mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

And

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED).

NAME OF APPLICANT	Universal Coal Development II (Pty) Ltd
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FILE REFERENCE NUMBER DMR:	LP 30/5/1/2/2 (10131) MR/LP 30/5/1/2/3/2/1 (10131) EM

9 May 2017

IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining “will not result in unacceptable pollution, ecological degradation or damage to the environment”.

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16(3)(b) of the EIA Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17 (1) (c) the Competent Authority must check whether the application has considered any minimum requirements applicable or instructions or guidance provided by the Competent Authority to the submission of applications.

It is therefore an instruction that the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or a permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

It is furthermore an instruction that the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The objective of the environmental impact assessment process is to, through a consultative process—

(a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;

(b) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;

(c) identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;

(d) determine the—-

(i) Nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and

(ii) Degree to which these impacts—

(AA)can be reversed;

(Bb)may cause irreplaceable loss of resources, and

(cc) can be avoided, managed or mitigated;

(e) identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;

(f) identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;

(g) identify suitable measures to manage, avoid or mitigate identified impacts; and

(h) Identify residual risks that need to be managed and monitored.

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LIST OF ABBREVIATIONS

AIA	Archaeological Impact Assessment
ASAPA	Association of Southern African Professional Archaeologists
BID	Background Information Document
CA	Competent Authority
CARA	Conservation of Agricultural Resources Act (Act 43 of 1983)
CSA	Constitution of South Africa (Act No. 108 of 1996)
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism (currently known as DEA)
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECA	Environment Conservation Act (ECA), 1989 (Act No. 73 of 1989)
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
GN	Government Notice
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IEM	Integrated Environmental Management
IWULA	Integrated Water Use License Application
IWWMP	Integrated Water and Waste Management Plan
MPRDA	Minerals and Petroleum Resources Development Act (Act No. 28 of 2002) (as amended)
NEMA	National Environmental Management Act (EIA regulations of 4 Dec 2014)
NEMAQA	National Environmental Management: Air Quality Act (Act No. 39 of 2004)
NEMBA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NEMWA	National Environmental Management: Waste Act (Act No. 59 of 2008)
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NWA	National Water Act, 1998 (Act No. 36 of 1998)
OHSA	Occupational Health and Safety Act (Act No. 85 of 1993)
PPP	Public Participation Process
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute

GLOSSARY OF TERMS

Anthropogenic: Change induced by human intervention.

Applicant: Any person who applies for an authorisation to undertake an activity or undertake an Environmental Process in terms of the Environmental Impact Assessment (EIA) Regulations – National Environmental Management Act (EIA regulations of 04 December 2014) as contemplated in the scheduled activities listed in Government Notice (GN) No 983, 984 and 985.

Archaeological resources: This includes:

- material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;
- rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
- wrecks, being any vessel or aircraft, or any part thereof which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which South African Heritage Resources Agency (SAHRA) considers to be worthy of conservation; features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

Biodiversity: The variety of life in an area, including the number of different species, the genetic wealth within each species, and the natural areas where they are found.

Cultural significance: This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

Cumulative Impact: In relation to an activity, cumulative impact means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Environment: All physical, chemical and biological factors and conditions that influence an object.

Environmental Impact Assessment: In relation to an application, to which Scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of the application.

Environmental Impact Assessment Report: In-depth assessment of impacts associated with a proposed development. This forms the second phase of an EIA and follows on the Scoping Report (SR).

Heritage resources: This means any place or object of cultural significance. See also archaeological resources above.

Precipitation: Any form of water, such as rain, snow, sleet, or hail that falls to the earth's surface.

Red Data species: All those species included in the categories of endangered, vulnerable or rare, as defined by the International Union for the Conservation of Nature and Natural Resources.

Riparian: The area of land adjacent to a stream or river that is influenced by stream induced or related processes.

PART A

1 SCOPE OF ASSSSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

1.1 Contact Person and correspondence address

1.1.1 Details of the EAP

i) Details of the EAP

Jomela Consulting Pty Ltd. was appointed by Universal Coal Development II (UCDII) (Pty) Ltd. to compile this Environmental Impact Assessment Report (EIAR) and Environmental Management Programme (EMPr) for the proposed open cast coal mining hereby referred to as the Berenice Project situated in the Makhado Local Municipality within the Vhembe District Municipality in the Limpopo Province. The details of the Environmental Assessment Practitioner (EAP) are provided in:

Table 1: Environmental Assessment Practitioner Details

Company:	Jomela Consulting (Pty) Ltd
Company Reg. No.:	2013/023450/07
Postal Address:	Postnet Box 215 Private Bag X1 Woodhill Gauteng 0076
Contact Persons:	Yvonne Gutoona Nhlanhla Khosa
Contact Number:	012 772 2350/ 012 345 1678 082 970 1513
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Website	www.jomela.co.za

ii) Expertise of the EAP.

(1) **The qualifications of the EAP**

(with evidence).

Judith Mlanda

M.A Environmental Studies (Environment & Society), University of Pretoria

B.A (Sociology & Psychology), University of Namibia

Membership of Professional Associations:

EAPSA Certified Environmental Assessment Practitioner

SATTCA Internal Auditor Certificate in environmental management systems (ISO 14001:2004)

Yvonne Gutoona

B.Sc. Geology and Geography (University of Zimbabwe (UZ))

B.Sc. Hons Geography in progress (University of Johannesburg (UJ))

Membership of Professional Associations:

Registered as a Natural Scientist (Cert.Sci.Nat.), with the South African Council for Natural Scientific Professions (SACNASP)

Member of the Geological Society of South Africa

Refer to Annexure A for the full description of the EAP team.

2) **Summary of the EAP's past experience**.

(In carrying out the Environmental Impact Assessment Procedure)

The EAPs combined have over twenty years' experience. A summary of the EAPs experience in Environmental aspects is presented below:

- Environmental Impact Assessments;
- Basic assessments, WULA reports;
- Water use license application;
- Waste use license application;
- Soil Assessment, Specialist Studies;
- Prospecting and Mining right Authorizations;
- Environmental Management Plans;
- Public Participation; and
- Environmental Authorizations.

