ENVIRONMENTAL & ENGINEERING

REPORT

ZOMHLABA – RESOURCES (PTY) LTD

LAKESIDE COLLIERY

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

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QUALITY CONTROL BY:

Nature of Signoff:	**Responsible Person:**	**Role / Responsibility**	**Qualification**
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Client			

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EAP - was independent and performed the work relating to the application in an objective manner, even if this

results in views and findings that are not favourable to the application; have expertise in conducting environmental impact assessments or undertaking specialist work as required, including knowledge of the Act, these Regulations and any guidelines that have relevance to the proposed activity; ensure compliance with these Regulations;

Take into account, to the extent possible, the matters referred to in regulation 18 when preparing the application and any report, plan or document relating to the application; disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in the possession of the EAP and, where applicable, the specialist, that reasonably has or may have the potential of influencing-

The findings, results, observations, conclusions and recommendations provided in this report are based solely on the information provided to Eco Elementum (Pty) Ltd by the Client and other external sources (including previous site investigation data and external scientific studies). The opinions expressed herein apply to the site conditions and features which existed at the time of commencement of the investigations and production of this report.

The author has utilised his/her best scientific and professional knowledge in preparing this report and the content herein contained is and remains confidential in nature, save where otherwise ordered by a Court of law.

Whilst Eco Elementum (Pty) Ltd exercises due care and diligence in rendering the services and preparing this report, the accuracy of the content herein contained is reliant on the accuracy, correctness and completeness of information and/or data supplied to it by the Client. In this regard, Eco Elementum (Pty) Ltd accepts no liability for any loss and/or damages arising out of the inaccuracy of this report in instances where the information and/or data provided to it by the Client is found to be inaccurate, incorrect and/or incomplete.

DECLARATION OF INDEPENDANCE

I, Riana Panaino, declare that;

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing:
    - any decision to be taken with respect to the application by the competent authority; and
    - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

31 March 2022

Signature **Date**

Mrs Riana Panaino
BSc Honn Biodiversity and Conservation
Pr.Sci.Nat: 117170
Registered EAP

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PART B: ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1. DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

1.a DETAILS OF THE EAP

Table 1.1: EAP details

EAP:	Eco Elementum (Pty) Ltd - Environmental and Engineering
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1.b DESCRIPTION OF THE ASPECTS OF THE ACTIVITY

Table 1.2: Proposed Activity

ITEM	DETAIL
Type of mineral	Coal
Mining method	Strip and Rollover Mining Techniques
Depth of the mineral below surface	The No.2 seam and 4 seam coal band occurs predominantly above Dwyka Tillite, up to 50m below ground level for the proposed open cast sections.
Geological formation	Mining in the Lakeside area have mainly occurred down to the no 2 seam over the mining history. For the proposed mining at Lakeside the opencast mining will be mined down to 2 seam and in some areas only down to the 4 seam. • Pit A = 2 seam; • Pit B = 2 seam; • Pit C = 4 seam; The 2 Seam coal band occurs predominantly above Dwyka Tillite, approximately 50 m below ground level for the proposed Lakeside open cast section. The seam may be up to 6 m thick, consisting of alternating bands of dull coal interspersed with bands of coal shale, as well as narrow bands of fine – coarse grained sandstone / mudstone. Average ash content of the 2 seam is 30,3%, with 20,5%, with and average sulphur content of 1,08%. The 4 seam floor at Pit C varies between 1 519 and 1 529 mamsl.
Life of mine	4 to 5 Years
Production rate	140 000 tons per month
Saleable Product	The No. 2 and 4 coal seams are the main coal seams that are mined by the Lakeside Colliery. The No.2 Seam coal band occurs predominantly above Dwyka Tillite, up to 50m below ground level for the proposed Lakeside open cast section. Mining will consist of the removal of coal from the No. 2 coal seam, the ROM will be transported to an on-site beneficiation plant where the ROM will be processed to be sold to Eskom Holdings Ltd.
Target Market	Eskom

1.c COMPOSITE MAP

Figure 1.1: Site Layout with sensitivities

1.d DESCRIPTION OF IMPACT MANAGEMENT OBJECTIVES INCLUDING MANAGEMENT STATEMENTS

1.d.i Determination of closure objectives

- To appropriately close the mining area, the mine would annually identify areas of rehabilitation and actively pursue the closure vision. The Annual rehabilitation plan will be updated on an annual basis and identify areas of concern.

1.d.ii 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.

The management plan is detailed below for each aspect during each mining phase. Some measures are relevant to more than one aspect. These are not reiterated for each aspect.

The applicant shall ensure that employees and contractors are adequately trained with regard to the implementation of the EMP and environmental legal requirements and obligations. It is anticipated that Environmental awareness shall be targeted at all project involved personnel and also part time personnel shall be trained so that they are aware of environmental obligations by the time they visit the site. The environmental awareness practitioner will be appointed to conduct training during site establishment and will be responsible for how the site look like before the drilling and how it looks like after rehabilitation. This will be to ensure that the site has been restored to its original state or to an acceptable level.

The applicant is committed to identifying training needs and ensuring that all personnel whose work may create a significant impact upon the environment receive appropriate training. The Environmental Awareness Plan describes the training available and the manner in which environmental training needs are identified and continually reassessed.

1.d.iii Potential risk of Acid Mine Drainage.

The ABA results (GCS. 2003) indicate that the Karoo overburden has no acid generation potential and does have neutralising potential. The tests on the numbers 2 and 3 coal seams indicate that they are strongly acid producing. In order to determine whether the mining will result in acid mine drainage it is necessary to assess the overall impact of all the units weighted by unit thickness. The thickness of the Karoo sediments is generally five to ten times that of the coal seams and therefore the net neutralising potential is likely to be greater than one. There will be a low potential for acid mine drainage.

1.d.iv Steps Taken to Investigate, Assess and Evaluate the Impact of Acid Mine Drainage

Acid generation is a common response to the coal mining environment. Coal and carbonaceous material contain a mineral known as pyrite, an iron-sulphide mineral, which is the main contributor to acid rock drainage (ARD). After being exposed to oxygen and water the sulphide minerals react to form an acid bacterium, which increases with the exposure to water and oxygen often accelerates the acidification process. The reaction can however also occur abiotically.

The general equation of pyrite oxidation is as follows:

$$2FeS_2 + 7O_2 + 2H_2O \rightarrow 2Fe^{2+} + 4SO_4^{2-} + 4H^+$$

Ferrous iron is oxidised to ferric iron:

$$4Fe^{2+} + O_2 + 4H^+ \rightarrow 4Fe^{3+} + 2H_2O$$

As mentioned previously these two reactions can occur abiotically or with the catalisation by micro-organisms. These organisms arise from the oxidation reactions. The ferric cations reduce to ferrous ions:

$$FeS_2 + 14Fe^{3+} + 8H_2O \rightarrow 15Fe^{2+} + 2SO_4^{2-} + 16H^+$$

The release of H+ lowers the pH. At the lower pH the solubility of the ferric ion continuous which increases the acid generation.

In opencast operations, the objective is to remove all the coal, therefore acid generation and neutralisation potential is based on the chemistry of the surrounding country rock (i.e., the roof (overburden) and floor of the coal seam.

Geochemical analysis conducted for the Lakeside Leeuwfontein area indicated a probability for acid generating. Therefore, the groundwater quality in the pit regions is expected to decrease as a result of the acidification. It is highly recommended that all carbonaceous material be placed on the pit floor and covered with overburden material. This will result in coverage of the carbonaceous material with water first, which will eliminate oxygen from the system to decrease the process of acid generation.

A groundwater pollution plume will start to migrate down gradient once the groundwater level has reached a point of equilibrium.

1.d.v Engineering or Mine Design Solutions to Be Implemented to Avoid or Remedy Acid Mine Drainage

- Carbonaceous material should be placed at the deeper base of the opencast pits to allow flooding with groundwater as soon as possible. This will reduce the redox reaction potential as oxygen is excluded from the system.
- Rehabilitation should occur in such a manner that surface runoff is directed away from the rehabilitated pit and recharge to the pit minimized.
- Flow paths which include fracture zones should be sealed to reduce inflow of fresh groundwater and outflow of contaminated groundwater.
- Methods of handling the potential decant should be investigated and may include treatment of polluted water.
- The groundwater quality in the monitoring boreholes should continue to be analysed on a quarterly interval basis.

1.d.vi Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage.

