 5.6) should include wetland areas and should incorporate a measure of sedimentation levels. These results should be made available to the wetland specialists in order to determine of the sediment loads in both the adjacent and downstream wetland ecosystems. If not incorporated into the hydrological monitoring, this should be undertaken separately as part of the wetland monitoring exercise.

5.3.2. Monitoring Objectives

The overall monitoring objective is to ensure that the state of the wetlands do not differ from the baseline state, which was established during construction, before mining operations commenced. Specific objectives to accomplish this objective include:

- The objectives of the species abundance monitoring are to determine the intricacy of the composition of the wetland at that given point in time (i.e. a simplified wetland ecosystem would arise due to the excessive clearance of wetland vegetation species). The target should thus be to maintain a sufficiently intricate wetland system as this will have a higher chance of being rehabilitated at closure than an overly simplified system. If the system has been severely simplified, the intervention would be to implement a seeding programme or the application of suitable indigenous species of important vegetation;
- The objective of the monitoring of invasive species in the wetland habitat is to determine whether all of the invasive species have been eradicated and if not, what percentage of the vegetation they make up and whether it is posing a threat to the indigenous vegetation. The target for monitoring should be the complete eradication of all alien invasive species within the monitored wetland systems; and
- The monitoring objectives in terms of surface water quality monitoring are discussed in Section 5.6.2

5.3.3. Monitoring Time Frames

The monitoring of species abundance of vegetation communities must be conducted once-off during the construction phase. Thereafter, wetland monitoring should be undertaken bi-annually at the beginning and end of the rainy season for the LOM until decommissioning is complete. The rate of indigenous vegetation rehabilitation and the presence of invasive species should be monitored once-off during the decommissioning phase and annually thereafter for at least five years during the post-closure phase. Specific problems / issues could increase monitoring frequency.

5.3.4. Responsible Officer

The on-site ECO is responsible for appointing a qualified specialist to undertake monitoring, or to undergo the required training in the sampling techniques and interpretation methods if monitoring will be undertaken in-house. If monitoring objectives are not met, the ECO will be responsible to report the findings to the Mine Manager and Management Team who can then discuss mechanisms to reduce the impact, measure the effectiveness of management measures in place, and where necessary, intervene further.

5.3.5. Monitoring Costs

It is estimated that monitoring will cost R 50 000.00 per annum.

5.4. Soil Quality

5.4.1. Monitoring Programme

On account of the fact that ongoing rehabilitation will be implemented, soil quality monitoring should be carried out to accurately determine the fertiliser requirements that will be needed. Monitoring should always be carried out at the same time of the year and at least six weeks after the last application of fertiliser.

Soils should be sampled and analysed for the following parameters:

pH (H2O)	Phosphorus (Bray I)
EC	Calcium (mg/kg)
Cation exchange capacity	Sodium (mg/kg)
Magnesium mg/kg	Potassium (mg/kg)
Zinc (mg/kg)	Clay
Organic matter content (C %)	

5.4.2. Monitoring Objectives

- Monitoring objectives include assessing the quality of the soils on-site throughout the LOM to determine to what degree they are being impacted on by the mining activities; and
- Monitoring objectives should also include determining what the arability of the soils is throughout the LOM to ensure that the land capability of the area remains as high as possible for post-closure use of the area.

5.4.3. Monitoring Time Frames

Ongoing evaluation of the nutrient status of the growth medium will be needed throughout the life of the project and into the rehabilitation phase.

Ongoing sampling and monitoring of the in-situ conditions will be necessary throughout the operational phase to accurately define the post operational conditions if the rehabilitation is to be successful.

Additional soil sampling and analysis should also be carried out annually until the levels of nutrients, specifically magnesium, phosphorus and potassium, are at the required levels for sustainable growth. Once the desired nutritional status has been achieved, it is recommended that the interval between sampling is increased.

An annual environmental audit should be undertaken. If growth problems develop, ad hoc, sampling should be carried out to determine the problem.

In addition, and as part of the ongoing auditing and monitoring of the site, selected fixed points will need to be surveyed to assess the possibility of subsidence and or collapse. It is recommended that this is implemented as a matter of routine monitoring (six monthly). Early

warning of possible topographic failure will assist in the long term planning and costing for remedial action.

5.4.4. Responsible Officer

The ECO should ensure a soil specialist with the capacity to conduct the monitoring is employed to undertake soil monitoring.

5.4.5. Monitoring Costs

Annual soil monitoring is estimated at R 50 000.00 per annum.

5.5. Groundwater

5.5.1. Monitoring Programme

A groundwater monitoring program must be put into place and continue after mine closure to monitor for any contamination migrating away from site. Boreholes CS1 and CS2 installed by Rison during their study can be included in the monitoring program. However, these boreholes will not be sufficient to monitor the entire mining operational area and additional site specific monitoring boreholes e.g. around the various mine pit areas, as well as the discard stockpile area, PCD and other points, will have to be added to monitor changes in groundwater and quality. Monitoring boreholes should be installed into each of the mined-out and rehabilitated mining areas after closure close to the points where decant is expected.

A ground geophysical investigation will have to be performed to help identify geological structures that could act as preferential groundwater flow, and contaminant migration pathways. These structures can then be targeted for the monitoring boreholes.

Chemical elements that should be analysed for includes:

- General chemistry such as pH, TDS and EC;
- Major elements such as calcium, magnesium, sodium, potassium, sulphate, nitrate; and
- An Inductively Coupled Plasma (ICP) scan of minor elements including aluminium, manganese, cadmium, mercury, chromium, vanadium and zinc.

Monitoring of groundwater levels and rainfall will be required to verify the current specialist simulation results. Groundwater monitoring is undertaken to establish the following:

- The impact of mine dewatering on the surrounding aquifers. This is achieved through monitoring of groundwater levels in boreholes;
- Groundwater inflow into the pits. This is achieved through monitoring of groundwater levels in the monitoring boreholes;
- Impact of mining and mineral processing on groundwater quality.

It is recommended that groundwater monitoring is undertaken according to South African National Standards (SANS) and DWA requirements as detailed in Table 17 below:

Table 17: Proposed monitoring programme.

MONTORING POSITION	SAMPLING INTERVAL	ANALYSIS	WATER QUALITY STANDARDS
CONSTRUCTION PHASE			
Mine monitoring boreholes	Quarterly (April, July, Oct, Jan)	Full chemical analysis to be finalised.	SANS: Class I DWA WQ Standards: Potable
Mine monitoring boreholes	Monthly	Groundwater levels	Not applicable
Hydrocensus boreholes	Bi-Annually (April, Oct)	Full chemical analysis	SANS: Class I DWA WQ Standards: Potable
Hydrocensus boreholes	Quarterly	Groundwater levels	Not applicable
Rainfall	Daily at the mine	No analysis	Not Applicable
OPERATIONAL PHASE			
Mine monitoring boreholes	Quarterly (April, July, Oct, Jan)	Full chemical analysis to be finalised.	SANS: Class I DWA WQ Standards: Potable
Mine monitoring boreholes	Quarterly	Groundwater levels	Not applicable
Hydrocensus boreholes	Bi-Annually (April, Oct)	Full chemical analysis	SANS: Class I DWA WQ Standards: Potable
Hydrocensus boreholes	Quarterly	Groundwater levels	Not applicable
Rainfall	Daily at the mine	No analysis	Not Applicable
DECOMMISSIONING PHASE			
Mine monitoring boreholes	Monthly (April, July, Oct, Jan)	Full chemical analysis to be finalised Groundwater levels	SANS: Class I DWA WQ Standards: Potable
Hydrocensus boreholes	Quarterly (April, Oct)	Full chemical analysis Groundwater level	SANS: Class I DWA WQ Standards: Potable
POST-CLOSURE PHASE FOR 2 YEARS AFTER MINING CEASES			
Mine monitoring boreholes	Quarterly (April, July, Oct, Jan)	Full chemical analysis to be finalised Groundwater levels	SANS: Class I DWA WQ Standards: Potable
Hydrocensus boreholes	Bi-Annually (April, Oct)	Full chemical analysis Groundwater level	SANS: Class I DWA WQ Standards: Potable
Rainfall	Daily at the mine	No analysis	Not Applicable

The numerical model used to determine the impact of the mine on groundwater must be updated on a two yearly basis as additional monitoring information becomes available. This will provide a platform for including changes in mining, processing or waste deposition at the operations into the numerical model, when such changes occur. In this way, all impact predictions will proceed to the level of detail required for mine closure, at least five years before planned mine closure.

5.5.2. Monitoring Objectives

The monitoring boreholes should be used to monitor the rising groundwater levels and act as an early warning system before decant starts. The monitoring results can also be used to track the development of the groundwater character in the rehabilitated mining area in order to ensure the correct treatment processes and capacities are planned for. Based on this the establishment and commissioning of the water treatment plans can be timed properly. This is also indicated in Table 17.

5.5.3. Monitoring Time Frame

During the initial 12 month period it is recommended that the monitoring program be implemented on a monthly basis in order to obtain a background indication of seasonal changes in the area.

Once the initial 12 month period is completed the time increments can be increased to quarterly sampling runs, depending on the outcome of the first 12 months of monitoring.

An annual compliance report must be compiled and submitted to the DWA for evaluation and comment. The mine must develop a monitoring response protocol to establish procedures in the event that groundwater-monitoring information indicates that action is required. The groundwater monitoring plan must be revised every 5 years.

5.5.4. Responsible Officer

The on-site ECO is responsible for conducting the groundwater monitoring and collecting groundwater samples however a geohydrologist should be appointed to interpret the data.

5.5.5. Monitoring Costs

Monthly construction monitoring costs are estimated at R 330 000.00 per annum while quarterly operational monitoring costs are estimated to be R 260 000.00 per annum. Decommissioning post-closure monitoring costs are estimated at R 150 000.00 per annum. A cost of R50 000.00 per borehole is also attributed to any boreholes which have to be installed on-site.

5.6. Surface Water

5.6.1. Monitoring Programme

To gauge the performance of the mine during its operational phase and to monitor its residual impacts on the surface water environment after closure, it is recommended that a surface water monitoring programme be implemented. Sampling points for the monitoring programme are indicated in Table 18.

The following monitoring points should be included in the monitoring programme (Figure 2):

Table 18: Surface water monitoring points.

SAMPLING POINT	DECIMAL DEGREES (WGS84)		METRES (WG29º - POSITIVE NORTH)	
	LATITUDE	LONGITUDE	X	Y
Ghotwane River	28.806865	-25.114171	-19478.99	-2778715.23
Elands River	28.760021	-25.151093	-24196.23	-2782812.86
"No-Name" Upstream	28.758589	-25.067147	-24357.30	-2773514.00
Ghotwane Upstream	28.736439	-25.093214	-26586.44	-2776405.72
"No-Name" Stream Dam	28.766574	-25.078960	-23549.30	-2774821.16
Pipeline from Siyabuswa WWTP	28.754521	-25.089041	-24763.30	-2775940.03

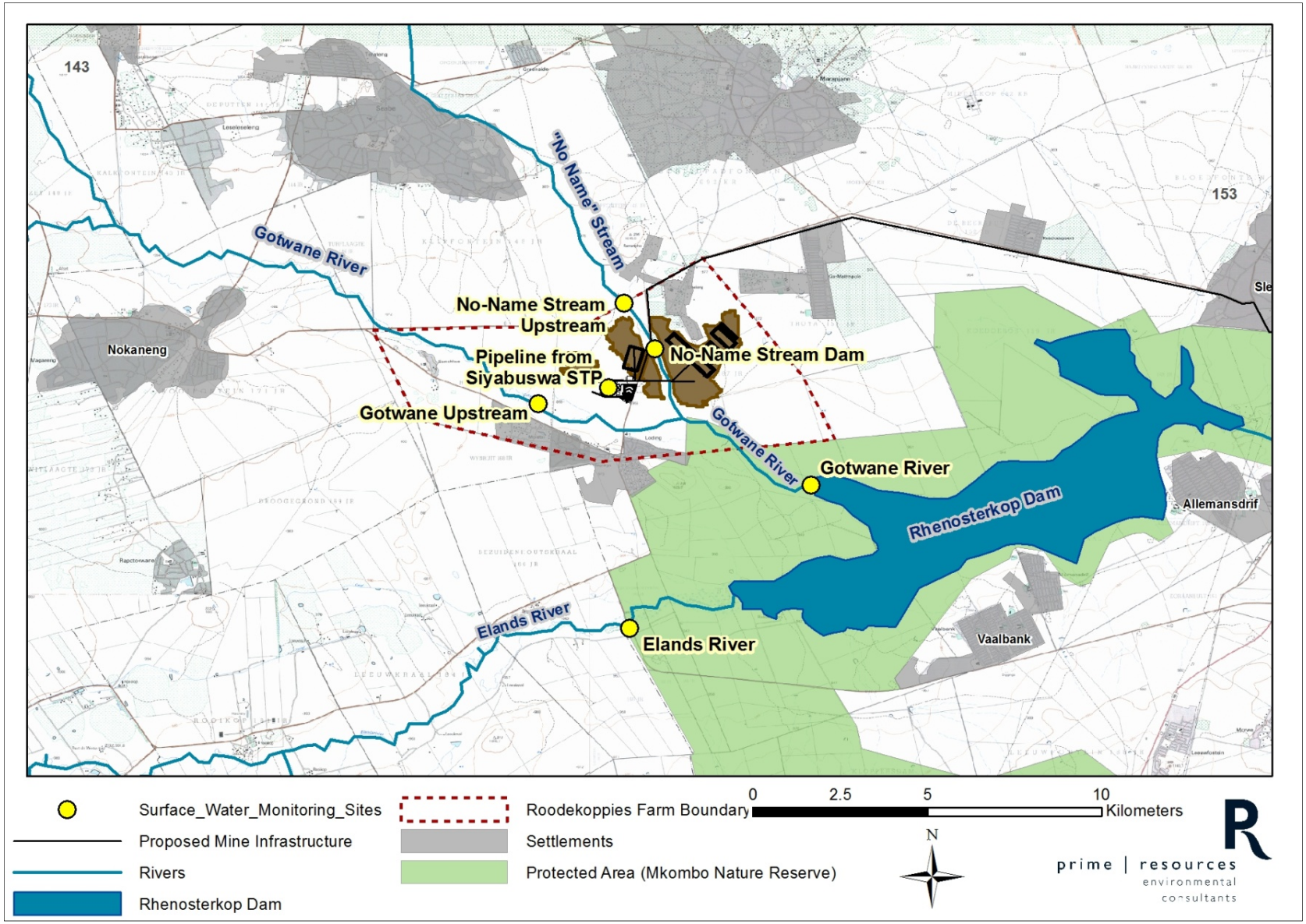

Figure 2: The proposed sampling sites for surface water monitoring at Canyon Springs Coal Mine

The proposed sampling sites shown above would be sufficient to assess the impact of the mine on the surface water environment. There may not be water at the Ghotwane River and No-Name Stream sampling points at the time of each sampling. However, it is recommended that samples be collected even if only stagnant pools are available, provided that this is recorded in the log when sampling is done. It is also recommended that, where possible, the flow in the streams be estimated during sampling.