1.2 Description of the property.

The proposed coal mining right application will be 7761.095 hectares on the farms Berenice 548MS, Celine 547MS, Doorvaardt 355MS, Matsuri 358MS, Longford 354MS and Gezelschap 395MS. Access to the proposed site will be obtained through an existing access road through agricultural land. The Project Area is located in an area which is relatively flat lying with the incision of the Brak River Valley towards the north of the area, at a surface elevation of 690 metres (m) to 735 m above sea level.

No human settlements are situated within the planned opencast mining area. The land is currently mainly used for game and small-scale farming.

Table 2: Property Description

Farm Name:	Full extent of Berenice 548MS Full extent of Celine 547MS Portion 1 Doorvaardt 355MS Remainder Doorvaardt 355MS Full extent of Matsuri 358MS Full extent of Longford 354MS Full extent of Gezelschap 395MS
Application area (Ha)	7761.095 ha
Magisterial district:	Makhado Local Municipality in the Vhembe District Municipality, Limpopo Province
Distance and direction from nearest town	The Project Area is ~ 50 km by road from Alldays and 30 km by road from Waterpoort. The nearest sizeable town is Makhado some 80 km by road to the southeast.
21-digit Surveyor General Code for each farm portion	T0MS00000000054800000 T0MS00000000054700000 T0MS00000000035500000 T0MS00000000035800000 T0MS00000000035400000 T0MS00000000039500000

1.3 Locality map

(Show nearest town, scale not smaller than 1:250000).

The proposed Berenice project is located in the Limpopo Province of South Africa, some 120 kilometres (km) to the north of Polokwane and to the east of the settlement of Alldays. The Project may be reached via an all-weather gravel road that branches off from the tar road, the R584, between Alldays and Waterpoort. The Project Area is approximately (~) 50 km by road from Alldays and about 30 km by road from Waterpoort. The nearest sizeable town is Makhado (Louis Trichardt) some 80 km by road to the southeast. The nearest accessible railway siding is at Waterpoort, ~ 30 km southeast.