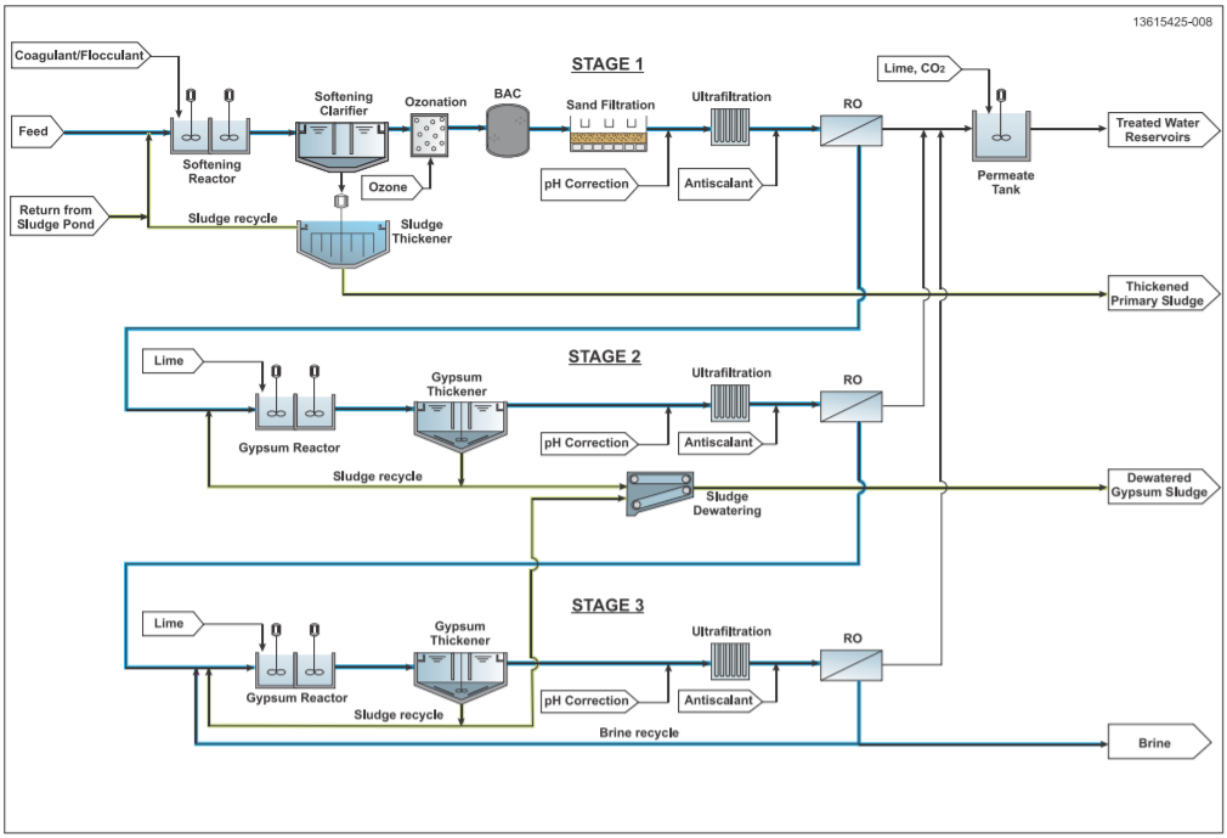
Three treatment options were considered for the treatment of acid mine drainage:

- **RO Treatment plant**

  Reverse osmosis (RO) removes most of the dissolved solids from brackish or saline feed water and can treat water to a very good quality. Pre-treatment for RO often involves limestone and/or lime dosing and aeration for the neutralisation of acidic water and the removal of metals. Neutralisation is then followed by stringent filtration using either sand and cartridge filters, or ultrafiltration (UF), before RO. This process uses pressure to drive water through a semi-permeable membrane, leaving the ions behind. A clean water stream (permeate) and a concentrated brine solution (retentate) result. RO is capable of rejecting bacteria, salts, sugars, proteins, particles, dyes, and other constituents that have a molecular weight of greater than 150-250 daltons.

  RO has the ability to produce treated water with a very low TDS concentration; however, this is expensive (in terms of capital and operational costs) and reduces the quantity of water recovered. Generally, a recovery of 50%-80% can be achieved with a single stage RO plant, and this can be increased to 95% with multiple stage RO, thereby greatly reducing the waste brine volume and the cost of brine disposal.

  Multiple stage RO can achieve water recoveries of greater than 99%, depending on the feed water quality. These high water recoveries are achieved when the feed water consists of predominantly divalent ions that can be precipitated from the preceding stage's brine before being treated in the next RO stage. Multiple stage RO systems can also contain nanofiltration membranes to allow monovalent ions to pass through the membrane and increase the overall water recovery by reducing the production of brine.



The sludge and brine waste streams which are a by-product of the RO process require long-term disposal due to their hazardous nature and high concentration of dissolved salts.

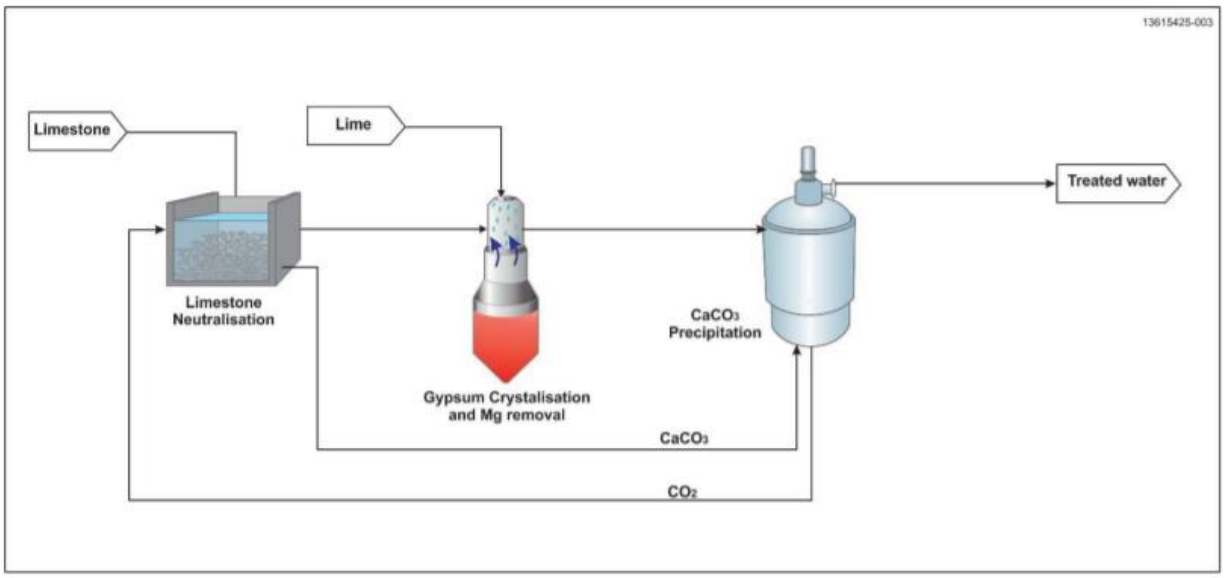
- **Lime treatment**

  The integrated limestone and iron(II)-oxidation process allows for the oxidation of iron(II) when limestone alone is used for neutralisation in the first stage (Maree and du Plessis, 1994; Maree et al., 1996). Powdered limestone is used for iron(II)-oxidation at pH 5.5, neutralisation of free acid, metal precipitation (e.g. Fe3+ and Al3+) and gypsum crystallisation. All reactions are achieved in the same reactor. The novelty of this development lies in the fact that conditions were identified in which iron(II) can be oxidised at pH 5.5 by the addition of limestone. Limestone, the cheapest alkali, is used for neutralisation of the bulk of the acid content. Carbon dioxide (CO2) is produced and stripped off through aeration and transported to the third stage. Lime is used in the second stage to allow for precipitation of magnesium and other metals, and the sulphate associated with these metals. The solubility product of gypsum controls the level to which sulphate is removed. In the third stage, CaCO3 precipitation

occurs when the CO2 that is produced in the first stage makes contact with the high pH of the water from the second stage. This occurs at pH 8.3. The CaCO3 is pure enough to be sold as a by-product, or it can be recycled to the first stage to supplement the limestone addition (Maree et al., 1996). This process offers benefits such as:

- (i) The treated water is under-saturated with respect to gypsum;
- (ii) if the feed water contains aluminium, sulphate removal is not only achieved through gypsum crystallisation, but also through ettringite (3CaO.3CaSO4.2Al2O3) formation as it precipitates in the pH range 11.3 to 11.4.

The equipment consists of low-cost mixed or aerated reactors and clarifiers. A number of process configurations exist, each with specific advantages or disadvantages. The process is robust and proven, but the resultant water quality normally fails to meet the standards that would allow for river discharge or reuse. The process also produces large volumes of mixed precipitate sludge waste that requires long-term disposal. The process can be used as an effective metals removal pre-treatment step prior to desalination processes, such as RO or ion exchange. Limestone can be used for complete removal of iron(II) within 90 min reaction time. Lime can therefore be used for removal of metals (Maree et al., 2013).



- **Passive Treatment (Preferred option)**

  A constructed wetland (CW) is an artificial wetland to treat acid mine drainage. Constructed wetlands are engineered systems that use natural functions vegetation, soil, and organisms to treat polluted water. Depending on the type of polluted water the design of the constructed wetland has to be adjusted accordingly.

  Similarly, to natural wetlands, constructed wetlands also act as a biofilter and/or can remove a range of pollutants (such as organic matter, nutrients, pathogens, heavy metals) from the water.

  Passive treatment systems are a valuable option for treating acid mine drainage at remote locations. The advantages of passive treatment systems are that they do not require electrical power; do not require any mechanical equipment, hazardous chemicals, or buildings; do not require daily operation and maintenance; are more natural and aesthetic in their appearance and may support plants and wildlife; and, are less expensive than active alternatives.

1.d.vii Volumes and Rate of Water Use Required for The Mining Operation

It is important to note that the Water Uses at the Lakeside Colliery are interlinked with those from Leeuwfontein Colliery, and are operated under One (1) Water Use License.

PCD-G, located at the new beneficiation plant at Leeuwfontein Colliery, adjacent to OC-G, will serve as the central PCD for Both Lakeside and Leeuwfontein Collieries. The excess water from PCD-C (Lakeside Colliery) and PCD-E (Leeuwfontein Colliery) will be pumped to the central PCD, where it will be re-used in the beneficiation process. The water deficit, required for the beneficiation process, will be augmented from the old underground workings.