No-Name Stream Dam

This sample should be collected on a monthly basis (provided there is water to sample) during construction, where after it will cease to exist and will be replaced by the sampling point upstream. As this sample is collected at a dam, it is likely that water for sampling will be available for a longer period into the dry season than in any other place in the No-Name Stream.

No-Name Stream Upstream

This sample will replace the No-Name Stream Dam sample and will be representative of the uncontaminated surface run off in the No-Name Stream entering the area of impact of the mine and must be collected on a monthly basis when water is available for sampling.

Ghotwane River Upstream

This sample must also be collected on a monthly basis when water is available in this non-perennial river. It will be representative of the uncontaminated water entering the zone of impact by the mine.

Pipeline from the Siyabuswa Wastewater Treatment Plant

It is the intention of the mine to use TSE from the Siyabuswa WWTP in the coal washing plant. For this reason, a sample was collected from the Siyabuswa WWTP. This sample indicated that this WWTP is not functioning properly at present and that people exposed to the water or wet coal washed with this water could potentially be exposed to pathogenic bacteria associated with sewage if improperly treated. For this reason (bacteriological safety of people), we have included this sample in the sampling regimen. This sample must be collected and analysed on a daily and weekly basis and analysed for COD (weekly by a laboratory) and residual chlorine. The latter can be done daily by a trained staff member using a kit similar to those used for swimming pools.

Elands River and Ghotwane River near the Rhenosterkop Dam

Both these samples must be included in the monthly sampling programme. The Ghotwane River sample will be representative of the final water after passing all the zones of impact from the mine, while the Elands Rivers sample will be used as a reference sample of local water not impacted upon by the mine.

Sampling of water pumped from the pit or from underground seepage sources has not been included, as these samples will fall within the groundwater-sampling programme. Likewise, the water in all the surface dams (PCDs and other storage dams) and at the water treatment plant must also be monitored, but this water forms part of the mine service water circuit or the potable water circuit and not part of the environmental monitoring programme, hence they are not

including it in this section. They must, however, not be left out of the overall water quality monitoring programme.

From an environmental monitoring perspective, an analytical laboratory with SANAS accreditation for at least the major cations and anions and other determinants normally associated with coal mining, should carry out the following minimum analyses:

Monthly

- Suspended Solids
- Total Alkalinity
- pH
- EC
- Na^+
- K^+
- Ca^{2+}
- Mg^{2+}
- NO_{3-}
- Cl^-
- SO_4^{2-}

Using the pH and EC values, the CO_3^{2-} and HCO_3^- concentrations should be calculated and a Piper Diagram (or equivalent) produced using the above analyses. Each successive Piper Diagram should be compared with the ones from the previous sampling exercise and any movement of locations where the samples plot must be noted and investigated if this movement indicates contamination from the mine.

It is not necessary to include the Siyabuswa WWTP water in the above list of analyses. However, to ensure the safety of people being exposed to this water, it is necessary to determine the COD on a weekly basis (by a laboratory) and the residual chlorine on a daily basis. The latter must be done using colorimetric techniques (similar to the testing of swimming pool water) and must be done on site by an adequately trained person.

Seasonally

In addition to the above monthly samples, a full spectrum Inductively-Coupled Plasma Mass Spectrometer (ICP-MS) scan must also be conducted once during the rainy and once during the dry season, preferably during July and January of each year on all the above samples. This analysis will indicate the concentrations of the metals present in the water.

Additionally, although it does not form part of this sampling programme, we recommend that the mine adopt a standard procedure, which must be implemented every time there is any accidental spillage of water that could be contaminated. This standard procedure must adequately describe the physical and reporting actions taken in identifying, sampling, mitigating, re-sampling after mitigation and closeout procedures of any spillage incident that may occur during the LOM.

5.6.2. Monitoring Objectives

In general, the surface water quality of the two surface water sources (the Elands and Ghotwane Rivers) in close proximity to the proposed mine was very good, although the flow in most of the watercourses was relatively low. These qualities will be used in future to gauge the performance of the mine in terms of downstream water quality. This will place an additional responsibility on the mine during active mining and especially after closure of the mine, to maintain this status quo. The surface water monitoring programme will gauge the performance of the mine during its operational phase and monitor its residual impacts on the surface water environment after closure.

If it appears that the mining activities are having an impact on the quality of the surface water, then investigations have to be made to determine whether contaminated water is escaping from the SCD / PCD, due to discard handling or pollution such as hydrocarbons, grease, oils, etc. are being spilled onsite and coming into contact with the surface water resources.

The presence of heavy metals, dissolved solids, the levels of alkalinity, conductivity etc. should be monitored. The aim should be to have the levels of the above mentioned parameters comply with the SANS 241:2011 which is the official drinking water standard in South Africa.

Monitoring should also be done to determine if the levels of sulphate in the surface are kept low enough not to generate AMD. The objective should be to keep the sulphate levels from escalating to the point where AMD is generated.

Further to the above, the DWA in the WUL will provide catchment standards which are to be included as monitoring targets, especially in the event that any water associated with the proposed Mine is to be discharged to the catchment.

5.6.3. Monitoring Time Frame

Surface water monitoring should be conducted throughout the LOM on a monthly basis at all the sampling points excluding the Pipeline from the Siyabuswa WWTP sampling point, which should be monitored on a daily and weekly basis. It is recommended that two reports be compiled and submitted to DWA annually. The first should be a summary report, briefly describing the first 6-month period water quality in all surface streams/rivers and should be done once the July analyses results are available each year. The second report should be done after the January sample results are available from the laboratory each year and must include a comprehensive discussion on the surface water quality of the streams around the mine, identifying any impacts from the mine and also discussing trends, if any are discernible. Usually trends will only be noticed after 3 or more years of sampling.

5.6.4. Responsible Officer

The on-site ECO is responsible for appointing a qualified specialist to undertaken monitoring or for undergoing the required training in the sampling techniques and interpretation methods if monitoring will be undertaken in-house. If monitoring objectives are not met, the ECO will be responsible to report the findings to the Mine Manager and Management Team who can then

discuss mechanisms to reduce the impact, measure the effectiveness of management measures in place, and where necessary, intervene further. The effectiveness of additional measures will be assessed through further monitoring.

5.6.5. Monitoring Costs

If mine personnel collect the samples and deliver them to a laboratory, the cost of the surface water sampling programme and production of reports should be approximately R 75 000.00 per annum. This amount includes the laboratory costs and an interpretation and bi-annual report by a professional aquatic scientist, but excludes the travel and collection/delivery of the samples.

5.7. Air Quality

5.7.1. Monitoring Programme

Dust Fallout

It is recommended that a continuous dust fall monitoring programme be established with at least ten dust fall buckets around the proposed mining operations (Figure 3). These buckets must be operated in accordance with the NEMAQA Draft Dust Control Regulations (Government Notice No. 309, 2011).

Particulate Matter (PM_{10})

Continuous PM_{10} monitoring must be undertaken using a continuous PM_{10} monitor, e.g. an E-sampler. An E-sampler can be used for real-time particulate monitoring through near-forward light scattering as well as standard filter methods. The E-sampler should be operated and maintained according to SANAS TR07-02 guidelines.

Meteorological Station

A meteorological station would need to be erected for the life of the mine to measure (at minimum) wind speed and wind direction, but preferably also temperature, solar radiation, humidity, barometric pressure and rainfall.

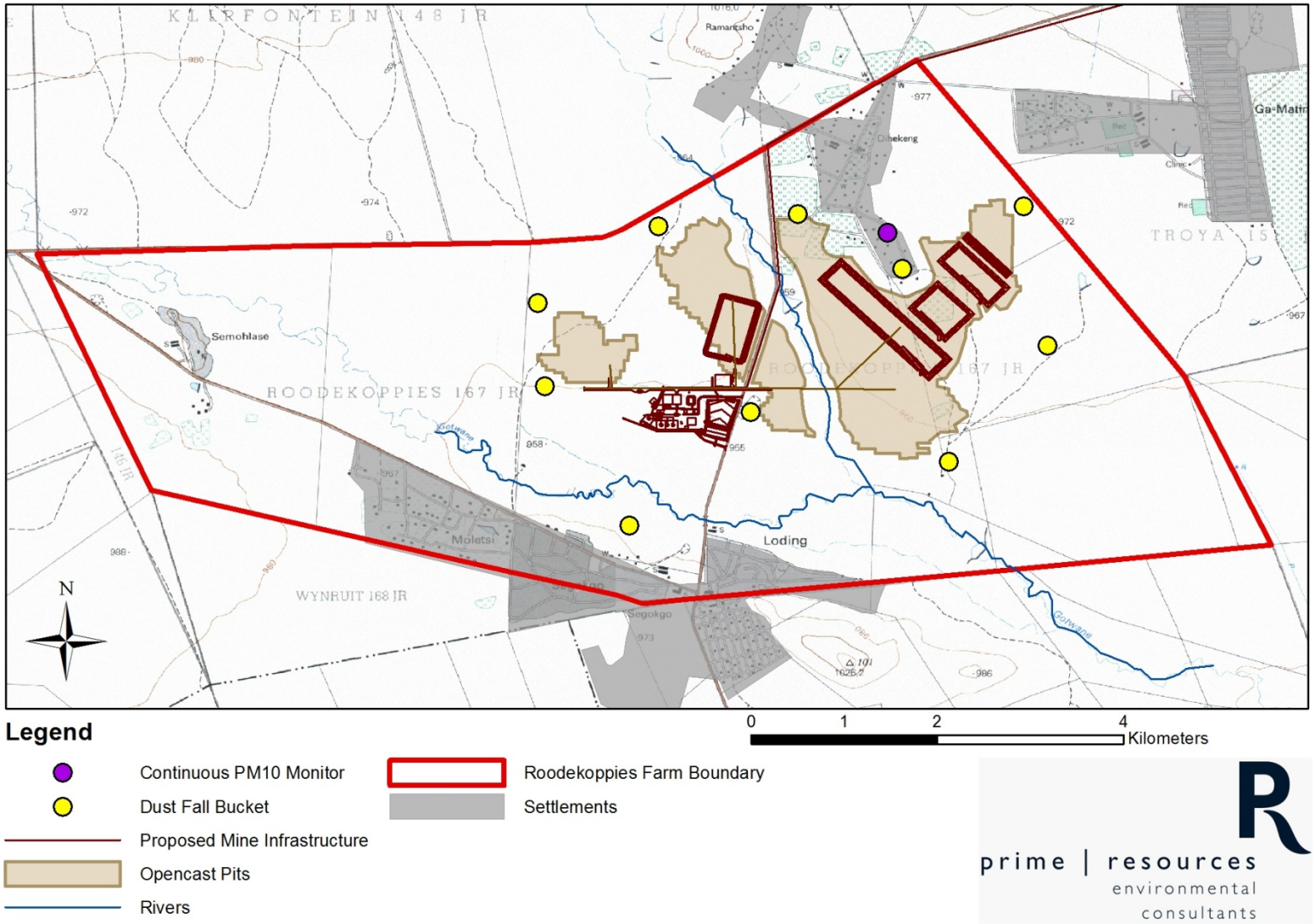

Figure 3: Recommended locations for dust fall buckets and a continuous PM10 monitor

5.7.2. Monitoring Objectives

Dust Fallout

The monitoring objective is that dust fallout rates at the surrounding sensitive receptors should not exceed 600 mg/m²-day averaged over 30 days as they are residential areas.

Particulate Matter

Monitoring objectives are that measured particulate matter concentrations at the mine and surrounding sensitive receptors should not exceed the South African National Ambient Air Quality Standards (SA NAAQS) limit values for PM_{10}

The SA NAAQS for inhalable particulates (PM_{10}) are given in Table 19. A margin of tolerance of 45 µg/m³ has initially been given to the daily average limit value of 75 µg/m³ for PM_{10}. This margin of tolerance allows existing operations time to develop measures to reduce emissions in those areas already above the limit value. The margin of tolerance is only valid unto the end of 2014, after which the limit value applies. The standard allows 4 exceedances per year of the limit value plus the margin of tolerance.

Table 19: National air quality standard for inhalable particulates (PM10)

AVERAGING PERIOD	CONCENTRATION (MG/M³)	FREQUENCY OF EXCEEDENCE	COMPLIANCE DATE
24 hours	120	4	Immediate
	75	4	1 January 2015
1 Year	50	0	Immediate
	40	0	1 January 2015

If the number of exceedances measured at the proposed Dihekeng monitoring site is higher than that allowed by the National Standards, the mine must take urgent measures to further mitigate emissions until ambient air quality particulate concentrations are brought back into line with the National Standards. In the case of exceedances above the National Standards, two more continuous monitoring sites should be established – one in the residential area of Moletsi, Loding and Segokgo and one in Ga-Matimpule. The grievance mechanism should also be studied for any reports of excessive dust generation in the community.

5.7.3. Monitoring Time Frames

The proposed monitoring network should be installed before the commencement of construction activities to establish a baseline for ambient air quality in the area. Ambient air quality should also be monitored throughout the life of the mine to determine the effectiveness of mitigation measures in place.

Dust fallout should be measured on a monthly basis and PM_{10} concentrations must be monitored regularly e.g. by using a sampler which takes a sample every third day.

Monthly reports must be produced with recommendations to management with regard to the effectiveness of the mitigation methods being applied.

5.7.4. Responsible Officer

The on-site ECO is responsible for appointing a qualified specialist to undertake monitoring, or to undergo the required training in the sampling techniques and interpretation methods if monitoring will be undertaken in-house. If monitoring objectives are not met, the ECO will be responsible to report the findings to the Mine Manager and Management Team who can then discuss mechanisms to reduce the impact, measure the effectiveness of management measures in place, and where necessary, intervene further.

5.7.5. Monitoring Costs

Dust Fallout

The purchase and installation of eight fallout buckets will require a once off payment of R 17 000.00. The gravimetric analysis of samples (monthly) will cost R 35 280.00 per annum.

PM_{10} and $PM_{2.5}$ concentrations

To install the sampler will require a once off payment of R 12 000.00. Annual rental of sampler and gravimetric analysis of samples (sampled every third day) will cost R 76 880.00 per annum.

5.8. Noise

5.8.1. Monitoring Programme

Noise monitoring will need to take place during the construction, operation and decommissioning phases of the mine. Monitoring should be undertaken at the surrounding noise sensitive receptors to ensure that noise levels meet the required standards and to detect deviations from predicted noise levels and enable corrective measures to be taken where warranted. These noise monitoring processes should be carried out according to SANS 10103-2008 requirements.