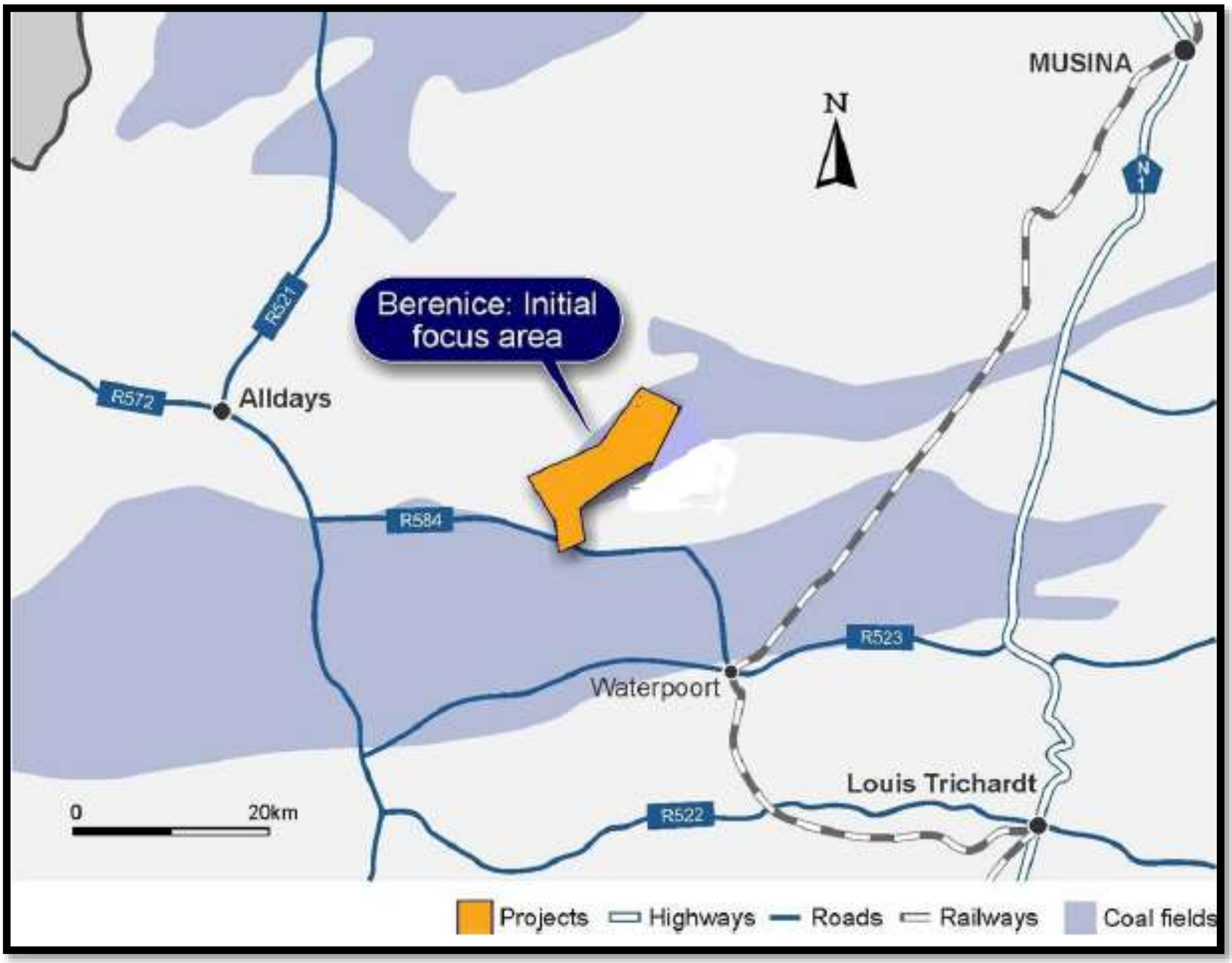


Figure 1: Project Locality

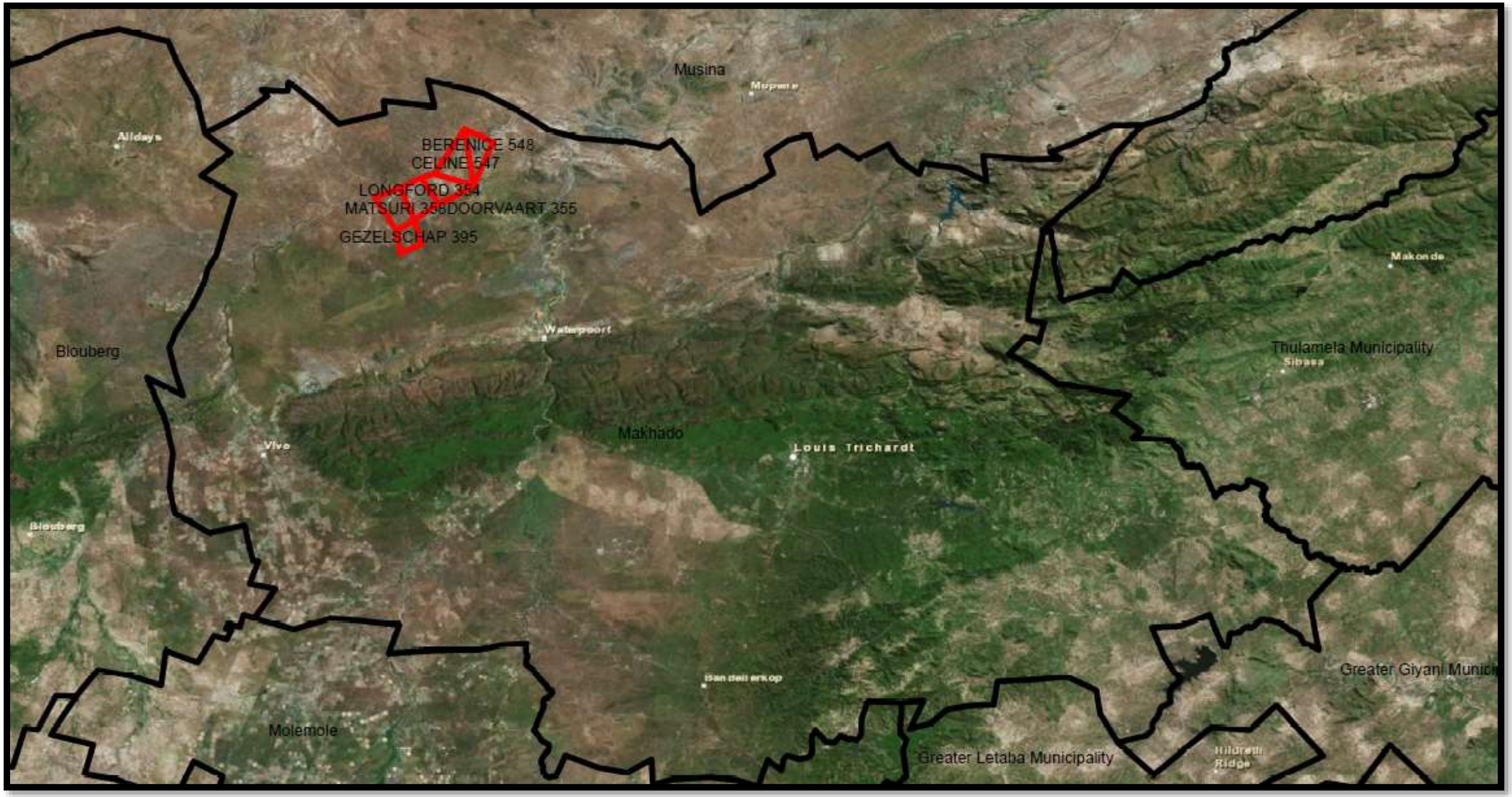


Figure 2: Google Map of the proposed Berenice Coal Mining area

1.4 Description of the scope of the proposed overall activity.

Provide a plan drawn to a scale acceptable to the competent authority but not less than 1: 10 000 that shows the location, and area (hectares) of all the aforesaid main and listed activities, and infrastructure to be placed on site

The map below shows the plan contemplated in Regulation 2(2) of the MPRDA, showing the land to which application relates. The map also denotes the directly affected farms and the boundary coordinates of the application area.