Dust suppression will be implemented on the stockpiles, loading platform, crushing area, overburden stockpiles and on the internal roads. Typically, the application rate for dust suppression will be limited to 1.0 l/m²/day.

The water balance was simulated for three distinct scenarios, which correspond to the planned mining activities.

Scenario-1

The scenario will consist of the mining of OC-C (yr3 to yr 7). The dirty water runoff from the dirty mining area will be diverted to PCD-C. The ground water inflow, as well as the dirty water runoff, from the opencast will be dewatered into PCD-C. The dirty water collected in the PCD will be used for localised dust suppression, with the excess water being pumped to PCD-G.

Scenario-2

The scenario will consist of the mining of OC-G (yr8 to yr 20). The dirty water runoff from the dirty mining area will be diverted to PCD-G. The ground water inflow, as well as the dirty water runoff, from the opencast will also be dewatered into the PCD. The dirty water collected in the PCD will be used for dust suppression. A schematic flow diagram of the water balance is shown on

Scenario-3

The scenario will consist of the mining of OC-E (yr21 to yr 22). The dirty water runoff from the dirty mining area will be diverted to PCD-E. The ground water inflow, as well as the dirty water runoff, from the opencast will also be dewatered into PCD-C. The dirty water collected in the PCD will be used for localised dust suppression, with the excess water being pumped to PCD-G. A schematic flow diagram of the water balance is shown on

Table 3: Scenario 1_OC-C_Average Annual Water Usage (m^3/annum)

AREA	IN (m^3/annum)					TOTAL
Wash Plant	ROM	PWD				
	73 050	1 343 773				**1 416 823**
Thickener	Slurry	Rainfall				
	1 086 625	179				**1 086 804**
Process Water Dam (PWD)	Plant PCD	Direct Rainfall	Thickener Return	Filter Press Return		
	275 028	179	991 030	77 833		**1 344 071**
Dirty Areas	Rainfall					
	115 578					**115 578**
Pollution Control Dam-G (PCD-G)	Direct Rainfall	Wash plant Runoff	Block C PCD	Underground		
	13 338	24 038	81 584	253 876		**372 836**
Pollution Control Dam-C (PCD-C)	Direct Rainfall	Dirty Runoff	OC_C Dewatering			
	2 706	5 090	164 180			**171 976**
Open Cast-C (OC-C)	Direct Rainfall	Dirty Runoff	Ground Water			
	37 493	38 965	135 143			**211 600**
					TOTAL	**4 508 088**
	OUT (m^3/annum)					
Wash Plant	Product	Slurry	Discard	Internal Losses		
	44 688	1 086 625	16 755	268 755		**1 416 823**
Thickener	PWD	Filter Press	Evaporation			
	991 030	95 475	298			**1 086 804**
Process Water Dam (PWD)	Wash plant	Evaporation				
	1 343 773	298				**1 344 071**
Dirty Areas	Block C Runoff	Wash plant Runoff	Evaporation			
	5 090	24 038	86 449			**115 578**
Pollution Control Dam-G (PCD-G)	RWD	Spillage	Evaporation	Dust Suppression		
	275 028	0	21 098	76 703		**372 828**

AREA	IN (m³/annum)					TOTAL
Pollution Control Dam-C (PCD-C)	PCD-G	Spillage	Evaporation	Dust Suppression		
	81 584	67	4 278	86 047		171 976
Open Cast-C (OC-C)	PCD-C	Evaporation				
	164 180	47 370				211 550
					TOTAL	4 508 080
BALANCE (%)						0.000%

Table 4: Scenario 2_OC-G_Average Annual Water Usage (m³/annum)

AREA	IN (m³/annum)					TOTAL
Wash Plant	ROM	PWD				
	73 050	1 343 773				1 416 823
Thickener	Slurry	Rainfall				
	1 086 625	179				1 086 804
Process Water Dam (PWD)	Plant PCD	Direct Rainfall	Thickener Return	Filter Press Return		
	275 028	179	991 030	77 833		1 344 071
Dirty Areas	Rainfall					
	397 002					397 002
Pollution Control Dam-G (PCD-G)	Direct Rainfall	Wash plant Runoff	Stockpile Area Runoff	Block G Dewatering	Underground	
	13 277	24 038	18 989	153 995	251 070	461 368
Open Cast G (OC-G)	Direct Rainfall	Dirty Runoff	Ground Water			
	25 476	26 477	134 229			186 182
					TOTAL	4 706 069
	OUT (m³/annum)					
Wash Plant	Product	Slurry	Discard	Internal Losses		
	44 688	1 086 625	16 755	268 755		1 416 823
Thickener	PWD	Filter Press	Evaporation			
	991 030	95 475	298			1 086 804
Process Water Dam (PWD)	Wash plant	Evaporation				
	1 343 901	298				1 344 200
Dirty Areas	Stockpile Area Runoff	Wash plant Runoff	Evap / Entrained			
	18 989	24 038	353 975			397 002
Pollution Control Dam-G (PCD-G)	RWD	Spillage	Evaporation	Dust Suppression		
	275 028	955	21 017	164362.5		461 363
Open Cast G (OC-G)	PCD G	Evaporation				
	153 995	32 188				186 182
					TOTAL	4 706 192
BALANCE (%)						-0.003%

Table 5: Scenario 3_OC-E_Average Annual Water Usage (m³/annum)

AREA	IN (m³/annum)					TOTAL
Wash Plant	ROM	PWD				
	73 050	1 343 773				1 416 823
Thickener	Slurry	Rainfall				
	1 086 625	179				1 086 804
Process Water Dam (PWD)	Plant PCD	Direct Rainfall	Thickener Return	Filter Press Return		
	275 028	179	991 030	77 833		1 344 071
Dirty Areas	Rainfall					
	115 578					115 578
Pollution Control Dam-G (PCD-G)	Direct Rainfall	Wash plant Runoff	Block E PCD	Underground		
	13 338	24 038	16 847	318 561		372 785

AREA	IN (m^3/annum)					TOTAL
Pollution Control Dam-E (PCD-E)	Direct Rainfall	Dirty Runoff	OC_E Dewatering			
	2 706	2 335	46 039			**51 079**
Open Cast-E (OC-E)	Direct Rainfall	Dirty Runoff	Ground Water			
	5 241	10 895	36 525			**52 661**
					TOTAL	**4 387 140**
OUT (m^3/annum)						
Wash Plant	Product	Slurry	Discard	Internal Losses		
	44 688	1 086 625	16 755	268 755		**1 416 823**
Thickener	PWD	Filter Press	Evaporation			
	991 030	95 475	298			**1 086 804**
Process Water Dam (PWD)	Wash plant	Evaporation				
	1 343 773	298				**1 344 071**
Dirty Areas	Runoff	Entrained/Losses	Evaporation			
	24 038	33 750	57 789			**115 578**
Pollution Control Dam-G (PCD-G)	RWD	Spillage	Evaporation	Dust Suppression		
	275 028	0	21 077	76 703		**372 807**
Pollution Control Dam-E (PCD-E)	PCD-G	Spillage	Evaporation	Dust Suppression		
	16 847	2	1 982	32 234		**51 065**
Open Cast-E (OC-E)	PCD-E	Evaporation				
	46 039	6 622				**52 661**
					TOTAL	**4 387 148**
BALANCE (%)						**0.000%**

1.d.viii Has A Water Use Licence Been Applied for?

A water use license application (IWULA) and associated Integrated Water and Waste Management Plan (IWWMP) was applied for and issued by the DWS on 24 March 2022.

1.d.ix Impacts to be Mitigated in Their Respective Phases

Measures to rehabilitate the environment affected by the undertaking of any listed activity

ACTIVITIES	IMPACT	PHASE	SIZE AND SCALE OF DISTURBANCE	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
Ecological Impacts (Wetland, Aquatic Terrestrial)						
Mining operations, change in land use	Loss of Species of Conservation Concern	Construction, Operation and Closure	332 hectares	Avoidance of wetland areas as far as possible. Relocate sensitive species to more favourable areas. Any disturbed areas should be rehabilitated in line with the rehabilitation guidelines, this includes the clearing of alien vegetation. Protect as much indigenous vegetation as possible. Stabilise against erosion and sedimentation.	Implement SWMP as per GN704 Follow the approved Closure and Rehabilitation Plan Follow approved Alien Invasive plan as guided by SANBI	Prior to construction. Ongoing maintenance throughout LoM
Mining operations, change in land use	Loss of indigenous vegetation, floral and faunal habitat and ecological structure of water resources and soil	Construction, Operation and Closure	332 hectares			
Mining operations, change in land use	Increase in Alien Invasive Species	Construction, Operation and Closure	332 hectares			
Increased traffic, heavy machinery movement, stockpiles, blasting.	Flow alteration	Construction, Operation and Closure	332 hectares	A topsoil stripping and stockpiling guideline must be completed to ensure rehabilitation success. Attenuation of stormwater from any establishment and its associated infrastructure, Do not allow surface water or stormwater to be concentrated, or to flow down cut or fill slopes without erosion protection measures being in place. Exposed soils must be rehabilitated as soon as practically possible to limit the risk of erosion		
Vehicle and machinery movement, decant, stockpiling, rainfall seepage	Pollution of watercourse	Construction, Operation and Closure	332 hectares	Prevent movement in wetland areas. Prevent water quality deterioration.		
Mining operations, change in land use	Spread of alien vegetation	Construction, Operation and Closure	333 hectares	Alien and invasive management must be undertaken. Promote indigenous vegetation growth.		
Heritage						
Site clearance and mining of Pit C	Destruction of Structures at Site L01	Construction and Operation	Localised at the structure site	Recording and documentation	National Heritage Resources Act 25 of 1999	Prior to construction. Ongoing maintenance throughout LoM
Site clearance and mining of Pit C	Destruction of graves at Site L12	Construction and Operation	Localised at the grave site	Removal and relocation of graves	National Heritage Resources Act 25 of 2000	Prior to construction. Ongoing maintenance throughout LoM