In addition to this it is recommended that equipment noise audits take place on a regular basis, this is important as it ensures that equipment is not deteriorating. Standardised noise measurements should be carried out on individual equipment at the delivery to site to construct a reference data base and regular checks should be carried out.

5.8.2. Monitoring Objectives

- Noise levels on site should meet the noise standard requirements of the Occupational Health and Safety Act (Act No 85 of 1993) which states that the no person shall be permitted to work in an area for 8 hours where noise levels are at or exceed 85 dBA;
- Ambient noise levels at the noise sensitive receptors should not exceed the SANS 10103-2008 standards for a rural area which is 45 dBA during the daytime period (06h00 to 22h00) and 35 dBA during the night-time period (22h00 to 06h00); and

- Regular checks should be carried out on equipment and machinery to ensure that equipment is not deteriorating compared to the reference data.

5.8.3. Monitoring Time Frames

Monitoring should be undertaken on a bi-annual basis throughout the life of the mine.

5.8.4. Responsible Officer

The on-site ECO is responsible for appointing a qualified specialist to undertake monitoring, or to undergo the required training if monitoring will be undertaken in-house. If monitoring objectives are not met, the ECO will be responsible to report the findings to the Mine Manager and Management Team who can then discuss mechanisms to reduce the impact, measure the effectiveness of management measures in place, and where necessary, intervene further.

5.8.5. Monitoring Costs

The cost for a specialist to undertake the noise monitoring is approximately R 20 000.00 per session.

5.9. Blasting and Vibrations

5.9.1. Monitoring Programme

Monitoring of the seismic and acoustic impact of blasting operations is of utmost importance at blasting operations where there is a risk of damage to any private property which is not owned by the mine. Seismic and acoustic monitoring allows the mine to assess the impact that mining activities are having on the surrounding communities. This allows the mining company to react appropriately by either admitting to the damages caused and settling the claim appropriately, or alternatively by refuting any serious claims with scientific evidence which suggests that no damages could have been caused by blasting operations.

In view of the close proximity of the surrounding villages of Dihekeng to the proposed mine site, it is recommended that permanent seismic / acoustic monitoring stations are installed. A few positions where these monitoring stations should be situated are recommended in Figure 4.

- Permanent seismic and acoustic stations should be established at villages located on the boundary of the mine, namely: Dihekeng, Ga-Matimpule and Loding / Sehokgo;

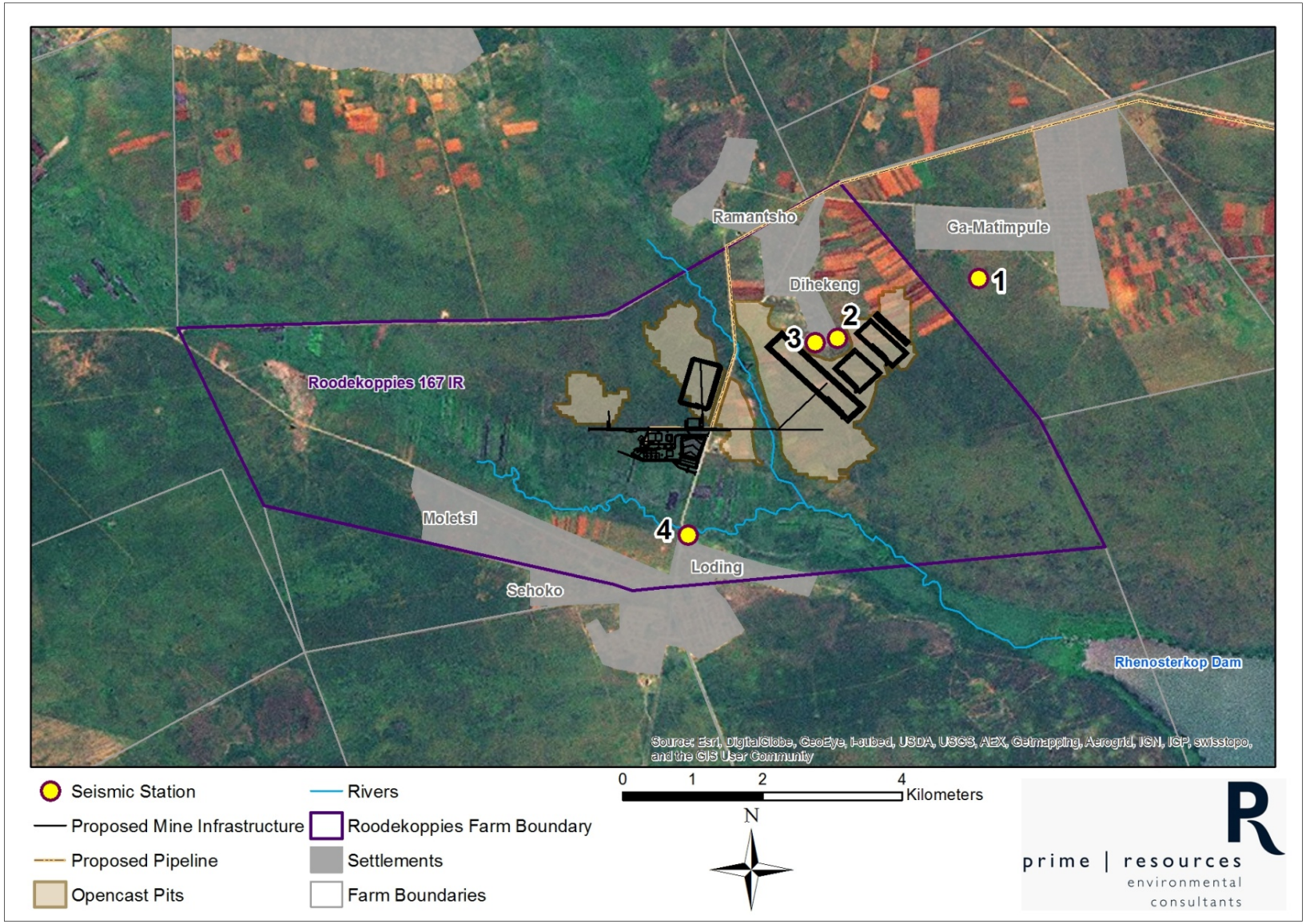

Figure 4: Recommended locations for permanent seismic monitoring stations

The recommended location of Station 1 is at a chicken farm just south of Ga-Matimpule village, Station 2 and 3 should be placed on the eastern and western boundaries of the southern portion of Dihekeng village, and Station 4 should be placed on the most northern extent of Loding town.

The condition applied to clear all people and livestock within a 500 m radius of the blast is onerous. This process is time consuming and may lead to social disruption. In order to avoid this, it is recommended that all blasts be recorded on a suitable HD video camera, the camera will record any fly-rock that may be thrown into the air by any blast. More than one camera may be necessary in order to achieve a full record of all fly rock. These digital videos of blasts must be kept on record by the mine and given a positive reference to the date, time and reference number of the particular blast concerned. After a minimum of ten blasts are fired and shown by the video records to not have thrown any fly-rock beyond the mine boundaries the appointed engineer and the appointee may agree to reduce the radius of the area to be cleared before all subsequent blasts.

Seismic and acoustic monitoring should be done at a minimum of one of the schools in the Loding and Moletsi. Also, seismic and acoustic monitoring should be done at the closest points of the D2740 and the D1944 roads.

5.9.2. Monitoring Objectives

Seismograph stations 1-4 (Figure 4) will record ground vibrations and air blasts for monitoring purposes.

The following must be taken into consideration when recordings from the seismographs are interpreted during monitoring:

- Buildings subjected to ground vibrations exceeding 12.7 mm / s leads to the risk of cosmetic and or damage to buildings;
- Determine if air blast levels are greater than 134 dB. This may cause human irritation;
- Determine if air-blasts produced by blasting activities are equivalent or greater than 130 dB in the region of livestock;
- The present condition (before blasting activities) of the closest housing to the opencast pit(s) should be assessed. Complaints relating to damage to these buildings may arise if buildings are too close to blasting activities; and
- After a minimum of 10 HD recorded blasts, both the appointee and the qualified engineer supervising the blasts should analyse the footage and determine if blasts have thrown fly-rock beyond the mine perimeter fence.

5.9.3. Monitoring Timeframes

A report should be prepared every month; this report should be based on the readings derived from the four recommended seismograph stations.

5.9.4. Responsible Officer

- The on-site ECO is responsible for appointing the appointee or a suitably qualified blast engineer (internal or external) to carry out the monitoring and reporting; and
- If these monitoring objectives are not met the blast engineer (or appointee) should liaise with the ECO who will have the responsibility of reporting the findings to the mine manager and management team who can then discuss mechanisms to reduce the impact, measure the effectiveness of the management measures which are in place, and where necessary, intervene further. The effectiveness of additional measures will be assessed through further monitoring. A grievance mechanism should be set up by the mine; this allows a channel through which complaints can be directed from the community to the mining company. Once the grievance mechanism is implemented it should be studied for any complaints relating to blasting / vibration activities.

5.9.5. Monitoring Costs

Total Capital Cost

The cost per station is R 50 000.00, this cost includes:

- One Nomis supergraph seismograph;
- One station housing;
- One solar panel;
- One battery;
- One modem and SIM card;
- One power controller; and
- Installation by specialist.

It is also recommended that two spare batteries be purchased which will be an extra R 2 000.00. The total capital cost will amount to R 252 000.00 (once-off).

Monthly Cost

Monitoring and monthly reporting of blasting events registered on these seismographs by the specialist will cost a further R 3 000.00 per station per month. This cost includes the cost of annual calibration of the seismographs. The total monthly cost will amount to R 15 000.00.

5.10. EMP Implementation Monitoring

Regular monitoring of the EMP throughout the construction, operation and decommissioning phases is to be undertaken by the Mine Environmental Department. Annual auditing of the compliance with the EMP will be undertaken by a suitably qualified, independent, person, with audit reports being compiled as a result. Please refer to Section 5.11 below for information regarding the performance assessment of the EMP.

During the decommissioning phase, the environmental team will inspect the implementation of the EMP with the results being fed back to the relevant contractors during the monthly project

meetings. The re-vegetation maintenance period will also be monitored so as to ensure that the process is successful, and also to determine whether re-seeding is necessary. Section 24Q of NEMA monitoring of the approved EMP must be conducted as may be prescribed by the conditions of Environmental Authorisation. Any conditions regarding monitoring of the EMP prescribed by the Department must therefore be adhered to in addition to the above.

Finally, a report will be submitted to the DMR with regard to the status of the mine and its compliance with the decommissioning phase outlined in the EMP when applying for a closure certificate. The closure plan is discussed in Section 10.

5.11. EMP Performance Assessment

Section 24Q of NEMA states that a performance assessment of the approved EMP must be conducted as may be prescribed by the conditions of Environmental Authorisation. A performance assessment of the implementation of the EMP is required as per Section 33(e) of the NEMA EIA Regulations (GN543). Any conditions regarding performance assessments prescribed by the Department must therefore be adhered to in addition to Regulation 55 of the MPRDA (GNR527 of 2004). MPRDA Regulation 55(1) stipulates the requirements for a bi-annual performance assessment of the EMP (in sub-regulation [3]) so as to ensure compliance with the EMP, and also to assess the continued appropriateness and adequacy of the EMP.

The performance assessment will form part of the environmental auditing activities at the operations. The assessment of the EMP performance must be undertaken as a minimum biannually and will look at the following aspects of the EMP:

- The compliance of the EMP with regard to the current legal and permitting requirements;
- Current environmental performance against the target and objectives set out in the EMP;
- The level of implementation of the mitigation and management measures outlined in the EMP;
- Findings from environmental audits and the reporting of any environmental incidents which may have occurred; and
- The availability of environmental management resources (i.e. manpower and financial resources).

The performance assessment report must contain the following information:

- Information regarding the period applicable to the performance assessment;
- Details with regard to the:
    - Scope of the assessment;
    - Procedure used to conduct the assessment;
    - Interpreted information gained from monitoring the approved EMP;
    - Evaluation criteria employed during the assessment;
    - Results of the assessment; and
    - Recommendations on how and when non-compliances and deficiencies will be rectified.

Additionally, as required by the DMR a performance assessment report will be compiled and submitted within three months of the assessment having been completed.

Submission of Information

- All procedures (emergency, environmental awareness, rehabilitation strategies, etc.) must be included into the mine's Environmental Management System (EMS). The mine's EMS will monitor and assess the performance of the EMP on an on-going basis.
- All information as required by the various government departments should be captured and be readily available for submission when required.
- An annual report will be submitted to the DMR.
- The financial provision for closure (quantum and method) must be provided as required by Section33(g)(v) of the NEMA EIA Regulations; and must be updated annually as per the MPRDA Regulations.