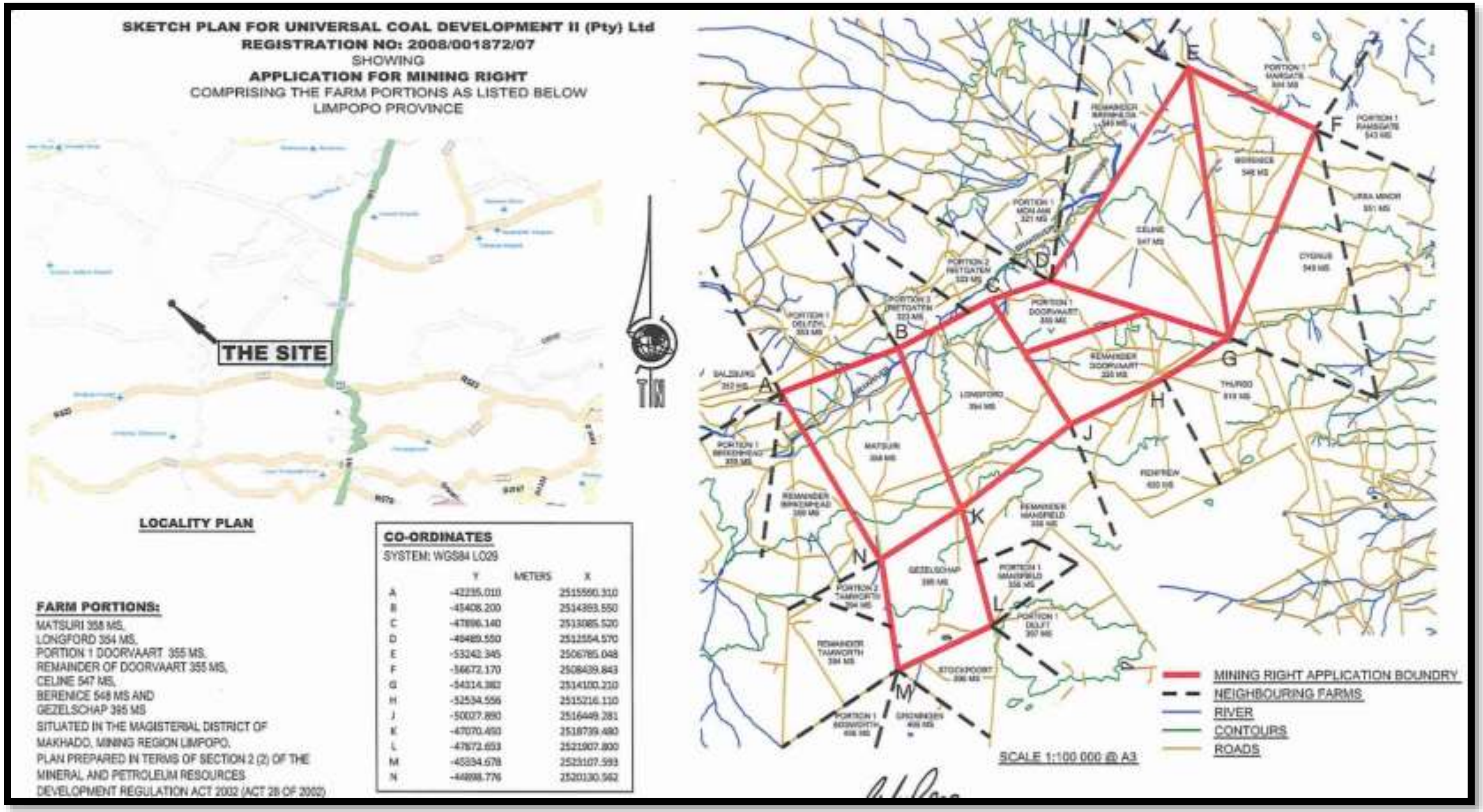


Figure 3: Mining Right Application Area- Regulation 2.2 Map

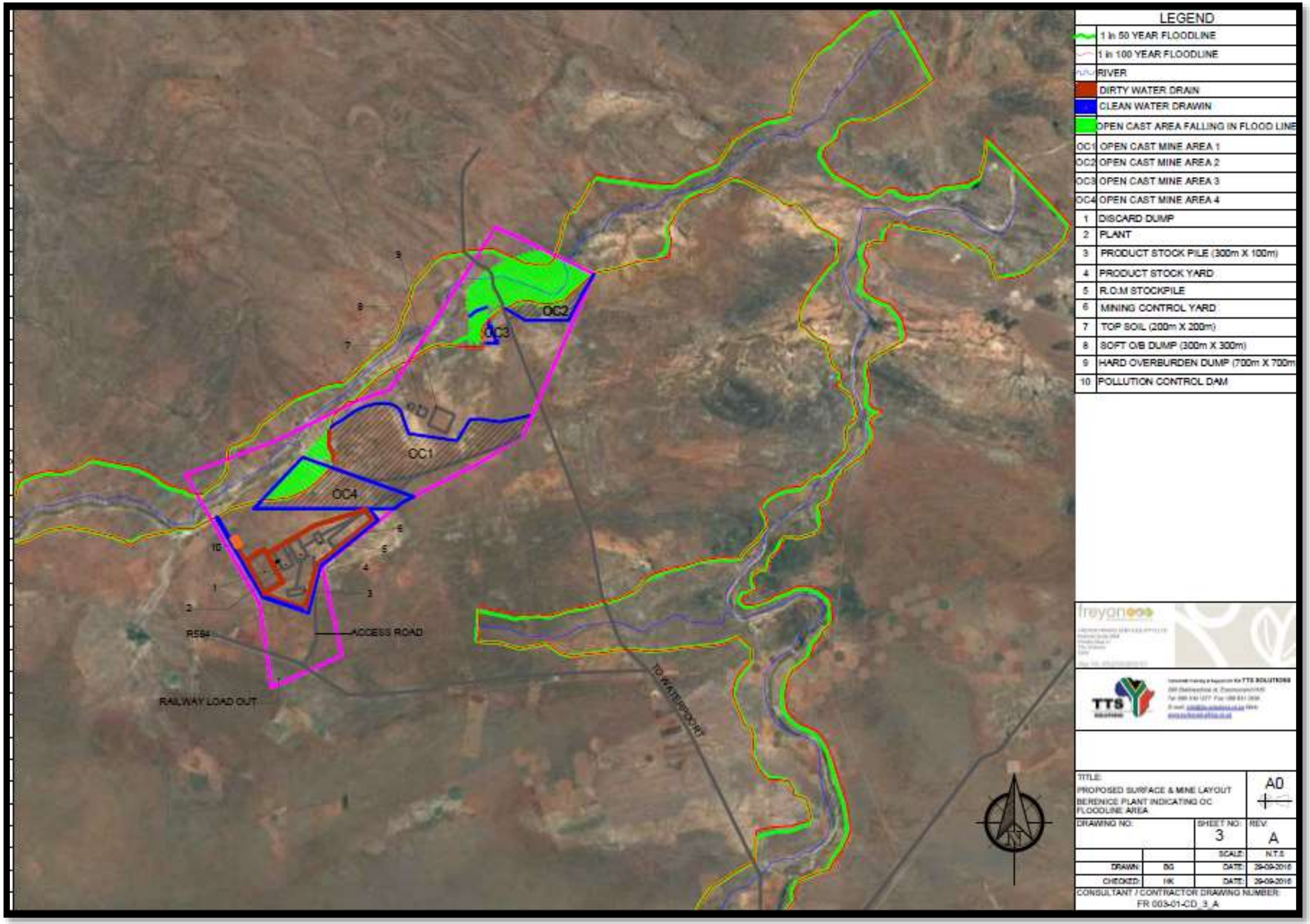


Figure 4: Site Layout and proposed infrastructure

1.4.1 Listed and specified activities

Table 3: Listed Activities

NAME OF ACTIVITY	Aerial extent of the Activity Ha or m²	LISTED ACTIVITY (Mark with an **X** where applicable or affected).	APPLICABLE LISTING NOTICE (*GNR 983, 984, 985*	WASTE MANAGEMENT AUTHORISATION
GNR 983 Listing Notice 1: Activities requiring an environmental authorisation subject to a Basic Assessment				
The development of facilities or infrastructure for the transmission and distribution of electricity- (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; ***Relevance: A power distribution switch yard will be constructed (substation).***	2HA	X	**GNR 983 Listing Notice 1:** Activity 11	N/A
The development of – (ii) channels exceeding 100 square metres in size (iv) dams where the dam including infrastructure and water surface area, exceeds 100 square meters in size (vi) bulk storm water outlet structures exceeding 100 square metres in size; (xii) Infrastructure or structures with a physical footprint of 100 square meters or more. ***Relevance: A pollution control dams will be constructed.***	20ha	X	**GNR 983 Listing Notice 1:** Activity 12	N/A
The development of a road where no reserve exists where the road is wider than 8 meters, but excluding roads which are identified and included in activity 27 in listing Notice 2 of 2014. ***Relevance: Access roads will be upgraded and mine haul roads constructed.***	20km	X	**GNR 983 Listing Notice 1:** Activity 24	N/A
The clearance of an area of 1 hectare of more, but less than 20 hectares of indigenous vegetation. ***Relevance: the area applied for is 20 hectare consisting of indigenous vegetation.***	20ha	X	**GNR 983 Listing Notice 1:** Activity 27	N/A
GNR 984Listing Notice 2: Activities requiring an environmental authorisation subject to a Scoping and Environmental Impact Assessment.				
The development of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres. ***Relevance: Hydrocarbon fuels (e.g. diesel and grease) will be stored on site for fuelling of vehicles.***	1 000m³	X	**GNR 984 Listing 2:** Activity 4	N/A
The development and related operation of facilities or infrastructure for the bulk transportation of dangerous goods- (iii) in solid form, outside an industrial complex, using funiculars or conveyors with a throughput capacity of more than 50 tons day.	10HA	X	GNR 984 Listing 2: Activity 7	N/A

Relevance: Conveyors transporting coal				
The clearance of an area of 20 hectares or more of indigenous vegetation ***Relevance: clearing of mining area***	5 791.30 ha	X	GNR 984 Listing 2: Activity 15	N/A
Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including associated infrastructure, structures and earthworks, directly related to the extraction of a mineral resource.. ***Relevance: Mining activity***	7 761.095 ha	X	GNR 984 Listing 2: Activity 17	X Applicable
Any activity including the operation of that activity associated with the primary processing of a mineral resource including winning, reduction, extraction, classifying, concentrating, crushing, screening and washing:***Relevance: Coal Processing plant***	5 791.30 ha	X	GNR 984 Listing 2: Activity 21	X Applicable
GNR 983 Listing Notice 3: Activities requiring an environmental authorisation subject to a Basic Assessment				