ACTIVITIES	IMPACT	PHASE	SIZE AND SCALE OF DISTURBANCE	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
Noise						
Construction and clearing activities	Increased Noise levels	Construction	Beyond site boundary	Construct a Noise Barrier between the main noise source noise sensitive receivers Equipment Maintenance Implement Road rules.	SANS 10103	Prior to construction. Ongoing maintenance throughout LoM
Operational Activities	Increased Noise levels	Operation	Beyond site boundary	Construct a Noise Barrier between the main noise source noise sensitive receivers Equipment Maintenance Implement Road rules.	SANS 10103	Prior to construction. Ongoing maintenance throughout LoM
Decommissioning activities	Increased Noise levels	Closure and Decommissioning	Beyond site boundary	Equipment Maintenance Implement Road rules.	SANS 10103	Ongoing maintenance throughout LoM
Groundwater						
Surface clearing and preparation	Increase in surface run-off and therefore decrease in aquifer recharge	Construction	Beyond site boundary	Re-vegetate	N/A	N/A
Box cut opening	Decrease in water level should the pit floor be lower than the water level	Construction	Beyond site boundary	No management can be incorporated to limit the impacts of dewatering should the box-cut floor be lower than the groundwater level.	N/A	N/A
Topsoil and overburden stockpiling	Acid generation in the case of carbonaceous material placement.	Operation	Beyond site boundary	Should a contamination plume be detected, groundwater abstraction to contain plume.	SANS241:2015	Storm water Management to be constructed prior to other infrastructure establishment. Ongoing monitoring.
ROM stockpiling	Acid generation as a result of carbonaceous material.	Operation	Beyond site boundary	Should a contamination plume be detected, groundwater abstraction to contain plume.	SANS241:2015	Storm water Management to be constructed prior to other infrastructure establishment. Ongoing monitoring.
Hydrocarbon spills	Spills from mining vehicles can infiltrate to the aquifer and cause a downgradient plume migration.	Operation	Beyond site boundary	Clean any hydrocarbon spills in the appropriate manner.	Standard Operating Procedure for Spill containment and clean-up	When Spills occur
Pit dewatering	The water infiltrating the pit will be removed for safe mining, causing a decrease in the water level.	Operation	Beyond site boundary	No management can be incorporated to limit the impacts of dewatering.	N/A	N/A
PCD operation	Contaminated water can migrate to the aquifer below	Operation	Beyond site boundary	Ensure adequate liner is installed and have overflow containment measures in place	NEMWA liner specifications	During construction

ACTIVITIES	IMPACT	PHASE	SIZE AND SCALE OF DISTURBANCE	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
	and downstream in the case of a leaking dam lining or the dam overflowing.					
Topsoil and overburden removal	Carbonaceous material, if any in the overburden, will be placed at the bottom of the pit as to prevent or minimise the exposure to oxygen and potential acid generation.	Closure and decommissioning	Beyond site boundary	Remove the topsoil and overburden dumps during rehabilitation. Placement of carbonaceous material at bottom of pit.	Follow the approved Closure and Rehabilitation Plan	During Closure and decommissioning
Revegetation	Increase surface runoff over the rehabilitated opencast, therefore decreasing aquifer recharge.	Rehabilitation	Beyond site boundary	Remove the ROM stockpile. This will eliminate the ROM stockpile as a potential source.	Follow the approved Closure and Rehabilitation Plan	During Closure and decommissioning
Pit dewatering	Recovery of the water level in the pit as dewatering ceases. In the case of acid generation, the plume will start to move away from the pit as the water level recovered. Decanting may occur once the water level has recovered to the decanting elevation.	Residual	Beyond site boundary	Keep water level in pit lower than level in nearby streams. Maintain water level below decant level (abstraction).	Follow the approved Closure and Rehabilitation Plan	During Closure and decommissioning
Infrastructure removal	Removal of potential contamination sources will have positive impact on the groundwater regime in terms of quality	Closure and decommissioning	Beyond site boundary	Remove all surface infrastructure including the PCD as soon as mining has ceased. This will eliminate the continuous impact on the groundwater regime.	Follow the approved Closure and Rehabilitation Plan	During Closure and decommissioning
Rehabilitation	Adequate Backfilling and rehabilitation will decrease aquifer recharge. The period to decant will therefore be prolonged.	Closure and decommissioning	Beyond site boundary	Carbonaceous material at deeper base of pit. Rehabilitation to direct surface run-off away from pit and recharge to pit minimised. Flow paths including fracture zones sealed.	Follow the approved Closure and Rehabilitation Plan	During Closure and decommissioning
Surface Water						
Construction activities	Sedimentation and pollution of the Watercourse	Construction Phase	332 hectares	Separate clean and Dirty Water System	SWMP	Storm water Management to be constructed prior to other infrastructure establishment
Open pit Mining	Reduction in Baseflow	Operational Phase	332 hectares	No mitigation available	N/A	N/A

ACTIVITIES	IMPACT	PHASE	SIZE AND SCALE OF DISTURBANCE	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
Operational Activities	Water quality deterioration	Operational Phase	332 hectares	Separate clean and Dirty Water System	SWMP	Storm water Management to be constructed prior to other infrastructure establishment. Ongoing monitoring.
Closure of the mine	Decant of poor-quality water	Closure and Decommissioning	332 hectares	Treat decant water before release to the environment	ISO 5667: Grab Samples Water parameters as approved in the IWULA	Passive treatment establishment before mine closure.
Air Quality						
Site establishment	Fugitive dust (containing TSP (total suspended particulate) will give rise to nuisance impacts as fallout dust, as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns) giving rise to health impacts	Construction and Operational Phase	Localised to Site	Area of disturbance to be kept to a minimum and no unnecessary clearing of vegetation to occur Reduce exposure areas Avoid Dust Creation	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) - National Dust Control Regulations (Government Gazette No. 36794 - No. R 827) SANS 1929:2011	Ongoing dust suppression throughout LoM. Concurrent rehabilitation of bare areas
Site closure	Fugitive dust (containing TSP (total suspended particulate) will give rise to nuisance impacts as fallout dust, as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns) giving rise to health impacts	Decommissioning Phase	Localised to Site	Demolition should not be performed during windy periods The area of disturbance must be kept to a minimum Prevent excessive dust on Roads.	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) - National Dust Control Regulations (Government Gazette No. 36794 - No. R 827) SANS 1929:2011	Ongoing dust suppression throughout LoM. Concurrent rehabilitation of bare areas
Rehabilitation	Fugitive dust (containing TSP (total suspended particulate) will give rise to nuisance impacts as fallout dust, as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns) giving rise to health impacts	Decommissioning Phase	Localised to Site	Revegetation of exposed areas for long-term dust and water erosion control. The area of disturbance must be kept to a minimum. Avoid excessive dust generation.	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) - National Dust Control Regulations (Government Gazette No. 36794 - No. R 827) SANS 1929:2011	Ongoing dust suppression throughout LoM. Concurrent rehabilitation of bare areas
Visual						

ACTIVITIES	IMPACT	PHASE	SIZE AND SCALE OF DISTURBANCE	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
Construction related activities	Potential visual impact on the viewpoints	Construction Phase	Beyond site boundary	Create visual barriers	N/A	Prior to construction
Mining related activities	Potential visual impact on Road and Land users	Operation, Decommissioning and Closure	Beyond site boundary	Create visual barriers	N/A	Prior to construction
Soils, Land Use, Land Capability and hydropedology						
Surface clearing and preparation	Soil erosion from exposed soil surfaces	Construction	332 hectares	Keep vegetation removal limited to footprint and use geo-textiles and other erosion control structures to limit soil erosion	Soil Management Plan as per the Specialist Soils report	Throughout construction
Surface clearing and preparation	Removal of both topsoil and subsoil horizons increase the risk of groundwater pollution	Construction	332 hectares	Limit areas where soil horizons are removed to that which are essential for the construction of infrastructure	Soil Management Plan as per the Specialist Soils report	Throughout construction
Hydrocarbon spills	Pollution of soil with hydrocarbons	Construction	332 hectares	Do regular checks on vehicles and equipment that are used during the construction phase to ensure that oil leakage and fuel spillage are minimised	Standard Operating Procedure for Spill containment and clean-up	When Spills occur
Surface clearing and preparation	Loss of pre-mining land capabilities	Construction	332 hectares	Mitigation measures will not be able to return the original land capabilities	Soil Management Plan as per the Specialist Soils report	Immediately after mining
Surface clearing and preparation	Loss of agricultural employment opportunities as a result of displacement of agricultural activities	Construction	332 hectares	Determine with the socio-economic impact assessment how many agricultural employment opportunities will be lost through the change in land use. Provide training and support to assist farm employees to find suitable employment opportunities.	SLP	Prior to and during mining
Surface clearing and preparation	Loss of agricultural production that includes grain crops and livestock	Construction	332 hectares	Mitigation measures and land rehabilitation may be able to re-instate crop livestock farming to a certain degree, but the grain crop production potential will be lost.	Soil Management Plan as per the Specialist Soils report	During stockpiling
Surface clearing and preparation	Loss of water purification and water storage ecosystem services of soil of the affected areas	Construction	332 hectares	The impact on both interflow and responsive zone soils within the project area will be immediate and mitigation measures are limited.	Soil Management Plan as per the Specialist Soils report	Throughout operation
Roll over mining	Soil surfaces are increasingly compacted by vehicle and equipment movement	Operation	332 hectares	Vehicle and equipment should only move around on haul roads and park in designated areas	Soil Management Plan as per the Specialist Soils report	Concurrently to mining and during rehabilitation.
Roll over mining	Soil erosion on soil stockpiles	Operation	332 hectares	The slope of the topsoil stockpiles must not be more than 15% in order to limit erosion from the stockpiles.	Soil Management Plan as per the Specialist Soils report	Daily
Pit dewatering and dust control	Soil contamination with a range of pollutants	Operation	332 hectares	Manage dirty and polluted water on site through storage and treatment with suitable infrastructure such as pollution control dams.	SWMP, GN704	Throughout operation