6. HIGH LEVEL ESTIMATE FOR CAPACITY TO MANAGE AND REHABILITATE THE ENVIRONMENT

MANAGEMENT MEASURES AND TIMEFRAME	ESTIMATED COST			
	CONSTRUCTION	OPERATION	DECOMMISSIONING	POST-CLOSURE
	6 MONTHS	19 YEARS	6 MONTHS	ON-GOING AS REQUIRED
Groundwater Management				
Groundwater quality monitoring should be conducted according to the monitoring programme detailed in Section 5.5.	Setup costs: R 250 000.00 Running costs: R 125 000.00 (R 250 000.00 per annum)	Running costs: R 4 750 000.00 (R 250 000.00 per annum)	Running costs: R 125 000.00 (R 250 000.00 per annum)	To be confirmed (TBC). Depending on the duration of the post-closure phase.
Surface Water and Stormwater Management				
Separate clean and dirty water using clean and dirty water management infrastructure (berms, trenches, SCD / PCD). Drainage facilities should be put in place to divert contaminated stormwater runoff from infrastructure and workings to the SCD and / or PCD. The rehabilitated opencast pits will be engineered in such a way to support the evaporation pans constructed during the decommissioning phase.	Berms, drainage SCD and PCD: R 19 000 000.00	TBC once mining commences (Running costs associated with clearing out settled solids in the SCD and PCD, and analysing the water quality before discharge)	R 200 000.00	R0.00
Surface water quality monitoring should be conducted throughout the LOM according to the monitoring programme detailed in Section 5.6.	R 60 000.00 (R 120 000.00 per annum)	R 2 280 000.00 (R 120 000.00 per annum)	R 60 000.00 (R 120 000.00 per annum)	To be confirmed (TBC). Depending on the duration of the post-closure phase.
Blasting Management				

MANAGEMENT MEASURES AND TIMEFRAME	ESTIMATED COST			
	CONSTRUCTION	OPERATION	DECOMMISSIONING	POST-CLOSURE
	6 MONTHS	19 YEARS	6 MONTHS	ON-GOING AS REQUIRED
Seismograph stations should be used to monitor the blasting events, as recommended by the specialist study detailed in Section 5.9. In addition to this, HD recordings of the blasting must be taken, and crack surveys of the surrounding buildings must be taken.	The total capital cost of the installation of the monitoring stations, spare batteries and battery chargers will amount to R 252 000.00 (once-off).		R 0.00	R 0.00
	R 48 000.00 (R 84 000.00 per annum)	R 1 596 000.00 (R 84 000.00 per annum)		
Noise Management				
Monitoring should be undertaken at the surrounding noise sensitive receptors to detect deviations from predicted noise levels. It is recommended that equipment noise audits take place on a regular basis. This should be done according to the monitoring programme detailed in Section 5.8.	R 40 000.00 (R 80 000.00 per annum)	R 1 520 000.00 (R 80 000.00 per annum)	R 40 000.00 (R 80 000.00 per annum)	R 0.00
Ensure that vehicles are serviced regularly and that silencers are fitted to the exhausts of vehicles.	Approximately R 1 000.00 per silencer. Running costs associated with servicing the vehicles regularly.			R 0.00
Dust Management				
Dust suppression should be conducted by implementing techniques such as wet suppression on roads and vegetate topsoil stockpile.	R 125 000.00 (R150 000 per annum)	R 2 850 000.00 (R150 000 per annum)	R 125 000.00 (R150 000 per annum)	R 0.00
Air quality monitoring should be conducted according to the monitoring programme detailed in Section 5.7.	Dust bucket purchase (10 buckets) and monitoring: R39 200.00 per annum		R 0.00	R 0.00
	Once off purchasing fee of PM^{10} monitoring equipment: R110 000.00 - R370 000.00	TBC once mining commences (either the ECO should be trained to undertake the	R 0.00	R 0.00

MANAGEMENT MEASURES AND TIMEFRAME	ESTIMATED COST			
	CONSTRUCTION	OPERATION	DECOMMISSIONING	POST-CLOSURE
	6 MONTHS	19 YEARS	6 MONTHS	ON-GOING AS REQUIRED
		sampling and analysis or a specialist should be employed)		
Erosion Control Management				
Apply topsoil and re-vegetate cleared areas / cover with jute mesh erosion control blankets.	R 0.00	TBC once mining commences (Vegetate topsoil stockpile and bare areas/ apply jute mesh erosion blankets)	R 0.00	R 0.00
The construction of the culverts and the stream crossing must be done in such a way as to avoid the generation of erosion due to land clearance			R 45 000.00	R 0 .00
Stockpile Management				
Soil should be removed and stockpiled. Stockpiled topsoil should be limed to improve fertility. The prevention of soil erosion must be ensured.	R 25 000.00 (R 50 000.00 per annum)	R 950 000.00 (R 50 000.00 per annum)	R 0.00	R 0.00
Vegetation Management				
Alien invasive species eradication and monitoring should be undertaken; as well as the implementation of a plant rescue and relocation plan.	R100 000.00 once-off for compilation of the plans.	TBC pending outcomes of the plans.	R 0.00	R 0.00
Faunal and floral monitoring should be conducted according to the monitoring programmes detailed in Section 5.1	Monitoring costs are estimated at R 120 000.00 on an as and when needed basis. These costs will largely be incurred for vegetation removal.	R 0.00	Monitoring costs are estimated at R 120 000.00 on an as and when needed basis. These costs will largely be incurred for rehabilitation.	R 0.00

MANAGEMENT MEASURES AND TIMEFRAME	ESTIMATED COST			
	CONSTRUCTION	OPERATION	DECOMMISSIONING	POST-CLOSURE
	6 MONTHS	19 YEARS	6 MONTHS	ON-GOING AS REQUIRED
Aquatic Management				
Aquatic ecology monitoring should be conducted according to the monitoring programme detailed in Section 5.2.	R 25 000.00 (R 50 000.00 per annum)	R 950 000.00 (R 50 000.00 per annum)	R 25 000.00 (R 50 000.00 per annum)	To be confirmed (TBC). Depending on the duration of the post-closure phase.
Wetland Management				
The monitoring of wetland conditions must be conducted according to the monitoring programme detailed in Section 5.3.	R 25 000.00 (R 50 000.00 per annum)	R 950 000.00 (R 50 000.00 per annum)	R 25 000.00 (R 50 000.00 per annum)	To be confirmed (TBC). Depending on the duration of the post-closure phase.
Traffic and Road Safety Management				
Construct the proposed turning lanes at the intersection located on D1944 recommended by the specialist in Section 4.12. Erect the recommended high mast lighting at the proposed access intersection.	TBC once mining commences	R0.00	R0.00	R0.00
Heritage Management				
Costs associated with the potential finds of heritage resources. Calling out a archaeologist / specialist, and a representative of SAHRA, to verify a potential find.	R 5 000.00 (R 10 000.00 per annum)	R 190 000.00 (R 10 000.00 per annum)	R 5 000.00 (R 10 000.00 per annum)	R 0.00
Waste Management				
Bins for the storage of general waste must be provided on site and a licensed company must be employed to remove the waste and dispose of it at a licensed landfill site.	R20 000.00	TBC once mining commences	TBC once mining commences	R0.00
Temporary facilities for hazardous waste	TBC once mining commences	TBC once mining commences	TBC once mining	R0.00

MANAGEMENT MEASURES AND TIMEFRAME	ESTIMATED COST			
	CONSTRUCTION	OPERATION	DECOMMISSIONING	POST-CLOSURE
	6 MONTHS	19 YEARS	6 MONTHS	ON-GOING AS REQUIRED
storage. Contract with hazardous waste removal specialist for disposal of at a licensed landfill site by licensed personnel.			commences	
Hazardous Material / Waste Management				
Ensure adequate maintenance of vehicles to reduce hydrocarbon spills.	TBC once mining commences	TBC once mining commences	TBC once mining commences	R0.00
Spill kits should be available on site should a spill occur.				R0.00
Appropriate containers (according to the material data and safety sheets) for the storage of hazardous materials / waste should be available on site and should be stored in a designated bunded, impermeable and ventilated area.				R0.00
All hazardous waste should be disposed of at a licensed hazardous waste disposal facility by licensed personnel.				R0.00

7. ENVIRONMENTAL PROCEDURES RELATED TO EMERGENCIES AND REMEDIATION

Section 33(g) of the NEMA EIA Regulations (GN543) requires "a description of the manner in which [the Mine] intends to (i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation…" The proposed Canyon Springs Coal Mine is thus required to document a procedure for environmentally related emergencies and remediation. This emergency procedure will ensure that employees are able to:

- Identify potential risks/hazards which may result in emergency situations;
- Monitor risks/hazards;
- Prevent potential emergency situations;
- Respond appropriately in the event that and emergency situation does occur; and
- Rehabilitate the impacted environment after an emergency situation has occurred.

The benefits of emergency preparedness and response are that:

- People are able to respond to emergencies quickly and effectively;
- Employees and contractors are aware of their roles and responsibilities; and
- The risk to health and safety of people and the impacts on the environment are reduced.

7.1. Types of Environmental Emergencies

There are various types of emergencies that may threaten the environment at the proposed Canyon Springs Coal Mine, examples of typical emergencies include:

- Uncontrolled fires;
- Traffic accidents;
- Accidental discharges to water bodies (e.g. contaminated water runoff or oil or chemical spills);
- Accidental discharges to land (e.g. oil or chemical spills);
- AMD; and
- Abnormal operating conditions resulting in public complaints (i.e. excessive dewatering affecting borehole yields, nuisance noise or nuisance dust generation, infrastructure damage due to vibrations, damage or harm due to fly rock and contamination of arable land).

Not all these incidents will necessarily result in an emergency condition. It is the magnitude and severity of the incident that will determine whether it is an emergency.

7.2. Emergency Response Plan

Although the cause of an emergency may differ, the actions to be followed in an emergency situation are generally the same. The following steps should be followed in an emergency situation:

- If an emergency situation is detected the person should consult the internal emergency reporting hierarchy organogram and notify the relevant person;
- The emergency contact list must be consulted and the internal and external emergency services (where appropriate) must be notified of the emergency so that it can be addressed using the relevant emergency equipment and emergency response teams;
- If required the public must be notified through the community notification system;
- The environmental manager should notify relevant authorities if required;
- Emergency evacuation must occur if the safety is compromised;
- Medical treatment and transport must be provided to anybody that is injured;
- The environmental manager should ensure that an incident register be completed for the emergency situation;
- The environmental impacts related to the emergency must be assessed and remediated by:
    - Taking measures to stop or prevent continued environmental degradation by either containing the contamination or stopping the contamination at source;
    - If required getting input from external environmental expertise to assess the nature of damage incurred; and
    - Remediation measures must be implemented to mitigate the impacts e.g. clean-up of spill or rehabilitation of vegetation.
- A debriefing session should be held after the emergency situation has been resolved; and
- The emergency preparedness and response plan should be revised according to the outcome of the debriefing session.

Further steps required include the following:

7.2.1. Detection of an Emergency Situation

- A risk assessment should be carried out to determine the hazards/risks at the mine which may potentially result in emergency situations. Simultaneously, apparent risk reduction options should be defined and pursued. Risk assessments should be conducted after any changes to the layout or process occur;
- In order to ensure that emergencies are detected as early as possible, the Mine should install fixed detectors or early warning systems in the areas around the mine where hazards/risks were identified. These include:
    - Any hazardous chemical or waste storage areas where there is the potential for hazardous chemical spills;
    - Workshop and plant storage areas where there is the potential for hydrocarbon spills;
    - Water management infrastructure where flooding may occur;
    - Areas where there is a high potential for explosions or fires to occur; and
    - Areas which may be impacted by seismicity.
- The detectors and early warning systems should be inspected, calibrated, tested and maintained to ensure that they remain effective; and

- Complaints from surrounding residents should also be regarded as an early warning system.

7.2.2. Hazard/Risk Monitoring

The hazards/risks identified at the mine should be monitored on an on-going basis including:

- The structural integrity of hazardous chemical containers and water management infrastructure should be monitored to ensure there are no leaks or indications of failure;
- Vehicles transporting hazardous materials and waste should be inspected to ensure these are being transported correctly;
- Vehicles should be serviced regularly to minimise hydrocarbon leaks and road traffic accidents;
- Explosives magazines should be inspected to ensure explosives are being handled and stored correctly;
- Fire breaks should be inspected and maintained; and
- Grievance/complaints channels must be monitored to identify impacts on the surrounding communities due to abnormal operating conditions.

7.2.3. Notification of emergency

- The Mine should compile an organogram indicating the internal reporting hierarchy (including the title and names of representatives) indicating both the internal and external emergency response personnel;
- An external reporting structure should also be compiled so that the designated representative can refer to it and contact the relevant authority (such as local municipality, DMR, DWA, DEA or local emergency services etc.) in case of an emergency;
- The emergency response procedure, a list of emergency contacts as well as the internal reporting hierarchy organogram and emergency response team organogram should be displayed around the mine; and
- Should any employee or person noting an emergency condition, they should immediately alert the appointed ECO of the mine, the shift supervisor or the Mine Manager.

7.2.4. Make safe

The following should be in place to ensure safety at the mine:

- Measures must also be taken to stop or prevent continued environmental degradation by either containing the contamination or stopping the contamination at source;
- The Mine should have a mechanism in place to fund any emergency response activities;
- The Mine should ensure that there are sufficient numbers of trained personnel as well as appropriate emergency response equipment for the type of emergency situations which may occur;
- Measures must be taken to ensure that personnel and public are safe and removed from the area of danger;

- Medical treatment and transport must be provided to anybody that is injured. Emergency evacuation must occur if the safety of people is compromised;
- Internal and external emergency services (where appropriate) must be notified of the emergency so that it can be addressed using the relevant emergency equipment and emergency response teams;
- The protocols for use of the emergency equipment should be available;
- Emergency equipment should be inspected, tested and maintained to ensure effectiveness;
- The Mine should consider the capacity of- and equipment available from- local emergency response services as well as other companies, and where possible mutual aid agreements should be maintained to allow for the sharing of emergency response services and specialised equipment; and
- A list of internal and external equipment, personnel, facilities, funding, expert knowledge and materials that may be required to respond to an emergency situation.

7.2.5. Obtain information on the emergency

The appointed ECO of the mine should obtain information on the nature of the emergency, origin, time that it commenced, persons involved, whether people have been injured and potential or actual environmental risks. An incident register should be kept which will allow for the collection of information regarding the previously mentioned aspects.

7.2.6. Remediate the associated environmental impact

The environmental impacts related to the emergency must be assessed and remediated. This may require the input of external environmental expertise to assess the nature of damage incurred. Remediation measures must be implemented to mitigate the impacts e.g. clean-up of spill or rehabilitation of vegetation.

7.2.7. Communication

- The Mine should have a community notification system in place so that if the community is to be affected by an emergency situation, the relevant affected people within the community can be notified of the situation and the procedures to follow, as well as when the situation has been resolved; and
- The relevant affected people must be kept informed of the emergency, including when the situation is over and normal work can be resumed. The emergency must be reported to the relevant authorities (such as local municipality, DMR, DWA, DEA, local emergency services, fire brigade, etc.) and the public when required.

7.2.8. Debriefing session

After the emergency there should be a debriefing session to discuss the cause of the emergency, extent of damages, extent of emergency preparedness and response. The cause of the emergency

must be investigated and corrective and preventative measures implemented to prevent a re-occurrence of the cause of the emergency, or lapses in effective response to the procedure.

7.2.9. Revise procedure

This plan should be reviewed and revised periodically to incorporate any new risks/hazards identified due to changes to the mine layout or process, as well as to incorporate any lessons learnt from the previous emergency situations to ensure that these situations do not reoccur.

7.2.10. Training and emergency drills

All staff must be trained in how to respond to emergency conditions at the mine and should be aware of the emergency exit points, the actions required in the event of an emergency and which external emergency services to contact.

The emergency procedure for emergencies (with the contact details of external services) must be posted in a visible, easily accessibly place throughout the mine. Emergency drills (e.g. fire and evacuation drills) should be conducted at periodic intervals, at least once per annum.

7.3. Specific Emergencies

7.3.1. Uncontrolled Fires

The Mine should take measures to prevent explosions and fires at the mine. The Mine will ensure that explosives are stored in a safe and appropriate manner and that there is adequate fire-fighting equipment located around the mine, which is regularly inspected. The Mine will ensure that a sufficient number of personnel receive formal fire-fighting training. Finally, it is the responsibility of the appointed ECO of the mine to ensure that there is an adequate system of firebreaks in place and that all fire hazard 'hotspots' have been identified. The fire emergency procedure is as follows:

- Raise the alarm by sounding the fire alarm system or notifying the relevant person (consult the internal emergency reporting hierarchy organogram);
- Determine the location and severity of the explosion and or fire;
- Consult the emergency contact list and notify the fire fighting representative as well as the fire department if necessary;
- Apply basic fire-fighting procedures if possible and apply evacuation procedures if necessary;
- Assemble at the emergency control point and obey all instructions from the fire fighting representative;
- The emergency number for the closest fire station must be located at the Mine Manager's office and all other site notice boards;
- The environmental manager should ensure that an incident register be completed for the explosion or fire;
- A debriefing session should be held after the situation is under control; and

- The emergency preparedness and response plan should be revised according to the outcome of the debriefing session.