The development of a road wider than 4 metres with a reserve less than 13,5 metres. (a) In Limpopo where:(ff) Core areas in biosphere reserves; **Relevance: The project lies within the Vhembe Biosphere**	20km	X	**GNR 985 Listing Notice 3:** Activity 4	N/A
The development of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres. (e) In Limpopo: i. All areas. **Relevance: Storage of fuels and other dangerous goods**	20ha	X	**GNR 985 Listing Notice 3:** Activity 10	N/A
The clearance of an area of 300 square metres or more of indigenous vegetation in Limpopo where: iv. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning. Relevance: The application area is zoned for agriculture and currently being used for eco gam hunting.	5 791.30 ha	X	**GNR 985 Listing Notice 3:** Activity 12	N/A
The development of-(xii) infrastructure or structures with a physical footprint of 10 square metres or more in Limpopo; (a) within a watercourse (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; (gg) Core areas in biosphere reserves;	5 791.30 ha	X	**GNR 985 Listing Notice 3:** Activity 14	N/A
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) GN 921				
CATEGORY B General Waste Storage of hazardous waste: The storage of hazardous waste in lagoons excluding storage of effluent, wastewater or sewage. (sewer treatment plant) **Treatment of waste** The treatment of hazardous waste in excess of 1 ton per day calculated as a monthly average; using any form of treatment excluding the treatment of effluent, wastewater or sewage. **Disposal of waste on land** The of disposal of any quantity of hazardous waste to land (PCD and Discard Dump)				X

1.4.2 Description of the activities to be undertaken

(Describe Methodology or technology to be employed, including the type of commodity to be mined and for a linear activity, a description of the route of the activity)

1.4.2.1 Description of Mining Method

The mining method will be a standard truck and shovel application where the topsoil is removed and stored. Thereafter, softs will be removed and stored at the designated material stockpiles. Drilling and blasting of the hard materials (hards) will then take place. Following the blasting process, material will be dozed into the void following the coaling operation. A conservative estimate of 15 % dozer gain has been in the calculations.

The remainder of the hard material will be loaded, trucked out of the pit, and dumped over the highwall into the void created by the mining operation. Coaling will then commence and the process repeated on a strip-by-strip basis. Material (apart from the topsoil) will then be rolled-over into the void created by the removal of the coal in the previous bench, with the hard overburden and interburden forming the base. This is followed by the soft overburden, levelled, and finally topsoil will be placed and seeded.

Initially, topsoil and hards will be placed in dedicated positions in the centre, just north of the Block OC1, as close as possible to the final void positions, in order to eliminate excessive handling during the closure phase of the mine. Rollover of overburden material will be implemented after the first strip has been mined. Rehabilitation will form an integral part of the mining process and final rehabilitated land will not be further than four mining strips behind the mining face.