ACTIVITIES	IMPACT	PHASE	SIZE AND SCALE OF DISTURBANCE	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
Heavy machinery and vehicle movement	Compaction of surfaces will increase surface water run-off	Rehabilitation	332 hectares	Prepare the rehabilitated areas properly to promote quick vegetation re-establishment.	Rehabilitation Plan	After closure
Resurfacing of areas with available topsoil	Bare soil surfaces are at risk of soil erosion until vegetation cover has sufficiently established	Rehabilitation	332 hectares	Vehicle and equipment should only move around on haul roads and park in designated areas	Rehabilitation Plan	After closure
Social Economic						
Roll Over Mining	Extended Job security (positive)	Operation	Local communities	Ensure employment continues to be sourced from the local areas	As per SLP	Prior to construction and throughout LoM
Roll Over Mining	Continued Economic input (Positive Impact)	Operation	Mine employees	Linkages with skills development/ Small, Medium and Micro Enterprises (SMME) development institutions and other mining operations; Preference should be given to capable subcontractors who based within the local municipal area; Monitoring of sub-contractors procurement; Local procurement targets should be formalised in the mines procurement policy.	As per SLP	Throughout LoM
Roll Over Mining	Health and Safety concern	Operation	Local area	Limit, as far as reasonably possible, social ills caused by influx of workers and jobseekers; Discourage influx of jobseekers by prioritising employment of unemployed members of local communities; Implement measures to address potential conflict between locals and non-locals.	As per SLP	Throughout LoM
Roll Over Mining	Increased social pathologies	Operation	Local area	Limit, as far as reasonably possible, social ills caused by influx of workers and jobseekers; Discourage influx of jobseekers by prioritising employment of unemployed members of local communities; Implement measures to address potential conflict between locals and non-locals.	As per SLP	Throughout LoM

1.e IMPACT MANAGEMENT OUTCOMES

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION TYPE	STANDARD TO BE ACHIEVED
Ecological Impacts (Wetland, Aquatic Terrestrial)					
Mining operations, change in land use	Loss of Species of Conservation Concern	Fauna and Flora diversity	Construction, Operation and Closure	Control through management and monitoring	Improved wetland functionality and status, with adequate habitat availability.
Mining operations, change in land use	Loss of indigenous vegetation, floral and faunal habitat and ecological structure of water resources and soil	Watercourses on site and downstream	Construction, Operation and Closure	Remedy through rehabilitation	

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION TYPE	STANDARD TO BE ACHIEVED
Mining operations, change in land use	Increase in Alien Invasive Species	Natural Habitat	Construction, Operation and Closure	Control through management and monitoring	
Increased traffic, heavy machinery movement, stockpiles, blasting.	Flow alteration	Watercourses on site and downstream	Construction, Operation and Closure	Modify through design measures	Dispersed flow to and in the wetland areas.
Vehicle and machinery movement, decant, stockpiling, rainfall seepage	Pollution of watercourse	Watercourses on site and downstream	Construction, Operation and Closure	Control through management and monitoring	Meet water quality standards
Mining operations, change in land use	Spread of alien vegetation	Natural Habitat	Construction, Operation and Closure	Control through management and monitoring	Alien and invasive species eradication
Heritage					
Site clearance and mining of Pit C	Destruction of Structures at Site L01	Sites of cultural significance	Construction and Operation	Control through management and monitoring	preservation of heritage resources
Site clearance and mining of Pit C	Destruction of graves at Site L12	Sites of cultural significance	Construction and Operation	Control through management and monitoring	Preservation of Archaeological artifacts
Noise					
Construction and clearing activities	Increased Noise levels	Neighbouring communities	Construction	Control through management and monitoring	Zero noise disturbance complaints
Operational Activities	Increased Noise levels	Neighbouring communities	Operation	Control through management and monitoring	Zero noise disturbance complaints
Decommissioning activities	Increased Noise levels	Neighbouring communities	Closure and Decommissioning	Control through management and monitoring	Zero noise disturbance complaints
Groundwater					
Surface clearing and preparation	Increase in surface run-off and therefore decrease in aquifer recharge	Groundwater	Construction	Control through management and monitoring	Minimal impact on aquifer recharge
Box cut opening	Decrease in water level should the pit floor be lower than the water level	Groundwater	Construction	N/A	N/A
Topsoil and overburden stockpiling	Acid generation in the case of carbonaceous material placement.	Groundwater	Operation	Remedy through control measures	Containment of poor-quality groundwater
ROM stockpiling	Acid generation as a result of carbonaceous material.	Groundwater	Operation	Control through management and monitoring	Effective prevention of the pollution of the groundwater resource
Hydrocarbon spills	Spills from mining vehicles can infiltrate to the aquifer and cause a downgradient plume migration.	Groundwater	Operation	Remedy through control measures	Effective prevention of the pollution of the groundwater resource
Pit dewatering	The water infiltrating the pit will be removed for safe mining, causing a decrease in the water level.	Groundwater	Operation	Remedy through compensation	N/A
PCD operation	Contaminated water can migrate to the aquifer below and downstream in the case of a leaking dam lining or the dam overflowing.	Groundwater	Operation	Control through management and monitoring	Effective prevention of the pollution of the groundwater resource
Topsoil and overburden removal	Carbonaceous material, if any in the overburden, will be placed at the bottom of the	Groundwater	Closure and decommissioning	Control through management and monitoring	Prevent Acid generation

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION TYPE	STANDARD TO BE ACHIEVED
	pit as to prevent or minimise the exposure to oxygen and potential acid generation.				
Revegetation	Increase surface runoff over the rehabilitated opencast, therefore decreasing aquifer recharge.	Groundwater	Rehabilitation	Control through management and monitoring	Continued increase in water quality
Pit dewatering	Recovery of the water level in the pit as dewatering ceases. In the case of acid generation, the plume will start to move away from the pit as the water level recovered. Decanting may occur once the water level has recovered to the decanting elevation.	Groundwater	Residual	Control through management and monitoring	Delayed recharge preventing acid water decant.
Infrastructure removal	Removal of potential contamination sources will have positive impact on the groundwater regime in terms of quality	Groundwater	Closure and decommissioning	Control through management and monitoring	Effective prevention of the pollution of the groundwater resource
Rehabilitation	Adequate Backfilling and rehabilitation will decrease aquifer recharge. The period to decant will therefore be prolonged.	Groundwater	Closure and decommissioning	Remedy through control measures	Release of acceptable quality water to the downstream environment
Surface Water					
Construction activities	Sedimentation and pollution of the Watercourse	Watercourse	Construction Phase	Modify through design measures	Effective onsite dirty water management and retention.
Open pit Mining	Reduction in Baseflow	Watercourse	Operational Phase	Modify through design measures	N/A
Operational Activities	Water quality deterioration	Watercourse	Operational Phase	Control through management and monitoring	Effective onsite dirty water management and retention.
Closure of the mine	Decant of poor-quality water	Watercourse	Closure and Decommissioning	Remedy through control measures	Release of acceptable quality water to the downstream environment
Air Quality					
Site establishment	Fugitive dust (containing TSP (total suspended particulate) will give rise to nuisance impacts as fallout dust, as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns) giving rise to health impacts	Social health and wellbeing	Construction and Operational Phase	Control through management and monitoring	minimal vegetation clearance and concurrent rehabilitation as mining progresses
Site closure	Fugitive dust (containing TSP (total suspended particulate) will give rise to nuisance impacts as fallout dust, as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns) giving rise to health impacts	Social health and wellbeing	Decommissioning Phase	Control through management and monitoring	Effective dust management on site
Rehabilitation	Fugitive dust (containing TSP (total suspended particulate) will give rise to nuisance impacts as fallout dust, as well as PM10 and PM2.5 (dust	Social health and wellbeing	Decommissioning Phase	Control through management and monitoring	Rehabilitation of cleared areas