7.3.2. Traffic Accidents

This procedure addresses accidents that occur on the site. The following actions must be taken in the event of a road accident:

- Establish what has happened, including the location, nature, and status of the accident; the nature and extent of injuries or damage; and the nature and extent of any spills or leaks (where chemicals may be involved – refer to relevant procedures below).
- Isolate the accident scene and spill area, and treat any casualties.
- Depending on the seriousness of the accident, notify the closest emergency services, the number for which must be on the list of emergency contact details posted up around the mine;
- Inform the Mine Manager, emergency response team, Health and Safety Manager and ECO. These contact numbers must be on the list of emergency contact details.
- Depending on the seriousness of the accident, notify the closest emergency services the number for which must be located at the Mine Manager's office and all other site notice boards.
- Inform the relevant person (consult the internal emergency reporting hierarchy organogram). These contact numbers must be on the list of emergency contact details posted up around the mine;
- The environmental manager should ensure that an incident register be completed for the accident;
- A debriefing session should be held after the situation is under control; and
- The emergency preparedness and response plan should be revised according to the outcome of the debriefing session.

7.3.3. Hazardous Chemical Spills

Standard procedures for hazardous chemical environmental emergencies include:

- Inform the relevant person and response teams (consult the internal emergency reporting hierarchy and emergency response organogram). These contact numbers must be on the list of emergency contact details posted up around the mine;
- If there are injuries sustained, notify the closest emergency services the number for which must be on the list of emergency contact details posted up around the mine;
- Obtain MSDS and follow the instructions to perform a detoxification, clean-up and rehabilitation of the spill;
- All personnel who form part of emergency reaction teams for hazardous chemical spills will be trained and able to apply detoxification procedures;
- Spills will be cleaned up as soon as possible to minimise the exposure to members of the public, personnel and the environment;

- Protection of sensitive habitats, fauna and flora, and livestock;
- Evacuation of local communities if necessary;
- Notification of mine personnel, emergency services and relevant government departments;
- The environmental manager should ensure that an incident register be completed for the spill;
- A debriefing session should be held after the situation is under control; and
- The emergency preparedness and response plan should be revised according to the outcome of the debriefing session.

As far as possible, assistance will be obtained from Hazchem emergency response units for dealing with any major spills (although unlikely). Where this is not possible, production personnel required to enter the area will be trained and fully equipped with MSDS and approved PPE.

7.3.4. Oil Spills

Oil spills can occur over most of the site and the major sources will be leaks from vehicles and machinery as well as hydrocarbon stores. These spills may be minor (i.e. a few spots) or major (i.e. a 220 ℓ drum falling over onto the soil). Negligence is also a source of oil spills where contractors or site staff are servicing machinery and allow used oil to spill onto the ground. There is also the potential for equipment and machinery breakdowns on the site. MSDS will be kept at the stores for each type of hydrocarbon on the site. These will contain information on decontamination procedures and the correct procedure to follow in the event of a spill. The Mine Manager will also place emergency spill kits (i.e. plastic tarpaulin, a 220 ℓ drum, a broom and an absorbent to soak up the material) at strategic locations around the site.

The following actions must be taken in the event of an oil spill:

- Inform the relevant person (consult the internal emergency reporting hierarchy organogram). These contact numbers must be on the list of emergency contact details posted up around the mine;
- Establish what has happened, and the nature and extent of the spill;
- Obtain MSDS and follow the instructions to contain and clean a spill. The area must be cordoned off and kept clear, and the spill contained and cleaned up immediately;
- Any contaminated soil, vegetation or rock must be removed and disposed of at a registered landfill site;
- The environmental manager should ensure that an incident register be completed for the spill;
- A debriefing session should be held after the situation is under control; and
- The emergency preparedness and response plan should be revised according to the outcome of the debriefing session.

7.3.5. Bulk Fuel Spillage

The following actions must be taken in the event of a bulk fuel spill:

- Inform the relevant person (consult the internal emergency reporting hierarchy organogram). These contact numbers must be on the list of emergency contact details posted up around the mine;
- Establish what has happened, and the nature and extent of the spill;
- To contain and clean a spill, the instructions on the MSDS must be followed. The area must be cordoned off and kept clear. Any contaminated soil, vegetation or rock must be removed and disposed of at a registered landfill site, or be treated at a bioremediation facility;
- The Mine Manager, responsible area manager, Health and Safety manager, ECO, and emergency response team must be informed. These contact number must be on the list of emergency contact details;
- Any contaminated soil, vegetation or rock must be removed and disposed of at a registered landfill site;
- The environmental manager should ensure that an incident register be completed for the spill;
- A debriefing session should be held after the situation is under control; and
- The emergency preparedness and response plan should be revised according to the outcome of the debriefing session.

7.3.6. Acid Mine Drainage

- Inform both the Mine Manager and environmental department of the situation;
- Notify authorities – DWA contact details must be on the list of emergency contact details; and
- A treatment procedure must be guided by discussions with authorities.

7.3.7. Abnormal Operating Conditions

- For any abnormal operating conditions resulting in public complaints (i.e. excessive dewatering, contamination of arable land as well as any other abnormal operating conditions which may arise the general emergency response plan detailed in Section 7.2 above should be implemented and followed.

8. ENVIRONMENTAL AWARENESS PLAN

8.1. Introduction

This chapter describes the environmental awareness plan as per the requirements of the EIA Regulations GNR543 Section 33(j). It details how the proposed Canyon Springs Coal Mine intends to inform its employees of any environmental risks which may result from their work and the manner in which the risks must be dealt with in order to avoid pollution or degradation of the environment.

The objective of the environmental awareness plan is to ensure the following:

- All personnel are made aware of the environmental management requirements;
- All personnel as a minimum must undergo general environmental awareness training; which would highlight all personnel environmental responsibility; and
- Those personnel whose functions may have a significant impact on the environment receive the appropriate training, so that they may perform their designated tasks adequately.

The benefits of awareness training are numerous and include:

- Awareness of the importance of conforming to the EMP;
- Improvement in environmental performance at the mine; and
- Support for the proposed Canyon Springs Coal Mine in its efforts to achieve its environmental management objectives and performance targets.

8.2. Objectives of the Environmental Awareness Plan

- To ensure that all personnel are made aware of the Canyon Springs Coal Mine's environmental management requirements and commitments;
- To ensure that all personnel, as a minimum, undergo general environmental awareness training, so as to highlight environmental responsibility; and
- To ensure that those personnel with responsibilities or activities that may have a significant impact on the environment receive appropriate training to avoid or minimise their potential impact.

The benefits of environmental awareness training include an improvement in environmental performance at the mine and support for the Canyon Springs Coal Mine in its efforts to achieve its environmental management objectives and performance targets

8.3. Roles and Responsibilities

Environmental awareness training at the proposed Canyon Springs Coal Mine is to be provided to all employees on site, as well as all contractors. Contractor employees whose work has, or can have, a significant environmental impact must undergo awareness training prior to the commencement of any such activities.

All new employees are to undergo environmental awareness training as part of their induction within the first two weeks of employment. Contractor employees whose work has, or can have, a significant impact on the environment must, upon appointment, have a personalised training programme developed as part of his/her job description and must undergo awareness training prior to the commencement of any such activities. Performance assessments will be conducted on the contractors' compliance on environmental issues under his/her control. After the initial training, refresher courses must be provided annually or upon request from trainee.

The on-site ECO or parties identified and recommended by the ECO, will undertake the environmental awareness training on site. The ECO is responsible for developing training modules, providing environmental training to employees on site, identifying additional training, maintaining a master set of training material, scheduling training sessions, maintaining training records, and updating this procedure as and when necessary. The ECO is to identify additional environmental training (revision and update of course) at least annually.

The environmental awareness plan for the proposed Canyon Springs Coal Mine outlines the environmental aspects for which training must be provided, optional methods of training, scheduling, and content of training sessions.

8.4. Training Requirements

There are two types of training which will be undertaken, namely awareness and ongoing environmental training / education. Awareness training refers to acquiring knowledge of the Environmental Policy, EMP requirements, legal requirements and key environmental issues.

Awareness training planned will be:

- General in nature;
- Similar in content irrespective of job description;
- Delivered from an environmental perspective; and
- Conducted in a classroom setting or during site visits.

Environmental education will be job-orientated and refers to training delivered to ensure that any task that may have a significant impact on the environment is performed properly. Competency training usually:

- Is specific in nature;
- Is dependent on the job description of the employee;
- Is aimed at ensuring that employees perform key tasks (or set of tasks) correctly; and
- Involves both classroom instruction as well as on-the-job training and task observations.

Both types of training must be performed as part of the proposed Canyon Springs Coal Mine environmental awareness plan. Personnel may require either awareness or competency training, or both, depending on their organisation, position within that organisation and specific job function. The agenda for the environmental awareness course/ induction would typically consist of the following:

- What is the environment;

- Why must we look after the environment;
- How do we look after the environment;
- Details of the working areas;
- Management of streams and rivers;
- Management of flora and fauna;
- Details regarding smoking and fires;
- Management of petrol, oil and diesel;
- Dust management;
- Ablution facilities;
- Waste management;
- Traffic safety; and
- Emergency procedures and numbers.

8.5. Record Keeping

Records must be kept and maintained for the date, content covered and attendees of training sessions. The attendee register must be signed by all attendees. See below for an example:

ENVIRONMENTAL TRAINING COURSE

Date		
Course content		
Course leader		
Attendee name	Department / Section	Signature

Training records must be maintained for a period of three (3) years

8.6. Environmental Awareness Training Components

Environmental awareness training at the Canyon Springs Coal Mine is to cover the following sections as a minimum, and be amended as and when necessary:

- Introduction to the environment;
- Environmental legislation and legal requirements;
- Safety, Health, Environmental and Quality (SHEQ) Policy;
- Delineation of working areas;
- Access to the site, and no-go zones;
- Water management (including both ground- and surface water resources as well as clean and dirty water management on site);
- Management of erosion and land degradation;

- Identification and eradication of alien invasive plants;
- Noise and blasting safety procedures;
- Air quality management;
- Hydrocarbon spillage management;
- Ablution facility management;
- Waste management;
- Energy conservation;
- Management of heritage sites;
- Traffic safety procedures;
- Interaction with the surrounding communities (consultation and addressing any grievances); and
- Emergency response procedures and numbers.

8.7. Frequency and Scheduling of Training

All new employees will be expected to undergo environmental awareness training as part of their induction. This induction should occur within the first two weeks of employment. Contractor employees whose work has or can have a significant environmental impact must undergo awareness training prior to the commencement of any such activities. The proposed Canyon Springs Coal Mine employees whose work has, or can have, a significant environmental impact must, upon employment, have a personalised training program developed as part of their job description. Performance assessments will also measure his/ her compliance on environmental issues under his/her control. This schedule will be drawn up by the employee and a 'mentor' assigned to the employee. This program should include any required competencies associated with that employee's environmental management role, and the means and timeframe by which this competency is meant to be achieved. Adherence to this program should be monitored by the employee and mentor, and the mentor should sign-off the employee as competent once the program has successfully been completed.

9. ENVIRONMENTAL GOALS AND OBJECTIVES

9.1. Objectives and Goals Relating to the Management of Identified Environmental Impacts

9.1.1. Objectives

As per the NEMA requirements of GNR543 Section 33(b), the main environmental objective of the proposed Canyon Springs Coal Mine is to minimise the potential impacts thereof on the environment to as great a degree as possible. The mine thus commits to the following environmental policy objectives:

- Comply with the legal requirements (both those identified in this document as well as any other relevant item of legislation which applies- or which becomes applicable during the life of the proposed operation) as well as any voluntary commitments;
- Prevent the generation and / or spread of pollution within the receiving environment through the implementation of effective management and mitigation measures outlined in this document as well as any which are recommended in response to impacts which may arise during the life of the proposed operation;
- Strive to return the proposed project area to pre-mining land capability;
- Ensure the intrinsic biodiversity of the proposed project area remains in line with the conservation objectives;
- Seeking to continually improve operations in terms of environmental performance; and
- Sharing of information on environmental performance with the community, relevant Stakeholders (including State Departments) and Interested and Affected Parties (IAPs) and imposing corrective intervention should environmental performance not meet the relevant standards.

9.1.2. Goals

The environmental related goals for the proposed Canyon Springs Coal Mine are thus as follows:

- Implementing the management and mitigation measures stated in this EMP;
- Implement and undertake the monitoring programmes stated in this EMP;
- Implement an EMS which encompasses all aspects of environmental impact management, mitigation and monitoring as defined in this EMP. This EMS will serve as a tool by which the outcomes of monitoring programmes can be gathered and thereby gauge the efficacy of management measures implemented, while also serving to gather all pertinent data related hereto, including the outcomes of any performance assessments or audits conducted, any additional studies or updates to models conducted and further to capture any relevant complaints, comments or concerns which may arise from the surrounding communities;

- Ensure that the employees at the proposed Canyon Springs Coal Mine and IAPs / Stakeholders are aware of the EMS as well as their roles and responsibilities relating thereto;
- Apply for, and adhere to, any commitments made or conditions of the WUL (i.e. ground- and surface water quality conditions);
- The requirements of the NWA (Act No. 36 of 1998) regarding the use and extraction of surface and groundwater is adhered to;
- Investigate further options to prevent groundwater drawdown in surrounding users' boreholes. Should this be unavoidable, water of the same quality and quantity must be provided to those affected users;
- Prevent the contamination of watercourses associated with the proposed development;
- Avoid the generation of excessive, nuisance noise to surrounding communities;
- Ensure the personnel noise exposure levels comply with the requirements of the Mine Health and Safety Act, 1996 (Act No. 29 of 1996);
- Reduce particulate matter and dust fallout throughout the life of the operation in order to comply with the SANAAQS and the NEMAQA draft dust fallout standards;
- Reduce dust generation from the roads and storage stockpiles;
- Comply with the required guidelines when blasting;
- Avoid damage to surrounding structures and any nuisance to people / animals due to blasting activities;
- The requirements of the NEMBA (Act No. 10 of 2004) regarding the protection of threatened ecosystems and species is adhered to;
- Together with Mpumalanga Department of Agriculture Rural Development and Land Administration (MDARDLA), investigate options for alternative land for use in grazing and agriculture where necessary, in the form of a resolution; and
- Ensure that soil resources are preserved in a manner allowing for suitable rehabilitation at closure.