Drilling and blasting activities will be required for hard material. Waste material will be handled by excavators and small-articulated trucks, as well as dozers. Where practical, throw blasting will be utilised to minimise loading and hauling requirements of hard material. Blast gain is entirely dependent on the competency of the overburden. Where the overburden consists mainly of soft material, throw blast gain is minimal. When it is classified as competent overburden, throw blast gain increases to as much as 20 % of the blasted material. Approximately 15 % of the overburden will be moved by dozer-push method to the waste side of the pit.

Establishing the backfill dumps as quickly as possible will minimise haul distances and ensure the waste fleets are kept to a minimum. Mine planning will sequence waste drilling, blasting, and removal to provide a continuous source of coal from the respective coal seams for beneficiation purposes.

1.4.2.2 Mining Right: Activities and infrastructure

All the required mine infrastructure for the Project Area will be established on the LP30/5/1/1/2/376PR Prospecting Right area granted to Bono Lithihi who in is partnership with Universal Coal Development II. The mining reserve consists of four economically mineable opencast blocks. These blocks are named OC 1, OC 2, OC 3 and OC4. Mining will commence in OC 1 that will be mined for 20 years. This will be followed by mining OC 2 and OC 3 consecutively and then OC 4. The life of the mine is calculated at 33 years with OC1 being mined for 20 years, followed by OC2 which will be mined for 7 years and OC3 will be mined for 6 years.

The mining reserves will be mined by utilising truck and shovel opencast method of mining due to the reserves being shallow. One box cut, located in the south and with an east to west orientation, has been designed in the mine layout for OC 1, with two proposed waste dump sites. This design has ensured that the hauling of overburden material over excessive distances, even during the start-up period, will be largely minimised. Rollover of overburden material will be implemented after the first strip has been mined. Drilling and blasting will be undertaken for hard material. Rehabilitation will form an integral part of the mining process.

A second box cut will be established in OC 2 in Year 20 of the Project. This box cut will be located in the south with an east to west orientation.

The selected positions of both the box cuts were based on the optimal relation between strip ratio and product yield.

1.4.2.2.1 Processing Plant

The market for the coal from the mine works program is to supply a high Volatile soft coking coal product for Export and an Eskom 21.5 MJ/kg product. The coal from the MWP area will be beneficiated to provide a consistent 12.0 % to 15.0 % Ash Export coking coal product and a 21.5 MJ/kg Eskom product.

The target market for the coal is firstly for Export and secondly for Eskom. The coal will be beneficiated through a double-stage dense medium washing plant and the anticipated cost for the washing process is ZAR 24.76 per Run-Of-Mine (ROMt) and the discard costs will be ZAR 5.44 per ROMt, based on a Build-Own-Operate-Transfer (BOOT) contract.

Due to the amount of material that has to be treated, about 10 Million tonnes per annum (Mtpa), the processing section of the plant will be split into two identical modules. The design of the Dense Media Separation (DMS) section for each module will be based on modular concepts for simplicity and ease of operation. The sections are designed to provide sufficient capacity for 10 Mtpa of ROM coal.

1.4.2.2.2 Raw Coal Section

The Run-Of-Mine (ROM) coal will be tipped directly into an 850 millimetres (mm) static grizzly screen and the underflow will feed into a 150-tonne feed bin. From there, the ROM coal will be fed via a vibrating grizzly feed to the crushing circuit. A ROM stockpile area will be created next to the feed bin that will only be utilised when the feeding bin is out of commission.

The first stage of the crushing circuit includes a jaw crusher and rotary-breaker in series, designed to reduce the ROM top size from 850 mm down to 80 mm and remove any stone material larger than 80 mm.

From here, the partially crushed ROM coal is fed to a closed circuit crushing and screening system to crush the coal to (minus) - 50 mm using one double roll crusher. The screened - 50 mm ROM product is conveyed directly to the DMS plant without passing through the crusher.

The – 50 mm de-stoned raw coal is discharged onto the plant feed stockpile tripper conveyor that distributes it along the 25 000-tonne live stockpile. The coal is withdrawn from the stockpile by variable speed vibrating feeders that feed onto the processing plant feed conveyor at a controllable rate up to a peak of 1 600 tonnes per hour (tph).

The conveyor discharges into the bifurcated plant feed bin that allows the material to be split into two streams feeding the two plant modules. The bin design and discharge arrangement ensure that each module receives feed material that is relatively similar in terms of particle size. Material is withdrawn from the bin at a controlled rate by means of a variable speed vibrating feeder operating in a closed loop with a mass meter on the module feed conveyor.

An automated belt sampler is incorporated on the surge bin feed conveyor to provide a representative sample of the raw feed for metallurgical control.

Raw Coal Section

The feed to each module is received by a feed preparation screen consisting of a feed pulping chute at the feed-end and rows of sprays to remove adhering fines. The screen produces a - 50 mm (plus) + 1 mm solids stream as feed to the DMS circuit and a – 1 mm + 0 mm slurry stream as feed to the fines circuit.