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION TYPE	STANDARD TO BE ACHIEVED
	with a size less than 10 microns, and dust with a size less than 2.5 microns) giving rise to health impacts				
Visual					
Construction related activities	Potential visual impact on the viewpoints	Sense of place	Construction Phase	Modify through design measures	Effective visual barriers surrounding the mining operation.
Mining related activities	Potential visual impact on Road and Land users	Sense of place	Operation, Decommissioning and Closure	Modify through design measures	Effective visual barriers surrounding the mining operation.
Soils, Land Use, Land Capability and hydropedology					
Surface clearing and preparation	Soil erosion from exposed soil surfaces	Land use and capability	Construction	Remedy through rehabilitation	To minimise the areas where soil surfaces will be exposed to soil erosion
Surface clearing and preparation	Removal of both topsoil and subsoil horizons increase the risk of groundwater pollution	Soil structure	Construction	Remedy through rehabilitation	To minimise the areas where soil surfaces will be exposed to soil erosion
Hydrocarbon spills	Pollution of soil with hydrocarbons	Land use and capability	Construction	Remedy through rehabilitation	To avoid the contamination of soil resources on site and around the site with hydrocarbons
Surface clearing and preparation	Loss of pre-mining land capabilities	Land use and capability	Construction	Remedy through rehabilitation	Not efficient
Surface clearing and preparation	Loss of agricultural employment opportunities as a result of displacement of agricultural activities	Social environment	Construction	Remedy through training	To avoid the displacement of farm employees and to ensure their livelihood as well as that of their dependents, are protected.
Surface clearing and preparation	Loss of agricultural production that includes grain crops and livestock	Land use	Construction	Remedy through rehabilitation	To prevent additional impacts on food production of the crop fields surrounding the proposed Leeuwfontein project footprint.
Surface clearing and preparation	Loss of water purification and water storage ecosystem services of soil of the affected areas	Ecosystem Services	Construction	Remedy through rehabilitation	To prevent and/or minimise the impact of surface coal mining on stream flow of wetlands in the project area.
Roll over mining	Soil surfaces are increasingly compacted by vehicle and equipment movement	Soil structure	Operation	Remedy through rehabilitation	To prevent extensive soil compaction in Leeuwfontein mining right area
Roll over mining	Soil erosion on soil stockpiles	Soil structure	Operation	Remedy through rehabilitation	To minimise the areas where soil surfaces will be exposed to soil erosion
Pit dewatering and dust control	Soil contamination with a range of pollutants	Soil chemistry	Operation	Remedy through rehabilitation	To avoid the contamination of soil resources on site and around the site with hydrocarbons
Heavy machinery and vehicle movement	Compaction of surfaces will increase surface water run-off	Soil structure	Rehabilitation	Remedy through rehabilitation	To prevent soil losses through erosion from the Leeuwfontein Mining Right area
Resurfacing of areas with available topsoil	Bare soil surfaces are at risk of soil erosion until vegetation cover has sufficiently established	Land use and capability	Rehabilitation	Remedy through rehabilitation	To increase the infiltration rate and porosity of compacted soil profiles prior to mine closure
Social Economic					

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION TYPE	STANDARD TO BE ACHIEVED
Roll Over Mining	Extended Job security (positive)	Social Economic	Operation	Remedy through Social and Labour Plan	Increased employment throughout the local communities
Roll Over Mining	Continued Economic input (Positive Impact)	Social Economic	Operation	Remedy through Social and Labour Plan	Local economical gain
Roll Over Mining	Health and Safety concern	Social Economic	Operation	Remedy through Social and Labour Plan	Maximisation of the proportion of job opportunities allocated to locals
Roll Over Mining	Increased social pathologies	Social Economic	Operation	Remedy through Social and Labour Plan	Maximisation of the proportion of job opportunities allocated to locals

1.f IMPACT MANAGEMENT ACTIONS

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
Ecological Impacts (Wetland, Aquatic Terrestrial)				
Mining operations, change in land use	Construction, Operation and Closure	Control through management and monitoring	Prior to construction. Ongoing maintenance throughout LoM	Implement SWMP as per GN704 Follow the approved Closure and Rehabilitation Plan Follow approved Alien Invasive plan as guided by SANBI
Mining operations, change in land use	Construction, Operation and Closure	Remedy through rehabilitation		
Mining operations, change in land use	Construction, Operation and Closure	Control through management and monitoring		
Increased traffic, heavy machinery movement, stockpiles, blasting.	Construction, Operation and Closure	Modify through design measures		
Vehicle and machinery movement, decant, stockpiling, rainfall seepage	Construction, Operation and Closure	Control through management and monitoring		
Heritage				
Site clearance and mining of Pit C	Destruction of Structures at Site L01	Control through management and monitoring	Prior to construction. Ongoing maintenance throughout LoM	National Heritage Resources Act 25 of 1999
Site clearance and mining of Pit C	Destruction of graves at Site L12	Control through management and monitoring	Prior to construction. Ongoing maintenance throughout LoM	National Heritage Resources Act 25 of 2000
Noise				
Construction and clearing activities	Increased Noise levels	Control through management and monitoring	Prior to construction. Ongoing maintenance throughout LoM	SANS 10103
Operational Activities	Increased Noise levels	Control through management and monitoring	Prior to construction. Ongoing maintenance throughout LoM	SANS 10103
Decommissioning activities	Increased Noise levels	Control through management and monitoring	Ongoing maintenance throughout LoM	SANS 10103
Groundwater				
Surface clearing and preparation	Construction	Control through management and monitoring	N/A	N/A
Box cut opening	Construction	N/A	N/A	N/A
Topsoil and overburden stockpiling	Operation	Remedy through control measures	Storm water Management to be constructed prior to other infrastructure establishment. Ongoing monitoring.	SANS241:2015
ROM stockpiling	Operation	Control through management and monitoring	Storm water Management to be constructed prior to other infrastructure establishment. Ongoing monitoring.	SANS241:2015

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
Hydrocarbon spills	Operation	Remedy through control measures	When Spills occur	Standard Operating Procedure for Spill containment and clean-up
Pit dewatering	Operation	Remedy through compensation	N/A	N/A
PCD operation	Operation	Control through management and monitoring	During construction	NEMWA liner specifications
Topsoil and overburden removal	Closure and decommissioning	Control through management and monitoring	During Closure and decommissioning	Follow the approved Closure and Rehabilitation Plan
Revegetation	Rehabilitation	Control through management and monitoring	During Closure and decommissioning	Follow the approved Closure and Rehabilitation Plan
Pit dewatering	Residual	Control through management and monitoring	During Closure and decommissioning	Follow the approved Closure and Rehabilitation Plan
Infrastructure removal	Closure and decommissioning	Control through management and monitoring	During Closure and decommissioning	Follow the approved Closure and Rehabilitation Plan
Rehabilitation	Closure and decommissioning	Remedy through control measures	During Closure and decommissioning	Follow the approved Closure and Rehabilitation Plan
Surface Water				
Construction activities	Construction Phase	Modify through design measures	Storm water Management to be constructed prior to other infrastructure establishment	SWMP
Open pit Mining	Operational Phase	Modify through design measures	N/A	N/A
Operational Activities	Operational Phase	Control through management and monitoring	Storm water Management to be constructed prior to other infrastructure establishment. Ongoing monitoring.	SWMP
Closure of the mine	Closure and Decommissioning	Remedy through control measures	Passive treatment establishment before mine closure.	ISO 5667: Grab Samples Water parameters as approved in the IWULA
Air Quality				
Site establishment	Fugitive dust (containing TSP (total suspended particulate) will give rise to nuisance impacts as fallout dust, as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns) giving rise to health impacts	Control through management and monitoring	Ongoing dust suppression throughout LoM. Concurrent rehabilitation of bare areas	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) - National Dust Control Regulations (Government Gazette No. 36794 - No. R 827) SANS 1929:2011
Site closure	Fugitive dust (containing TSP (total suspended particulate) will give rise to nuisance impacts as fallout dust, as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns) giving rise to health impacts	Control through management and monitoring	Ongoing dust suppression throughout LoM. Concurrent rehabilitation of bare areas	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) - National Dust Control Regulations (Government Gazette No. 36794 - No. R 827) SANS 1929:2011
Rehabilitation	Fugitive dust (containing TSP (total suspended particulate) will give rise to	Control through management and monitoring	Ongoing dust suppression throughout LoM. Concurrent rehabilitation of bare areas	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) - National Dust