9.2. Objectives and Goals Relating to the Socio-Economic Conditions

9.2.1. Objectives

The socio-economic objectives of the proposed Canyon Springs Coal Mine, as per their approved SLP (Appendix 14), are as follows:

- Encourage portable skills training in mining related disciplines;
- Develop core/scarce skills within the mine's workforce;
- Clearly define and implement career progression objectives;
- Facilitate career path development within the mine's workforce;
- Promote further education and qualification in mining related disciplines;
- Meet the Department of Labour's Employment Equity Act principles;
- Facilitate improved housing conditions among the mine's workforce that will require housing;

- Foster entrepreneurship in the local communities of Loding, Ga-matimpule, Ramantsho, etc.
- To develop a mentorship programme designed to address the operation's developmental needs, whilst facilitating the transferral of skills, knowledge and competence to employees;
- Establish a Learnership scheme that will enable employees to receive the necessary support and assistance needed to complete their qualifications in line with operational requirements;
- Invest in core business training that will promote productivity and employability;
- The Canyon Springs Coal Mine Bursary Scheme (Holgoun Development Trust) will be utilised to assist potential students to attain qualifications in mining-related disciplines, thereby contributing to the general upliftment of skills and qualification levels in the mining sector.
- Canyon Springs (Pty) Ltd undertakes to establish a Future Forum within six months of the employment of the full workforce. The Future Forum will be a partnership between management, the workers and their representatives and will be suitably represented by these parties. The purpose of the Future Forum would be to determine and forecast problems, challenges facing the proposed Canyon Springs Coal Mine, as well as investigate and determine potential solutions to those problems identified. The purpose of the consultation is to permit the parties, in the form of a joint problem-solving exercise, to strive for consensus. To this end the objectives and functions of the Future Forum is to:
    - Promote ongoing discussions between the workers representatives and mine management regarding the future of the mine as well as the following;
        - The SLP;
        - SLP Fund;
        - Establishment of a board of trustees to manage the fund;
        - The Workplace Skills Plan;
        - Employment Equity; and
        - Labour related topics.
    - Anticipate, forecast and identify problems, challenges and possible solutions with regard to productivity and employment;
    - Generate awareness of the SLP and associated activities;
    - Interact with the Department of Labour as and when required;
    - Identify production and employment turnaround strategies;
    - Implement strategies agreed upon by both the employer and worker representatives;
    - Consult and attempt to reach consensus on appropriate strategies to promote productivity;
    - Save jobs and ensure fair business practices; and
    - Implementation of early warning systems.

9.2.2. Goals

The goals to accomplish the above socio-economic objectives are to:

- Implementing Human Resources Development (HRD) programmes in order to ensure the on-going facilitation of transferable, accredited skills amongst the proposed Canyon Springs Coal Mine's workforce;
- The mine will implement a skills development plan to meet the requirements as per the Skills Development Act;
- Have discipline-based career management committees which focus on employee career development;
- Implement mentorship programmes to encourage the transfer of experience and attributes from mentor to protégé;
- Offer bursaries for full time tertiary studies in mining related disciplines;
- Make internship positions available to allow students to get experience in the field;
- Implement an employment equity plan;
- Develop strategies to promote affirmative action;
- Provide housing allowances in line with current practice to mine employees;
- Have a home ownership support programme to offer advice and assistance to mine employees regarding housing options that suit their needs; and
- Implement a procurement progression plan to promote sustainability of Historically Disadvantaged South Africans (HDSA) businesses.

9.3. Objectives and Goals Relating to Cultural and Heritage Aspects

9.3.1. Objectives

The proposed Canyon Springs Coal Mine's objective, regarding cultural and heritage aspects, is to ensure that the integrity of the heritage and cultural resources associated with the project area remain intact as far as practically possible.

9.3.2. Goals

The mine's goals relating to cultural and heritage aspects will be to:

- Ensure that the management measures proposed in the EMP which relate to cultural and heritage resources are implemented;
- Ensure compliance with the aspects of the National Heritage Resources Act, Act 25 of 1999; and
- Ensure that all possible sites of cultural and heritage value are identified and recorded.

10. PRELIMINARY CLOSURE PLAN

The preliminary closure plan provided below applies to the Canyon Springs Coal Mine. The scope of the interim closure plan is to detail the activities required to meet the requirements of the MPRDA, and the associated Regulations contained in GN527 of 2004, as well as the NEMA GNR543 Section 33 (b), (g) and (k), relating to the Mine's closure objectives.

10.1. Objectives

As per the MPRDA Regulations GNR 527, as well as the NEMA GNR543 Section 33 (b), (g) and (k), the objectives of the proposed Canyon Springs Coal Mine relating to mine closure are to ensure that:

- The closure of the mining operation incorporates a process which starts at the commencement of the operation and continues throughout the life of the operation.
- The risks pertaining to the environmental impacts are quantified and managed pro-actively, which includes the gathering of relevant information throughout the life of the mining operation;
- The safety and health requirements in terms of the Mine Health and Safety Act, 1996 (Act No. 29 of 1996) must be complied with;
- Public health and safety must be protected;
- The residual and possible latent environmental impacts must be identified and quantified;
- The need for long term monitoring and maintenance must be reduced or removed;
- The land must be rehabilitated, as far as is feasible, to its natural state, or to a predetermined and agreed standard or land use which conforms to the concept of sustainable development;
- Short- and long-term impacts on surface and groundwater quality must be minimised and contained at acceptable levels;
- The mining operations must be closed efficiently and cost effectively without creating a lasting legacy of pollution which may be transferred to subsequent users of the land or the State; and
- Socio-economic benefits post-closure must be maximised.

10.2. Goals

The most important aspects to focus on in terms of closure include:

- Rehabilitation of the affected land to a condition whereby land capability is as per the pre-mining conditions;
- Retention of biodiversity (or avoiding the long-term decline in the biodiversity of the project area) and promotion thereof in the long-term;
- Retention of wetlands on-site at the current or better PES;
- Rehabilitation of the mining area to reflect the aesthetic quality of the pre-mining

environment;

- Striving to return groundwater to a pre-mining quality, or if not possible, identifying mechanisms by which to treat poor quality groundwater to meet the catchment objectives;
- Minimisation of the potential health and safety impacts; and
- Contribution to the overall socio-economic well-being.

The goals to accomplish the closure objectives for each of the aforementioned aspects are discussed in the paragraphs that follow:

Groundwater

Although presently not a problem, the potential for AMD exists when mining commences and particularly after closure. The Acid Base Accounting (ABA) tests done show that it is likely that AMD conditions will form from all the lithologies that occur in the area. The high Sulphide-S percentage indicates that the acid conditions will be sustained in the long term. Leach test results show that, under neutral conditions, iron and manganese will be released.

Numerical modelling simulations show that the groundwater levels will not recover sufficiently during the LOM to allow for significant contamination to migrate away from the opencast pits and therefore contamination will be contained in the pit area. However, in the post closure phase groundwater levels in the rehabilitated mine area will continue to recover to near pre-mining levels. This will lead to the generation of AMD. Measures need to be implemented to reduce the probability of AMD forming within the mined out pits, and potentially threaten the quality of the surrounding aquifers, as well as the surrounding environment.

Surface water

It is estimated that once the mine has closed and the groundwater table stabilised, a volume of between 50 and 410 m^3/day will decant from the individual mining areas. Before acidification SO_4 will leach close to gypsum saturation at approximately 1 800 – 2 500 mg/L. Measures need to be implemented to exclude carbonaceous material from oxygen to ensure that no acidification occurs.

Throughout the 100 years of contamination of the decanting water approximately 15 to 30 g of sulphate will seep into the Ghotwane River as part of baseflow contribution. By implementing the measures referred to above, decanting water will add approximately 6 to 12 g of sulphate into the Ghotwane River (and subsequently to the Elands and Olifants Rivers) as part of baseflow contribution.

The decant of groundwater will also have to be managed to ensure the Ghotwane River and the No-Name Stream will not be affected by AMD and other heavy metal pollution.

Wetlands

As coal mining is considered to pose a serious threat to wetlands, a conservative approach is therefore to designate a 50 m buffer from the outer edge of the wetland temporary zone, within which mining-related activities should be avoided.

Decant is expected to start occurring around 10 to 20 years after mine closure. This may have a significant effect on the characteristics of the watercourse, and may result in negative impacts on

biodiversity within the wetlands. Measures will have to be implemented to ensure that decant does not negatively affect the quality of the water, soils and flora within the wetlands.

Land capability

The proposed surface infrastructure location is currently being used for a combination of livestock grazing (low intensity) and cultivation. The intention is to ensure that the rehabilitation of this area renders it suitable for similar aspects post-mining. It is not expected that this area will immediately return to agricultural potential and there is likely to be a reduction in the ability of the land to support both cultivation and grazing. In order to provide a stable and sustainable end land use of grazing and cultivation, the site will need to be safe (topographically and chemically), be able to sustain and maintain adequate (and suitable) grass species, and have adequate access to water for livestock.

Physical Stability

Physical stability is required for effective implementation of the planned land use goals post-closure and can be achieved through the following:

- Disturbed areas must be stabilised. This is especially important for rolled over / rehabilitated pit areas. These areas must be shaped appropriately by a suitably qualified engineer. Areas must be stabilised against flooding, erosion and subsidence.
- The embankments remaining following the removal of any dams and reservoirs must be shaped and re-vegetated.
- Drainage must be consistent with that of pre-operation as far as possible.

Biodiversity

Biodiversity of the post closure mine site can be ensured through the re-establishment of appropriate vegetation communities. The water that leaves the closed mine site must be of a sufficient quality so not to significantly impact on the downstream water resources. Rehabilitation must be carried out using native vegetation and species that will create self-sustaining communities that contribute to the re-introduction of faunal species. Disturbed areas must be stabilised in order to prevent erosion. Alien invasive species must be managed through integrated control methods including chemical and physical removal schemes.

Aesthetic Quality

The aesthetic quality of the mine site post closure can be achieved by thoroughly decommissioning the mine site which includes and all structures being dismantled, removed and disposed of appropriately (see closure methods in Section 10 below). Rehabilitated areas must be inconspicuous in the surrounding landscape in terms of topography and species composition. Rehabilitated areas must also be free draining and appropriately revegetated. Erosion must be prevented and any eroded areas revegetated. Final topography or landform design should ensure that the land is suited to its end land use (in this case cultivation and grazing land), is sustainable, and is hydrologically compatible with the surrounding land use. The construction of this final landform should be considered from the beginning of rehabilitation to ensure that it is

progressively constructed according to design. The final landform or topography is expected to be aesthetically pleasing and fit in with the surrounding landscape.

Health and Safety

The rehabilitated areas must ultimately be rendered safe by minimising the health and safety impacts. These impacts can be minimised post closure by sealing any excavations and stabilising areas of subsidence and appropriately disposing of all waste material at a registered landfill site.

Social Aspects

The mine must contribute to the overall socio-economic well-being of the affected local communities. There must be transparent communication with the local communities regarding mine closure and downscaling. Mine closure should also be carried out in such a way as to contribute to the long term socio-economic sustainability of the local communities, particularly those that were impacted on by the mine. The objectives stated in the SLP (Appendix 14) regarding the retrenchment of personnel should be adhered to.

10.2.1. Closure Measures

The following section details the closure measures, for each mine component, which should be implemented to ensure that the goals to accomplish the closure objectives are met.

10.2.1.1. Progressive Rehabilitation

This section serves to define the rehabilitation measures that can be undertaken during the operational phase of the proposed Canyon Springs Coal Mine.

Opencast Pits

Progressive rehabilitation of the opencast pits will be undertaken during the operational phase as opencast mining will cease before mine closure.

During opencast mining, three or four strips will initially be exposed. The strips will be cleared of vegetation, and topsoil stockpiled. The stockpiled soil will, where practicable, be used in concurrent rehabilitation. All stockpiled soil will be seeded if it is to be kept in-situ for longer than three months. The topsoil is to be stockpiled and vegetated (preferable) to protect it from water or wind erosion. The stockpiles should be placed away from roads and out of 1:100 year floodlines. Soils should be stockpiled as close as possible to areas where they will be replaced.

The overburden will be stripped and stockpiled separately (for carbonaceous and non-carbonaceous overburden). After the target resource has been mined, the topsoil and overburden material extracted from the strips being mined will be progressively placed into the excavation remaining from the previously mined strips. The discard material from the temporary discard dump will also be used in continuous rehabilitation of the opencast pits. Rehabilitation of the opencast pits will entail all discard and carbonaceous shale material being moved first so as to ensure that the carbonaceous material lies at the bottom of the opencast pits, as per the Geohydrological Impact Assessment (Future Flow May 2013) to a height not exceeding that of the

original coal seam. Hard and soft overburden material will then be backfilled in the same sequence as that of the original material (hard overburden, soft overburden and finally topsoil (300 mm)).

The mining surface topography of the pits will be shaped to form the required evaporation pans at the required invert levels during mine closure (See Section 10.2.1.3 below). Contamination of groundwater, with heavy metals and the generation of AMD, within the opencast pits may be reduced by placing carbonaceous material, used for filling the pit, at the bottom where oxygen will first be displaced by rising groundwater levels. This reduces the possibility of chemical reactions taking place and sulphate contamination forming. This will also reduce the risk of seasonal exposure of the carbonaceous material and sulphide minerals to oxygen when the groundwater level drops during the dry season.

A seed mix will be applied to the strips as they are rehabilitated to accelerate vegetation establishment. Rehabilitation should utilise indigenous species of trees, shrubs and grasses propagated from species dominating the surrounding vegetation types to reinstate the original grazing potential of the rehabilitated area. Rehabilitation programmes should be advised by biodiversity management plans aiming to increase species diversity in rehabilitated areas. All alien invasive vegetation should be eradicated before it becomes established. An ecologist should be employed to conduct regular monitoring of the rehabilitated opencast pit areas until the vegetation is well established and self-sustainable. Alien invasive species must be managed through integrated control methods including chemical and physical removal schemes.

10.2.1.2. Mine Components

Dismantling and Demolition of Infrastructure

At this stage it is anticipated that all of the infrastructure will be demolished / removed at mine closure.

During demolition, the following should be noted:

- The removal of foundations, ripping and levelling of areas should extend to 1 m below the final surface. Such foundations will include hard-standing areas and foundations associated with the terraces established at the processing plant and workshop areas, administration offices and pollution control and storage dams; and
- Demolition waste should be sorted and disposed of accordingly;
    - Inert waste such as concrete should be utilised to backfill excavations such as the opencast pits;
    - Materials such as steel should be recycled by an appointed contractor; and
    - Non-recyclable waste must be safely removed and disposed of a by contractor- and at a suitable facility that meets the requirements of the National Environmental Management – Waste Act (No. 58 of 2009). This applies to both general (domestic), industrial and hazardous waste. These waste streams are to be kept separate at all times to ensure that non-hazardous waste does not inadvertently become contaminated.