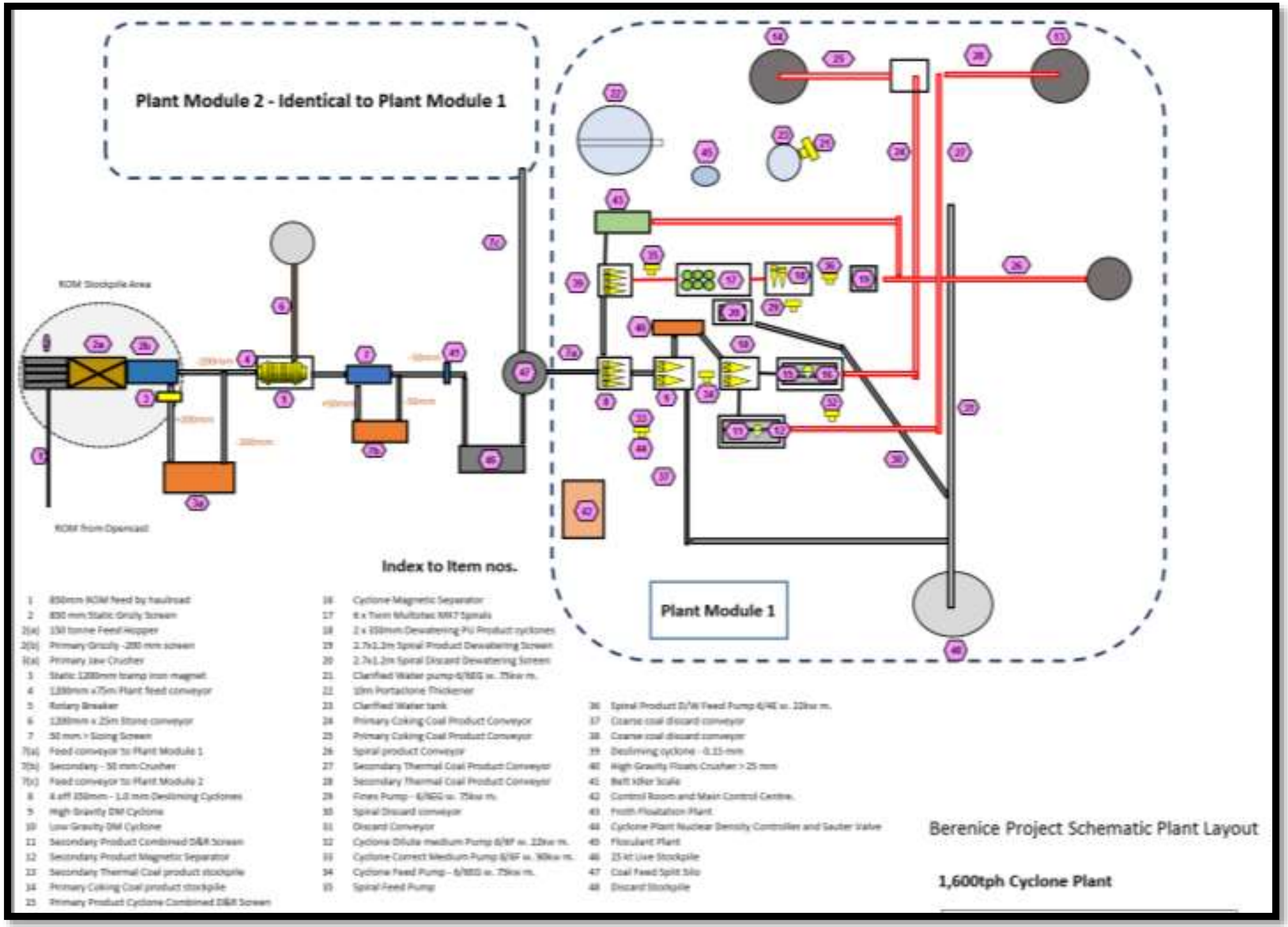


Figure 5: Washing Plant Layout

1.4.2.2.3 Dense Medium Separation Plant (DMS)

A two-stage Dense Medium Separation (DMS) circuit is provided to produce the coking and thermal coal products from the coarse feed generated as oversize from the module feed preparation screen. The solids are split into two equal streams at the discharge end of the screen before dropping to individual mixing boxes. The mixing boxes are used to allow appropriate mixing of the feed solids with magnetite medium from the circulating medium tank.

The magnetite medium slurry is used as transport medium for the feed solids to the cyclone and is used as separating medium in the cyclone. The RD of the magnetite medium slurry is a key parameter in the separation process and this is monitored and controlled, using an automatic density control system. The first stage of the DMS circuit, which is referred to as the high gravity stage, is operated at a higher medium density (typically 1.65 and above) to remove most of the waste material as sinks. The floats from high gravity stage reports to a crusher that crushes the material down to – 25 mm to improve the liberation of the coking coal before reporting to the secondary low gravity DMS stage. The sinks solids from the high gravity DMS report onto the plant discard conveyor.

The low gravity DMS is operated at a lower medium density of ~ 1.40 to produce the coking product as cyclone floats and the secondary product as cyclone sinks. All streams from the cyclones pass over their dedicated drain and rinse screens for medium recovery before the coal solids leave the system. The sinks solids from the low gravity DMS report onto the secondary product (thermal) conveyor and the low gravity DMS floats report onto the coking product conveyor.

The circuit also consists of a medium densification system that works hand-in-hand with the density control system. The densifying system increases the medium density by removing water from the medium while the density control system drops the medium density to the required level by injection a controlled quantity of water into the medium. There is also a dilute medium system that handles the dilute magnetite slurry streams resulting from the high- and low gravity drain and rinse screens after rinsing off the magnetite from the coal solids. The magnetite recovered from the dilute medium system is sent back to the high- and low gravity circulating medium circuits for reuse.

1.4.2.2.4 Fines Circuit

The - 1 mm feed preparation screen underflow slurry is pumped to a set of classification cyclones for the removal of the - 0.15 mm slimes material. The - 0.15 mm slimes leave the cyclone with the overflow stream that gravitates to the flotation feed tank, which feeds the flotation circuit.

The - 1.0 + 0.15 mm cyclone underflow material is gravitated to a feed header tank where dilution water is added via an automatic control valve to maintain a steady level in the tank and to ensure the correct feed to the spiral plant.

The spiral plant product is pumped to a dewatering cyclone that produces a dense product stream as underflow. The underflow stream gravitates to a high frequency vibrating screen for dewatering. The discard is also dewatered using a combination of a dewatering cyclone and a high frequency dewatering screen. The dewatered solids from the product dewatering screen report onto the coking product conveyor, and the solids from the discard screen report onto the plant discard conveyor. The overflow streams from the dewatering cyclones are gravitated to the flotation feed tank for more coking coal recovery through the float circuit.

1.4.2.2.5 Flotation Circuit

The slimes and ultra-fines from the fines circuit are pumped from the flotation feed tank to the float cells. Prior to feeding the cells, the stream is dosed with reagents (frother and collector) to make it possible to recover the coking coal in the stream as part of the froth that is produced by the cells. The reagents are dosed at metered rates to control the product quality and yield.