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
	nuisance impacts as fallout dust, as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns) giving rise to health impacts			Control Regulations (Government Gazette No. 36794 - No. R 827) SANS 1929:2011
Visual				
Construction related activities	Construction Phase	Modify through design measures	Prior to construction	N/A
Mining related activities	Operation, Decommissioning and Closure	Modify through design measures	Prior to construction	N/A
Soils, Land Use, Land Capability and hydropedology				
Surface clearing and preparation	Construction	Remedy through rehabilitation	Throughout construction	Soil Management Plan as per the Specialist Soils report
Surface clearing and preparation	Construction	Remedy through rehabilitation	Throughout construction	Soil Management Plan as per the Specialist Soils report
Hydrocarbon spills	Construction	Remedy through rehabilitation	When Spills occur	Standard Operating Procedure for Spill containment and clean-up
Surface clearing and preparation	Construction	Remedy through rehabilitation	Immediately after mining	Soil Management Plan as per the Specialist Soils report
Surface clearing and preparation	Construction	Remedy through training	Prior to and during mining	SLP
Surface clearing and preparation	Construction	Remedy through rehabilitation	During stockpiling	Soil Management Plan as per the Specialist Soils report
Surface clearing and preparation	Construction	Remedy through rehabilitation	Throughout operation	Soil Management Plan as per the Specialist Soils report
Roll over mining	Operation	Remedy through rehabilitation	Concurrently to mining and during rehabilitation.	Soil Management Plan as per the Specialist Soils report
Roll over mining	Operation	Remedy through rehabilitation	Daily	Soil Management Plan as per the Specialist Soils report
Pit dewatering and dust control	Operation	Remedy through rehabilitation	Throughout operation	SWMP, GN704
Heavy machinery and vehicle movement	Rehabilitation	Remedy through rehabilitation	After closure	Rehabilitation Plan
Resurfacing of areas with available topsoil	Rehabilitation	Remedy through rehabilitation	After closure	Rehabilitation Plan
Social Economic				
Roll Over Mining	Operation	Remedy through Social and Labour Plan	Prior to construction and throughout LoM	As per SLP
Roll Over Mining	Operation	Remedy through Social and Labour Plan	Throughout LoM	As per SLP
Roll Over Mining	Operation	Remedy through Social and Labour Plan	Throughout LoM	As per SLP
Roll Over Mining	Operation	Remedy through Social and Labour Plan	Throughout LoM	As per SLP

1.f.i Financial Provision

1.f.i.1 Determination of the Amount of Financial Provision

1.f.i.1.a Describe the Closure Objectives and the Extent to Which These Are Aligned to the Baseline Environment

The closure vision aims to return the disturbed areas to a stable, non-polluting and safe state that represents, as close as possible, the pre mining conditions. Mining wishes to leave a positive legacy in the area once the mining operations cease.

To appropriately close the mining area, the mine would annually identify areas of rehabilitation and actively pursue the closure vision. The Annual rehabilitation plan will be updated on an annual basis and identify areas of concern.

1.f.i.1.b Confirm That the Environmental Objectives in Relation to Closure Have Been Consulted with Landowner and I&APS

- A comprehensive Public Participation Process was undertaken, and all aspects of the project were discussed with interested and affected Parties.

1.f.i.1.c Rehabilitation Plan to Attain Closure Objectives Including Proposed Post-Mining Land Capability and Land Use

The scheduling of actions for final rehabilitation, decommissioning and closure which will ensure avoidance, rehabilitation and management of impacts is presented in the table below. As the disturbance after construction occurs on surface, linking the rehabilitation plan to the mine works program is not meaningful. Rather, the schedule is linked to applicant's intention to undertake rehabilitation activities over a five-year closure period at the end of the Life of Mine. The perceived schedule drivers of this plan are also indicated in the table. This schedule is based on implementing the actions described in this report and relates to the aspects considered in this section.

Aspect	Scheduling	
Year 1		**Continuous**
Opencast workings	Concurrent backfilling sequence and removal of salvageable equipment	Topsoil stripping, handling, stockpiling, preservation and replacement in line with the general surface rehabilitation and revegetation actions prescribed in this report as land becomes available for rehabilitation.
Surface Infrastructure related to mining operations (including plant)	Removal, decommissioning and demolition of infrastructure	
Final void	Backfilling and sealing	
Contaminated land remediation	Hydrocarbons – Removal of fuel storage and refuelling bays Chemical – contaminated equipment removal	
Year 2		
Pollution Control Dams	Management of stormwater in closure period, but capacity requirements can be assessed to remove upon closure	

Aspect	Scheduling
Waste Management Facilities	Removal, decommissioning and demolition of infrastructure
Roads and parking areas	Only roads required after closure to remain in place
Fencing and walling	Only fences required to remain after closure to stay in place
Year 3 - 5	
Water Management	Monitoring, measurement and management where required
Maintenance and aftercare	All rehabilitated areas

Appendix 4 requires that a spatial map or schedule, showing planned spatial progression throughout operations be included in the plan. However, as the spatial progression is limited to the mining footprint and the mine haul route, the inclusion of a plan showing the spatial progression will not add any further information than that included in the table above.

1.f.i.1.d Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives.

During the rehabilitation phase the following actions will take place:

- Transfer of facilities (possibly the access road and dams): Facilities are required to be transferred to new landowners;
- Cleaning up of contaminated areas: all areas that have been contaminated will be remediated;
- Shaping: Areas requiring shaping will be shaped;
- Vegetating: The mine will allow the natural vegetation to be established on all denuded areas and where natural vegetation is not developing, and will ensure vegetation growth through seeding processes as quickly as possible;
- Monitoring: The site will be monitored to ensure the stability of landforms, that vegetation establishes and to monitor for possible latent risks. Once the studies prove the site is non-polluting and has reached equilibrium with the surrounding environment an application can be made to the relevant government department for the cessation of these activities; and
- Aftercare and maintenance: The monitoring programmes will be used to identify areas that require aftercare and maintenance. The length of this activity is therefore dependant on the continuation of the monitoring programmes.

1.f.i.1.e Quantum of the Financial Provision Required to Manage and Rehabilitate the Environment

Financial Provision for Lakeside Colliery, to the amount of ***R65 108 989.38 (excluding VAT))*** be made by way of a guarantee acceptable to the DMR, as per the Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations.

Table 1.6: Financial Provision Quantum: Lakeside Colliery

Mine Closure Financial Liability		
	Item description	Cost
1	Surface Infrastructure	R0.00
1	Dismantling of processing plant and associated structures (including associated conveyors & power lines)	R0.00
2(A)	Demolition of steel buildings and structures (including floor slabs)	R0.00
2(B)	Demolition of reinforced concrete buildings and structures	R0.00
3	Rehabilitation of access roads	R0.00
4(A)	Demolition of electrified railway lines	R0.00
4(B)	Demolition and rehabilitation of non-electrified railway lines	R0.00
5	Demolition of housing and facilities (including floor slabs)	R0.00
12	Fencing	R0.00
2	Mining Areas & Waste Sites	R49 234 010.83
6	Opencast rehabilitation (including final voids and ramps)	R49 234 010.83
7	Sealing of shafts, adits and inclines (including concrete cap)	R0.00
3	Mine Residue Sites	R290 092.97
8(A)	Rehabilitation of overburden and spoils	R0.00
8(B)	Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste)	R0.00
8(C)	Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste)	R142 836.40
9	Rehabilitation of subsided areas	R0.00
13	Water management (Separating clean and dirty water, managing polluted water and managing the impact on groundwater, including treatment, when required)	R147 256.58
4	General Rehabilitation	R631 628.45
10	General surface rehabilitation, including of all denuded areas	R631 628.45
5	Aftercare & Maintenance	R3 653 349.87
13	Monitoring	R1 360 000.00
14	Maintenance	R2 293 349.87
15	Water Treatment Facility	R0.00
	Sub Total 1	R53 809 082.13
	Mobilisation and Project Management (10% of Subtotal 1)	R5 380 908.21
	Sub Total 2	R59 189 990.34
	Contingency (10% of subtotal 2)	R5 918 999.03
	Sub Total 3 (Closure Liability for Mine)	R65 108 989.38
	VAT (15% of subtotal 3)	R9 766 348.41
	Total	R74 875 337.78

1.f.i.1.f Confirm that the financial provision will be provided as determined.

The Financial provision will be provided.

MECHANISMS FOR MONITORING COMPLIANCE WITH AND PERFORMANCE ASSESSMENT AGAINST THE ENVIRONMENTAL MANAGEMENT PROGRAMME AND REPORTING THEREON, INCLUDING

1.g MONITORING OF IMPACT MANAGEMENT ACTIONS

1.h MONITORING AND REPORTING FREQUENCY

1.i RESPONSIBLE PERSONS

1.j TIME PERIOD FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS

1.k MECHANISM FOR MONITORING COMPLIANCE

Table 1.7: Mechanisms to Monitor Compliance

Source activity	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities (for the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
Construction, Operation and Decommissioning Activities	Water Quality	ISO 5667Grab Samples	Independent Specialist	Monthly as per WUL
Construction, Operation and Decommissioning Activities	Water Quantity	Water Balance to be Updated Annually Flow Meter Reading and Update of Datasheet	SHEQ/ Engineering	Daily
Construction, Operation and Decommissioning Activities	Biomonitoring	SASS 5 and IHAS Sampling Sites are to be established upstream and downstream of all Potential Impact	Aquatic Ecologist	Bi-Annually
Construction, Operation and Decommissioning Activities	Storm Water Management	Visual Inspection Check the system for blockages and possible spillage areas	SHEQ/ Engineering	After heavy rainfall
Construction, Operation and Decommissioning Activities	Biodiversity Assessment	Align the Fauna & Flora Compare the annual findings with those of the Baseline Studies	Ecologist	Annually
Construction, Operation and Decommissioning Activities	Alien Invasive Control Program (AICP)	Implement an Alien Invasive Control Programme. During the Biodiversity Assessment a qualified ecologist must be contracted to ensure that the implementation of the AICP is adequately addressed.	Ecologist	Bi-Annually

Source activity	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities (for the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
Construction, Operation and Decommissioning Activities	Vegetation and Rehabilitation	RSIP to be adhered to as specified in EMP	Ecologist	Bi-Annually
Construction, Operation and Decommissioning Activities	Groundwater Quality	SANAS Standards As specified in Geo-Hydro Report	Independent Specialist	Quarterly
Construction, Operation and Decommissioning Activities	Groundwater Levels	Depth meters Determine the groundwater fluctuation over a LOM	Independent Specialist	Determine the groundwater fluctuation over a LOM
Construction, Operation and Decommissioning Activities	Dust Fallout	Implement a Monitoring Programme Gravimetric Dust Fallout	To be analysed by an Accredited Laboratory Independent Specialist	Monthly
Construction, Operation and Decommissioning Activities	Environmental Noise & Vibration	Implement a Monitoring Programme SANAS Standards Noise monitoring are to be done to determine the effect of mining, and associated activities, on the receptors	Independent Specialist (Noise Specialist)	Annually
Construction, Operation and Decommissioning Activities	Visual Inspection of receptors	Implement Monitoring Schedule in-house Physical Census Any incidents of cracking must be recorded and addressed.	SHEQ/ Engineering	Before and After each blasting event

1.l INDICATE THE FREQUENCY OF THE SUBMISSION OF THE PERFORMANCE ASSESSMENT REPORT

All information as required by the various Government Departments should be captured and be readily available for submission when required and also for review by the external consultant conducting the performance assessment and audits.