Contaminated Water Handling Facilities

The following measures will be applied to the components of the clean and dirty water management system:

- Drain the contents of the SCD and PCD;
- Dismantle and remove all components;
- Rip and remove foundations to at least 300 mm below ground level to reduce compaction;
- Fill in any cavities with overburden, followed by subsoil and reshape to match the original surrounding topography;
- Deposit a layer of topsoil from stockpiles, with a minimum depth of 300 mm, across the area;
- Revegetate the areas using a seed mix and indigenous trees, shrubs and grasses. The species used should be propagated from species dominating the area;
- Ameliorate and fertilise the soil; and
- It is important to note that the clean and dirty water handling facilities should only be removed after any potential sources of contaminants within their respective catchments have been removed and the areas rehabilitated in order to ensure that contaminants are not inadvertently introduced into the receiving catchment during rehabilitation.

Sewage Treatment Plant and Waste Water Treatment Plant

The STP and WWTP will be demolished / dismantled and the footprint rehabilitated as follows:

- The contents of any treatment tanks and related structures will be cleared and the structures removed from site by an appointed contractor for disposal at a suitably licensed facility;
- Topsoil removed during construction will be replaced and used to level the disturbed area;
- The areas will be re-vegetated using a seed mix and indigenous trees, shrubs and grasses;
- The species used should be propagated from species dominating the area; and
- The soil should be ameliorated and fertilised.

Coal Handling and Preparation Plant

Based on Section C of the DMR closure guidelines (2005) the common method of closure for a processing plant ensures that:

- All steel structures and conveyors must be dismantled and removed from site by an appointed recycling contractor;
- Any hazardous material, tanks used to hold hazardous substances and chemicals and contaminated hard-standing areas must be removed from site by an appointed hazardous waste contractor for disposal at a licensed hazardous waste disposal facility;
- Portable facilities must be removed from site by the company from whom these facilities have been rented, or alternatively, if not part of the rental agreement, sold back to a company who deals in such facilities;
- All remaining infrastructure, hard-standing areas, foundations and conveyors should be broken down to natural ground level, and concrete buildings should be demolished to natural ground level and disposed of to a licensed facility by an appointed contractor;
- The compacted footprint of the plant area will be ripped and scarified;

- The areas are to be covered with 1 m subsoil, topsoiled with 300 mm of topsoil that was removed prior to construction and stockpiled;
- The areas will be revegetated using a seed mix and indigenous trees, shrubs and grasses. The species used should be propagated from species dominating the area; and
- Ameliorate and fertilise the soil.

Temporary Discard Dump

- The residue material of the temporary discard dump will be used in continuous rehabilitation of the opencast pits. Rehabilitation of the opencast pits will entail all discard/carbonaceous material being moved first so as to ensure that the carbonaceous material lies at the bottom of the opencast pits to a height not exceeding that of the original coal seam. Material will then be backfilled in the same sequence as that of the original material i.e.: hards, softs, sub-soil and finally topsoil. This reduces the possibility of chemical reactions taking place and sulphate contamination forming;
- The denuded footprint will be ripped and vegetation re-established;
- The areas will be re-vegetated using a seed mix and indigenous trees, shrubs and grasses. The species used should be propagated from species dominating the area; and
- The soil should be ameliorated and fertilised.

Overburden stockpiles

- All non-carbonaceous and carbonaceous overburden stockpiles will be used to backfill any voids;
- The denuded stockpile footprints will be ripped and vegetation re-established;
- The areas will be re-vegetated using a seed mix and indigenous trees, shrubs and grasses;
- The species used should be propagated from species dominating the area; and
- The soil should be ameliorated and fertilised.

Topsoil Handling and Management

Topsoil is an essential component for successful rehabilitation, especially during the initial period of plant growth. Topsoil contains nutrients and micro-organisms that are essential to plant growth and if they are lost then sustainable vegetative cover will take a longer period to establish.

Subsoil conditions are important in the long term. If the subsoil lacks the nutrients or is unsuitable for long term growth the initial vegetation will die off in periods of one to five years depending on the rate of penetration of the roots.

During decommissioning, subsoil and topsoil that has been stockpiled will be returned wherever possible to its original location. Soil resources that cannot be returned to the original position (due to the presence of some other structure) will be used for the rehabilitation of other areas.

To ensure that the proper soil handling and management is carried out the following should be taken into account:

- An inventory should be compiled and a comprehensive assessment conducted on the topsoil available for site reclamation in terms of the soil quality / chemistry and suitability for re-vegetation; and

- Applications of topsoil should be prioritised, with specific attention being given to:
    - Denuded areas due to mining activities; and
    - Areas from which surface infrastructure has been removed.

Dismantling of the topsoil stockpile footprint:

- Once the soil in the stockpile has been removed, the footprint will be ripped and vegetation re-established;
- The areas will be revegetated using a seed mix and indigenous trees, shrubs and grasses;
- The species used should be propagated from species dominating the area; and
- The soil should be ameliorated and fertilised.

Roads

All access and service roads will be removed and rehabilitated as follows:

- The surface of tarred roads must be ripped up and disposed of either during pit backfilling or at a licensed facility off-site;
- Compacted areas to be loosened by ripping or ploughing and re-graded;
- Fertilised topsoil, from stockpiles, will be used to cover the denuded areas; and
- The areas will be re-vegetated with indigenous plants.

Culverts

- As soon as mining and rehabilitation of Pit 1 is complete, the stream crossing / culvert over the No-name stream should be removed;
- All concrete and artificial surfaces should be removed;
- The damaged banks of the No-name stream should be reconstructed to limit erosion;
- A wetland specialist or botanist should be consulted to help re-vegetate the disturbed banks with appropriate indigenous wetland plant species. Species to be used on vertic soils associated with a seeding program for the wetlands include: *Ischaemum afrum; Sehima galpinii; Setaria incrassate; Panicum coloratum; Bothriochloa insculpta; Aristida bipartite; and Sorghum versicolor;*
- All alien vegetation emerging in the disturbed area should be removed before becoming established; and
- Any debris or sediment which has accumulated in the stream bed against the culvert should be removed to return the stream bed to its pre-mining state.

Ad Hoc Infrastructure

The removal and rehabilitation of the ad hoc infrastructure including the change-houses, workshops and security and administration offices, will be discussed below:

- Structures will be demolished / dismantled and removed from site by an appointed contractor for disposal at a suitably licensed facility;
- Hard-standing areas / foundations will be demolished to below ground-level and the inert material used for backfilling of any voids; and
- The excavations where foundations were removed will be rehabilitated by:
    - Backfilling with subsoil;

- Ripping and scarifying the entire footprint and covering with fertilised topsoil;
- The areas will be revegetated using a seed mix of indigenous plant species; and
- The soil should be ameliorated and fertilised.

10.2.1.3. Evaporation Pans

The design of the evaporation pans takes into account that the transmissivity of the mined material in the rehabilitated opencast pit will be higher than that of the surrounding un-mined material. Additionally it is expected that the recharge from rainfall over the mined out areas, will be significantly higher than that of the un-mined areas. Therefore, the rehabilitated mined area will act as a holding "reservoir" for groundwater with limited outflows to the surrounding area due to the naturally high groundwater level in the surrounding aquifers and the relatively low transmissivity of the un-mined material. The system of four evaporation pans will thus contain and evaporate this additional water. This will prevent any potential future decant and downstream contamination.

As can be seen Figure 5 below, and previously discussed, the pits will be backfilled in a strict sequence with discard and carbonaceous shale material first, sequentially followed by hard overburden, soft overburden and finally topsoil. The final surface of the pits will be revegetated to provide grazing lands for livestock and potentially even arable lands. The mining surface topography of the pits will be shaped to form the required evaporation pans at the required invert levels during mine closure. The basis of the siting of the evaporation pans is thus dependent on the final rehabilitated topography of the pits (Figure 6).

The size of each of the pans is sufficiently large to **totally evaporate** any excess water accumulating in these pans. They will largely be empty throughout the year and especially in the dry season and fill slightly primarily from surface run-off in the wetter seasons. The water level in these pans is never expected to reach the decant water level. The invert level of the evaporation pans, are constructed 2 m lower (freeboard of 2m) than the lowest point on the edge of the four open pits. This will prevent any potentially contaminated water overtopping downstream into the Ghotwane River once the pans are operational.

In order to determine the correct size of the four evaporation pans, the expected decant volumes calculated by Future Flow 2013 were used.

Table 20 below shows the calculated expected excess groundwater volumes for each of the rehabilitated pits, as well as the approximate decant point height in mamsl.

Table 20: Decant height, volumes and the associated evaporation pan sizes

PIT	DECANT HEIGHT(MAMSL)	DECANT VOLUME(M^3/DAY)	CALCULATED EVAPORATION PAN AREA (HA)
Pit 1	955	412.9	11
Pit 2	961	122.1	3.5
Pit 3	955	48.9	1.5
Pit 4	964	48.1	1.5

From this information the required areas of the evaporation pans, was calculated. The evaporation pan sizing also takes into account the rainfall run-off and the seasonal and annual evaporation. It is the evaporation of this mine water, from the centrally located evaporation pans, which ultimately removes between 48 and 412 m^3/day of mine water from the system, thereby preventing decant in the longer term post-closure.

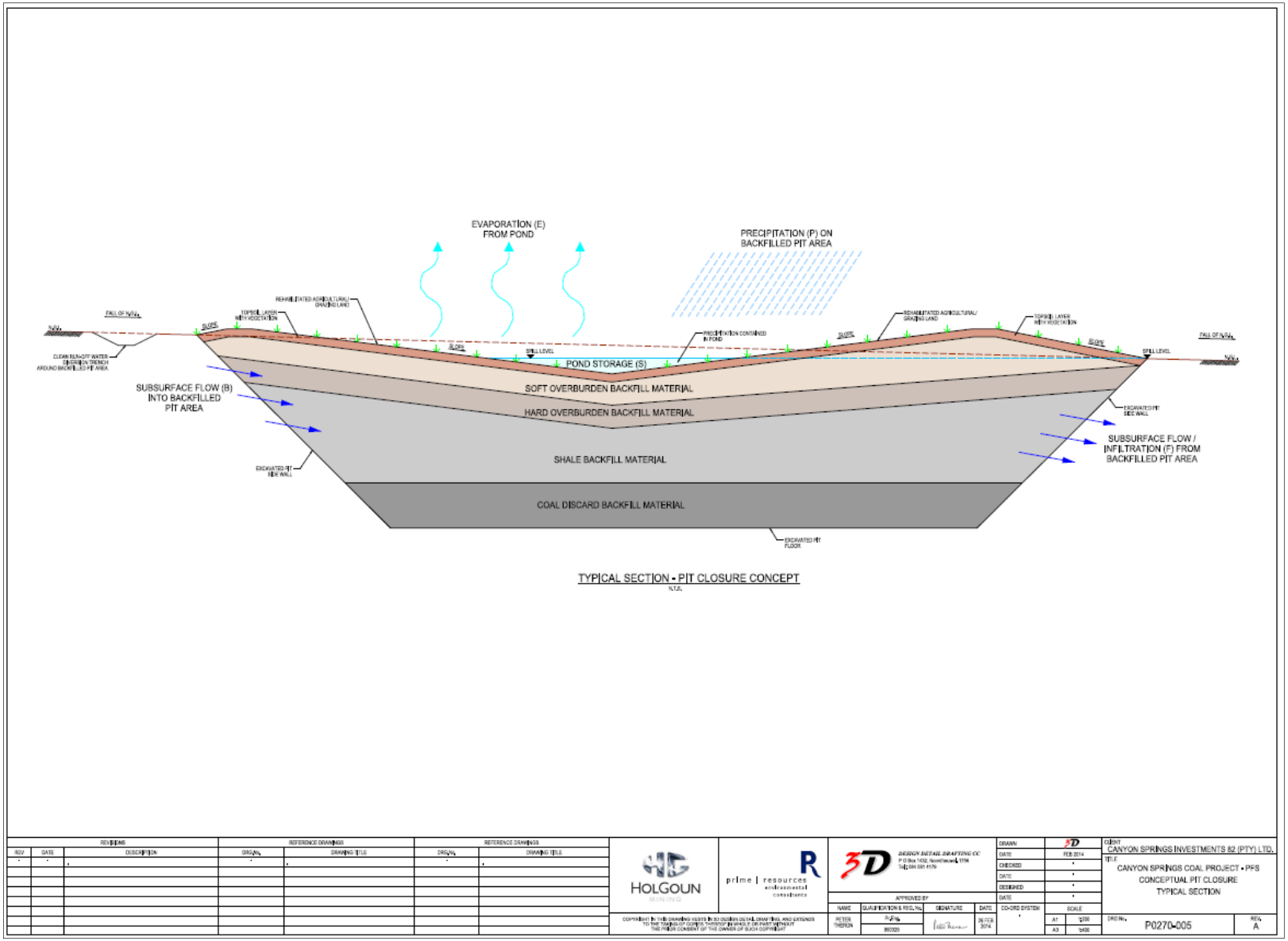

Figure 5: Typical section through proposed evaporation pan

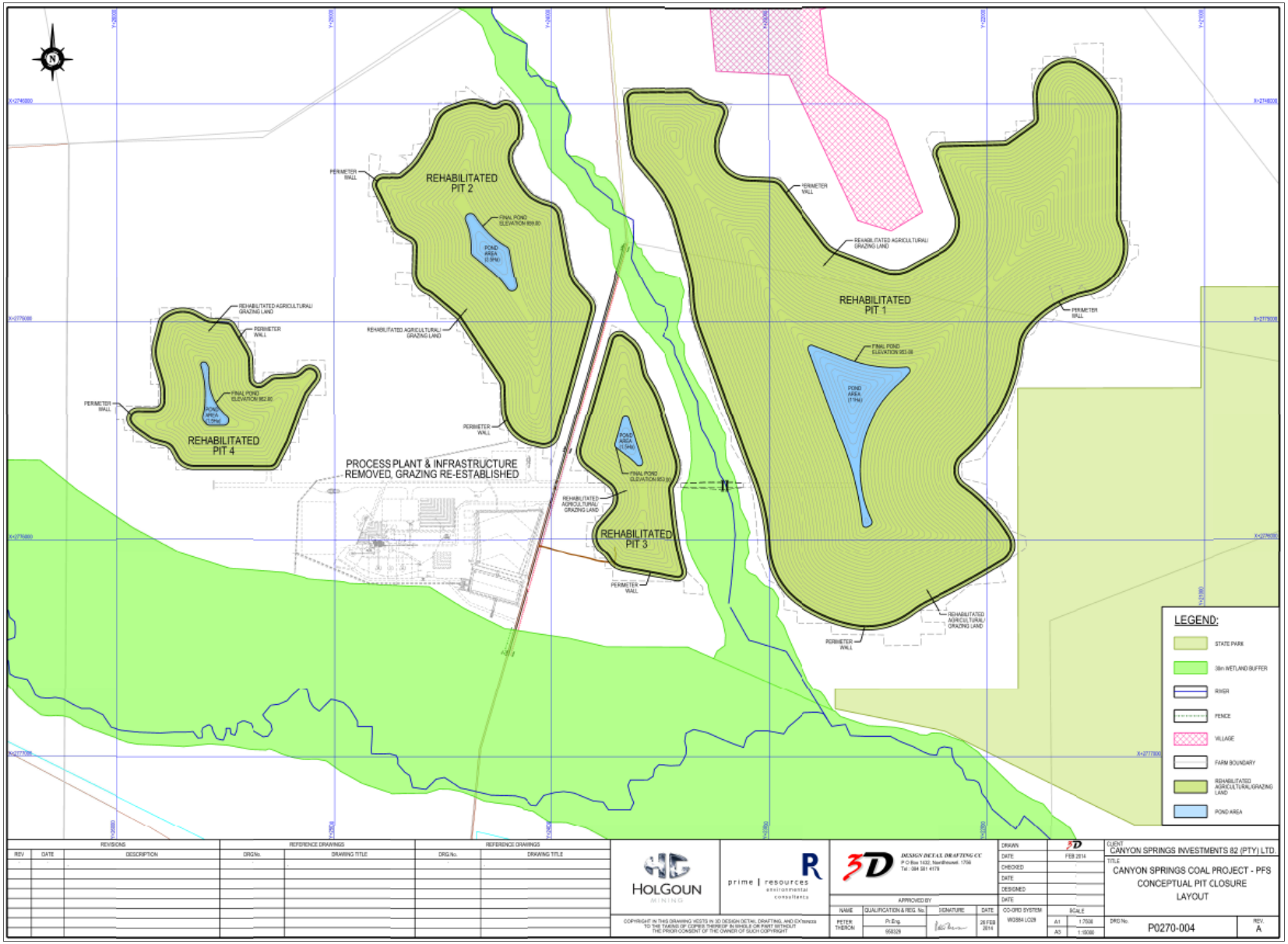

Figure 6: Conceptual pit closure and evaporation pan layout

10.2.1.4. Maintenance and Monitoring

A post-closure monitoring and maintenance period of three years after operations cease is assumed. It should be noted however that the authorities will ultimately dictate the post-closure monitoring and maintenance period required. Maintenance of rehabilitated areas and monitoring will be conducted for three years after mine closure or until a Closure Certificate is awarded.

Table 21 summarises the various monitoring programmes as set out in EMP which should continue to be monitored post closure.

Table 21: Monitoring and submission of information post closure

ASPECT		RECIPIENT OF INFORMATION	MONITORING		
EMP SECTION	SUBJECT		START	FREQUENCY	FINISH
5.6	Surface water quality	DWA	Construction phase	Quarterly *	3 years after closure
5.5	Groundwater quality	DWA	Construction phase	Quarterly **	3 years after closure
5.5	Groundwater levels	DWA	Construction phase	Quarterly **	3 years after closure
5.1	Re-vegetation/ rehabilitation	DMR	Decommissioning phase	Every two years	3 years after closure

* Suspended solids, total alkalinity, pH, EC, Na^+, K^+, Ca^{2+}, Mg^{2+}, NO_3^-, Cl^-, SO_4^{2-}

** Full chemical analysis to be finalised
Groundwater levels

According to the MPRDA closure guidelines, maintenance and aftercare should cover:

- Annually fertilising of rehabilitated areas;
- Monitoring of surface and groundwater quality and quantity; and
- Control of alien invasive vegetation.

A record of all closure aspects should be kept by the site ECO. These records will be important during any auditing process that needs to be undertaken on the closure aspects of the mine. MPRDA Regulation 55 audits (Performance Assessments of the EMP) must be undertaken every two years. In addition, it is expected that the closure plan be updated every 5 years. The closure plan must be finalised 5 years before the planned closure of the mine in accordance with Regulation 62 of the MPRDA.

10.2.1.5. Implementation Schedule for Rehabilitation and Closure

ACTIVITY YEAR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Vegetation clearing																							
Topsoil removal and stockpiling																							
Opencast mining																							
Beneficiation and waste generation																							
Assessment of structural integrity / stability (subsidence and impoundments)																							
Regulation 55 performance assessments																							
Groundwater monitoring / specialist input																							
Surface water monitoring / specialist input																							
Air quality (dust) monitoring																							
Noise monitoring																							
Review and update quantum for closure-related financial provision																							
IAP Engagement																							
Prepare and update closure plan																							
Finalise and submit: closure plan, environmental risk report and final																							

ACTIVITY / YEAR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
performance assessment																							
Continuous rehabilitation of opencast pits																							
Rehabilitation of final voids of opencast pits																							
Polluted water in dams processed																							
Empty STP																							
Demolish / dismantle remaining surface infrastructure																							
Removal of recyclable waste by appointed contractor																							
Disposal of non-hazardous / inert waste (concrete) as backfill																							
Disposal of remaining general waste to landfill																							
Remaining general waste removed by contractor for disposal at licensed landfill																							
Removal of hazardous / contaminated waste by contractor for disposal at licensed landfill																							
Denuded areas, compacted / hard-standing areas / footprints ripped to below surface level and scarified																							
Discard dump backfilled																							

ACTIVITY / YEAR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Apply subsoil to excavations, denuded footprints already ripped / scarified																							
Apply topsoil																							
Seeding with indigenous / agricultural species to match predetermined land-use																							
Maintenance and monitoring of vegetation and soil																							
Allow vegetation to stabilise																							
Record-keeping and reporting																							
Apply for closure certificate from authorities																							

11. FINANCIAL PROVISION

The NEMA GNR543 Section (g) and (k) as well as the MPRDA Section 41 require that Canyon Springs (Pty) Ltd comply with the Act regarding financial provisions for Canyon Springs Coal Mine. In order to ensure that Canyon Springs (Pty) Ltd provide sufficient funds for the total quantum to cover the rehabilitation, management and remediation of potential negative environmental impacts, the quantum for closure-related financial provision in terms of Section 41 of the MPRDA has been determined.

The rates were calculated using the recommended DMR rates for closure cost components (updated as of 2012). The "Rules-Based Approach" for determination of the Quantum for Closure-Related Financial Provision as per the 2005 DMR Guideline was used to determine the Quantum of Financial Provision. As per the guideline the following factors were addressed:

- Determination of the primary mineral and saleable by-products - The mineral to be mined is **Coal**.
- Determination of risk class - The Primary Risk or Hazard is Class A (High Risk).
- Determination of the sensitivity of the area – the area showed a mixture of medium sensitivity and high sensitivity characteristics. Therefore, the precautionary principle was used and the sensitivity of the area was found to be High.
- Determination of the level of information – considered to be limited.
- Determination of the closure components - the following closure components were identified for rehabilitation:
    - Demolition of reinforced concrete buildings and structures including the weighbridge structures, foundations, stormwater trenches and canals;
    - Opencast rehabilitation;
    - In situ rehabilitation of residue facilities;
    - Water management including provision for the SCD, the PCD, STP, WWTP, as well as miscellaneous canals, trenches and berms; and
    - 2-3 years of maintenance and aftercare of all rehabilitated areas.

Determination and application of weighting factors - Two weighting factors relevant to the mine location are applied to the closure costs:

- The first weighting factor is the nature of the terrain. The nature of the terrain is flat. The first weighting factor is therefore 1.00.
- The second weighting factor relates to the proximity of the mine to an urban centre. The proposed site is located approximately 55 km away from Modimolle in the Mpumalanga Province. Therefore, it is classed as peri-urban (less than 150 km from an urban centre), to which a weighting factor of 1.05 applies.

Identification of areas of disturbance - Areas, volumes and lengths of possible disturbances and developments and each applicable closure component were identified and calculated using the proposed mine layout plan as well as through site visits to assess the local conditions.

The closure costing was calculated according to the specifications of the MPRDA. The closure costing calculated for the DMR indicated that the amount to be provided, sufficient for rehabilitation of activities to be conducted in the first year of operation until the quantum is reviewed in terms of Regulation 54(1) in year 2, was as follows:

- Sub-Total 1 - the cost for final closure of the mine and assumes that the mine will undertake the closure and rehabilitation work themselves, and excludes VAT = R 40 098 975.13;
- Grand-total - third party undertakes rehabilitation / premature closure, and therefore includes VAT = R 55 769 654.60

The quantum for closure-related financial provision has been updated since the above to reflect:

- The most recent DMR (2013) base rates,
- Changes in the mining layout as discussed in the relevant sections of this report and in the EIA (Volume 1).

Closure estimates have been calculated for the first year of operation of the proposed Canyon Springs Coal Mine (Table 22). These values will, however, have to be re-evaluated annually throughout the LOM to ensure that adequate provision for rehabilitation is maintained.

Table 22: Quantum for Closure-related Financial Provision for Canyon Springs Coal Mine

Proposed Canyon Springs Coal Mine, MPRDA Regulation 41(3), Quantum for Closure Related Financial Provision, Base Year 2013

Site / Facility Name	Canyon Springs Coal Mine
Mineral Mined / Saleable By-product	Coal
Primary Risk Class	Class A - High Risk
Area Sensitivity	Elements of both Medium-High (precautionary principle applied, multiplication factor of 1 applied) (Determines multiplication factor for 6, 8(C) and 13)
Level of Information Available	Extensive
Closure Components, Closure Costs and Weighting Factors	As below

Closure Component No.	Main Description (as per DME Guideline)	Relevant Component On-site (Description)	Unit	DMR 2013 Base Rates	Quantity Year 1	Multiplication Factor	Nature of Terrain / Relevant Weighting Factor *Flat = 1*	Amount
1	Processing Plant	Includes provision for dissassembly and removal of plant infrastructure (incl. foundations, structures and conveyors) to ground level. Also incl. breaking down of any concrete buildings / structures **at plant** (& concrete hard-stand areas between buildings) to ground level and disposal to voids on-site; as well as the addition of topsoil to the area.	m^3	R 11.58	14.91	1	1	R 172.66
2(A)	Demolition of steel buildings and structures	Aside from plant, no fixed steel building and structures, will be installed on-site, all units will be containerised which will be removed from site as per the relevant rental agreement. Provision is included for the removal of the water supply pipeline (however, there is potential for this to be handed over to the municipality for provision to the surrounding communities).	m^2	R 161.34	6063.0	1	1	R 978 204.42
2(B)	Demolition of reinforced concrete buildings and structures	Typically includes weighbridge, minimal fixed structures, foundations and hard-standing areas, stormwater trenches and canals.	m^2	R 237.76	100.0	1	1	R 23 776.00
3	Rehabilitation of access roads	Service, haul and access roads to pits, within and around plant area.	m^2	R 28.87	8.0	1	1	R 230.96
4(A)	Electrified railway lines	None, trucks to be utilised on existing road network.	m	R 280.22	0.0	1	1	R 0.00
4(B)	Non-electrified railway lines		m	R 152.85	0.0	1	1	R 0.00
5	Demolition of housing and facilities	No workers to be housed on-site. Sewage treatment facility will be a package facility to be removed off-site at closure.	m^2	R 322.68	0.6	1	1	R 193.61
6	Opencast rehabilitation including final voids and ramps	Concurrent infilling with material from subsequent strips and waste rock followed by shaping and covering. Also includes provision for water management measures.	ha	R 169 151.95	137.0	0.52	1	R 12 050 384.92
7	Sealing of shafts, adits and inclines	None, all mining to be opencast only.	m^3	R 86.61	0.0	1	1	R 0.00
8(A)	Rehabilitation of overburden and spoils	Overburden will be stockpiled temporarily and thereafter re-introduced into pit - no overburden will remain on-surface to be shaped and re-vegetated. In the event of unforeseen closure, the maximum volume of material on surface will occupy 92.5ha.	ha	R 112 767.97	90.0	1	1	R 10 149 117.30
8(B)	Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste)	None	ha	R 140 450.47	0.0	1	1	R 0.00
8(C)	Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal rich waste)	Processing waste stockpile will occupy a footprint of 28.2ha, however, the intention is to introduce stockpiled discard back into mined-out areas of the pit during ongoing rehabilitation. In the event of unforeseen closure, the maximum volume of material on surface will occupy 28.2ha.	ha	R 407 934.73	22.0	0.80	1	R 7 179 651.25
9	Subsided areas	No underground mining and hence no subsidence should occur	ha	R 94 426.19	0.0	1	1	R 0.00
10	General surface rehabilitation, including grassing of all denuded areas	Includes provision for ripping, applying topsoil and re-vegetating all mine areas aside from the pits which will be subject to rehabiliation measures leaving denuded footprints (mainly plant and site infrastructure, dams and discard dump footpring.	ha	R 89 331.25	40.0	1	1	R 3 573 250.00
11	River diversions	No river diversions will be constructed.	ha	R 89 331.25	0.0	1	1	R 0.00
12	Fencing	Areas of the plant and site infrastructure and opencast pit.	m	R 101.90	9000.0	1	1	R 917 100.00
13	Water management (Separating clean and dirty water, managing polluted water and managing the impact on groundwater, including treatment, when required)	Includes provision for separating clean and dirty water, managing polluted water (draining of stormwater and pollution control dam) and managing the impact on groundwater, including treatment and management of decant if required.	ha	R 33 966.26	38.0	0.67	1	R 864 780.98
14	2-3 years of maintenance and aftercare	Maintenance and aftercare of all areas affected by proposed mining activities excluding opencast areas.	ha	R 11 888.19	200.0	1	1	R 2 377 638.00
15(A)	Site-specific closure costs identified as per specialist study.	Additional groundwater, ecological, surface water, wetland and noise studies.	Sum	R 75 000.00	1.0	1	1	R 75 000.00
							SUM OF CLOSURE COMPONENT COSTS	R 38 189 500.09
							SUBTOTAL 1 = (SUM OF CLOSURE COMPONENT COSTS) X (WEIGHTING FACTOR 2 = 1.05)	**R 40 098 975.10**
							PRELIMINARY AND GENERAL MANAGEMENT = 12% OF SUBTOTAL 1	R 4 811 877.01
							CONTINGENCIES = 10% OF SUBTOTAL 1	R 4 009 897.51
							SUBTOTAL 2 = (SUBTOTAL 1) + (PRELIMINARY AND GENERAL MANAGEMENT) + CONTINGENCY	R 48 920 749.62
							SUBTOTAL 3 = SUBTOTAL 2 EXCLUSIVE OF VAT AT 14%	R 48 920 749.62
							VAT = 14% OF SUBTOTAL 3	R 6 848 904.95
							GRAND TOTAL = SUBTOTAL 3 + VAT	**R 55 769 654.56**

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