As per NEMA EIA Regulations (GNR982 of 2014, as amended), a performance assessment/audit will be conducted by an external consultant throughout the life of mine at intervals stipulated in the EA. It is recommended to complete these audits annually. This is conducted to assess the adequacy and compliance to the EMP and the relevant legislation. As per NEMA, any amendments to the EMPr that may be required due to the performance assessment findings will be completed if necessary.

The Quantum of the Financial Provision must be reviewed on an annual basis and submitted to the DMR.

In addition to the NEMA requirements, the IWUL will be audited as per conditions once this is obtained, at which time the site will also be audited against GN704. The IWWMP will be updated annually once approved.

1.m ENVIRONMENTAL AWARENESS PLAN

1.m.i Manner in Which the Applicant Intends to Inform Employees of Environmental Risk Which May Result from Their Work

Objectives and Aims

The Objectives of the Environmental Awareness Plan are to ensure that: -

- Training needs are identified and all personnel whose work may create a significant impact upon the environment have received appropriate training.
- Procedures are established and maintained to make appropriate employees aware of:
  - The importance of conformance with SHEQ policy and procedures and the requirements of the EMS;
  - The significant environmental impacts, actual or potential, of their work activities and environmental benefits of improved personal performance;
  - Their roles and responsibilities in achieving conformance with environmental policy, procedures and EMS; and
  - The potential consequences of departure from specified operating procedures.
  - Personnel performing tasks, which can cause significant environmental impacts, are competent in terms of appropriate education, training and/ or experience.
- The Environmental Awareness Plan Aims at:
  - Informing all personnel of environmental policies, procedures and programmes applicable to the mining activities;
  - Providing job specific environmental training to ensure the protection of the environment;
  - Promoting general environmental awareness amongst all employees; and
  - Providing general training on the implementation of environmental actions.
- The Environmental Awareness Training Programme will include:
  - Training of the implementation of emergency procedures where necessary;
  - Environmental induction for new employees;
  - Code of conduct signed by all inducted employees; and
  - Identification of environmental risks associated with each job and job specific training on addressing these risks.

Responsibilities

The responsibilities in terms of environmental awareness training lie with the Applicant and Mine Manager.

Identification of training needs

- The identification of environmental training and development needs are derived from the analysis of role descriptions.
- The following general and specific training needs have been identified at the Lakeside & Leeuwfontein Colliery.

General Training:

- Environmental awareness training;
- Awareness of the Lakeside & Leeuwfontein Colliery SHEQ policy; and
- Awareness of environmental legislation or any other requirements Lakeside & Leeuwfontein Colliery subscribes to.

Specific Training:

- Awareness of significant environmental aspects associated with work activities;
- Awareness of environmentally related operational procedures that need to be followed when conducting work activities;
- Awareness of the potential consequences of not following environmentally related operational procedures; and
- Environmental legislative requirements of work activities.

General Environmental Awareness

General environmental awareness training forms part of the induction at Lakeside & Leeuwfontein Colliery. An employee will attend induction training and all contractor employees are required to undergo the general induction training should their work at the mine exceed a period of 1 week on site.

The training material encompasses information regarding the Lakeside & Leeuwfontein Colliery SHE Policy, charter and visions, the description of environmental impacts, namely air pollution, waste management, water management, land management and energy conservation, the importance of environmental legislation, key roles and responsibilities in terms of environmental management and the reporting of non-conformances.

Evaluation of the Environmental Awareness Plan

The effectiveness and efficiency of this plan will be monitored by the performance of annual audits aimed at testing the environmental awareness of employees directly and the analysis of the root causes of environmental incidents, including non-conformance to legal requirements, to determine which incidents were caused by a lack of environmental awareness and training. The evaluation of the Environmental Awareness Plan will be conducted by the Environmental Department. This evaluation will entail the auditing of the operation during the construction and operation phase once the activity has commenced.

The Environmental Awareness Plan described above is sufficient to make all those involved with the project aware of those risks that may occur as well as the necessary mitigation required to minimise these risks. This awareness plan displays that the Lakeside & Leeuwfontein Colliery is serious about the environment's well–being, empowerment of the local people and returning the land to appropriate use once the reclamation activities have been completed. Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment.

Emergency Response Plan

The EMP and other management options are intended to minimise all environmental risks as far as possible. Should there for some reason is unforeseen circumstances that might lead to unacceptable risks, emergency systems and procedures have been especially designed for this operation and is to be adhered in the case of such emergencies. The environmental emergency contingency plan addresses any reasonably anticipated failure (most probable risk) for the entire mining area and focuses on incidents that could cause environmental emergencies. As with any system, the most important and critical component is the identification and communication with the Responsible personal. Consequently, the contact information for these role-players should be available around the facility and be updated on a regular basis. In addition to this, first-party employees (such as security, safety superintendents, mine overseers, environmental officers) will be trained to respond to the responsible personnel in the event of an emergency.

Table 1.8: Emergency Response and Preparedness Plan

Possible environmental related emergency	Action plans / remediation	Time / period	Responsible person / party
Hydrocarbon Spill (diesel, oil, grease, etc.)	In the event of a small spill the soil will be treated in situ using a spill kit. In the event of a large spill a specialized crew will be called in to decontaminate the area and remove and rehabilitate the soil. The Environmental Management Representative will have the contact details of companies that provide this service.	Immediately	Immediate Supervisor
Veld Fires	The mine management team must ensure that trained personnel are appointed, and that firefighting equipment is in serviceable order. The responsible person must ensure that fire breaks are maintained. The responsible person must undertake periodic inspections of firefighting equipment. In the event of a fire on site the fire master and firefighting crew must immediately respond and in instances where the mines firefighting team is unable to control the fire, the services of the local municipal fire brigade must be called in. The fire master is responsible for ensuring that adequate arrangements are made with the local municipal fire brigade to ensure timeous response to veld fires.	Ongoing	Fire Master / Safety Officer
Explosions	Alternative evacuation routes should be identified and used, should the exit to the mine be blocked. Alternative air supply routes should be identified and implemented. All relevant emergency response units must be notified, and hospitals informed of potential incoming patients. The Environmental Management Representative will assess the situation from the information provided and set up investigation team or relevant personnel. This team may include the Operations Manager, Chief Safety Officer, the employee who reported the incident and the individual responsible for the incident.	Immediately	Mine Manager
Pollution Control Dam Breach	Prevent overflow from the adjacent dam by sandbagging the overflow point. Stop all pumping from pits. Pump as much water as possible into the pit areas to increase the capacity of the surface dams to contain run-off water as evaporation is increased.	Immediately	Plant Manager
Berm Breach / Drain Overflow	Where there has been overflow due to a blockage, the drain must be cleaned as soon as possible. Where the overflow is the result of a lack of capacity the dimensions of the drain must be increased. A breached berm must be repaired as	Immediately	Manager / Plant Manager

Possible environmental related emergency	Action plans / remediation	Time / period	Responsible person / party
	soon as possible. The dimensions of a breached berm must be increased to prevent a recurrence.		
Leakage or spill from the chemical toilets and associated infrastructure.	The failure of the chemical toilets and associated infrastructure poses a threat to both groundwater and surface water resources. In the event of a failure, the following procedures must be followed: • The incident must be reported to the Environmental Management Representative immediately. • An investigation team, set up by the Environmental Management Representative must investigate the cause of the failure. • Precautions must be taken to prevent the spread of any contaminants/material, especially into surface water courses. • Repairs must be commissioned as soon as possible, followed by an inspection to determine if repair work was efficient, and to detect any overlooked or future potential issues. • The failure must be recorded and inspected during the routine maintenance of the sewerage plant and associated infrastructure. The affected environment must be suitably rehabilitated or cleaned up.	Immediately	Environmental Management Representative
Subsidence and sinkholes	Alternative evacuation and access routes should be identified and used. All relevant emergency response units must be notified, and hospitals informed of incoming patients.	Immediately	Operational Manager/SHE Coordinator

1.n SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

No additional specific information required.

2. UNDERTAKING

The EAP herewith confirms

a. The correctness of the information provided in the reports ☒
b. The inclusion of comments and inputs from stakeholders and I&APs; ☒
c. The inclusion of inputs and recommendations from the specialist reports where relevant; and ☒
d. The acceptability of the project in relation to the finding of the assessment and level of mitigation proposed; ☒

Signed: _____ 2022