Flotation concentrate from the cell gravitates to a froth breaking pump and is pumped to the concentrate filter feed tank. The filter cakes from the filter are collected by a reversible conveyor that can either discharge directly onto the plant product conveyor or to a stockpile for storage and drying before rehandling. Provision is made for the filter cake to be refed to the coking product conveyor using a reload conveyor with an integrated hopper and a FEL. Filtrate is collected in a tank and pumped to the tailings thickener.

The flotation tailings stream gravitates to the flotation tailings tank where it is pumped to the tail thickener. The thickener produces a clarified water stream collected as overflow and thickened solids slurry collected as underflow. The overflow is collected in the process water tank and reused in the process. The underflow is pumped from the thickener cone to a tailings filter that generates solid cakes. The tails filter cake is collected by a reversible conveyor that can either discharge directly onto the plant discard conveyor or onto a stockpile pad for storage and drying before rehandling. Provision is made for the filter cake to be refed to the plant discard conveyor using a reload conveyor with an integrated hopper and a FEL. Filtrate is collected in a tank and pumped to the tailings thickener.

Raw water for cloth wash is provided for periodic cleaning of the product and discard filter cloths.

1.4.2.2.6 Services

A bulk magnetite-makeup facility is provided to service the two DMS modules. Magnetite tipped in 30-tonne loads from rear tipper trucks is sluiced with monitor guns to a vertical spindle pump and transferred to a magnetic separator. The recovered magnetite gravitates to a holding tank and kept in circulation, while the effluent recycles to the monitor guns. Over-dense slurry is dosed to the DMS modules via a splitter, as required.

An automated powder flocculent makeup and dosing system is provided to supply hydrated flocculent to the tailings thickener. Two additional flocculent makeup and dosing systems are provided for the product and tailings filters.

Two oil free compressors (a duty and a standby) that come with built-in driers, provide instrument air and process air to all modules. This is done via the instrument air receiver and the process air receiver, respectively. The instrument air first passes through a filter before reporting to the receiver to ensure high quality air for the instruments.

Potable quality water is provided for all pumps and equipment that require gland sealing.

1.4.2.2.7 Efficiency of the Process

The plant will be operated to process a minimum of 10 Mtpa of ROM coal and is expected to achieve an average total yield of 55.5 % for the Export and Eskom fractions. Regular sampling will be conducted to ensure that the plant is operating at the correct parameters to optimise the yield.

1.4.3 Infrastructure

General Design Philosophy

This study report section contains a concept level design philosophy for the civil infrastructure for the Berenice project. The latest edition of the applicable South African Standards and Standard Building Regulations establish the minimum requirements for design, materials and construction unless otherwise noted in this document.

In the absence of an applicable South African Standard, the latest edition of British Standards and Standard Code of Practice shall govern the quality of design, materials and construction, except where otherwise indicated.

1.4.3.1 Contractors lay down area and Site Establishment

Each potential contractor is provided with a laydown area, water and electrical connection. The provision of utilities, offices and warehousing will be temporary and supplied by each individual contractor.

1.4.3.2 Roads

Access Road

A new main access road is to be constructed from the existing R523 road; this will be a 7.4m wide tar surfaced road with stormwater earth channels and mitre drains to protect the road structure from flood damage. A detailed structural pavement design, considering current and future traffic loading, will be completed during the prefeasibility phase.

Intersections will be properly designed to provide safe entry and exit into the mining complex. Approvals from the provincial roads authority will be obtained for this access point.

Internal Mining Complex Roads

The internal roads will be 6m wide surfaced tar roads with semi mountable kerbs and non- mountable kerbs on both sides of the road as required. A detailed structural pavement design, considering current and future traffic loading, will be completed during the detail design phase.

These roads will be equipped with all the required stormwater systems and structures to prevent any possible flooding.

Haul Roads

Dedicated haul roads for the rigid dump trucks will be 32 m wide with safety berms on either side. The road pavement structure and geometric design will be based on the largest vehicle to be used in operations. Dust from these roads will be controlled by applying road binders and regular watering with water tankers.

Storm water drainage and culverts are designed to protect the road structure itself, and to divert the water to natural water courses where possible.

Pit bound Light Delivery Vehicle Roads

A 6m wide gravel dedicated mine vehicle roadway on the side with a safety berm between the mine vehicle roadway and the haul road will be constructed.

Dust from these roads will be controlled by applying road binders and regular watering with water tankers.

Storm water drainage and culverts are designed to protect the road structure itself, and to divert the water to natural water courses where possible.

1.4.3.3 Rail Line extension

A rail line extension has been proposed as an alternative to transport the coal from the Berenice site to Waterpoort Station. Due to the potential impacts outside the mining right farms the feasibility of this option will be investigated further and if chosen will have its own accompanying EIA.

1.4.3.4 Water Supply

Berenice Mine indicated that they require a volume of 3M l/day to ensure an effective and efficient mining operation. This portion of the report proposes a best practice approach to acquire all information necessary to complete a hydrogeological investigation that investigates the sustainability of water resource in the local aquifers.

1.4.3.4.1 Staff Water Requirements:

Water requirements for use by the mine staff is calculated at 200 litres (L) per person per day. The water supply capacity therefore has to be 42.6 kilolitres (kL) per day. Boreholes will be established to supply water for staff requirements. A small water treatment plant will be built at the mine to produce potable water from the borehole water.

1.4.3.4.2 Industrial Water Requirements:

Bulk water supply has the potential to be one of the biggest non-commercial influences on the viability of the Project. No bulk water supply currently exists in the vicinity of the site. Investigations have suggested that regional district municipalities do not have provision for future bulk-supply development. Therefore, ground water will be extracted from well fields established in the area, as this method of water supply seems to be the most viable for the Project. The feasibility of this option will be reviewed further during the Water Use Licence Application (WULA). According to the groundwater specialist studies, there is enough groundwater to meet the mine’s demand. The use or groundwater will be subject to the DWS issuing permission (S 21 a water use).

The washing plant fresh water consumption, required as make-up water, has been estimated to be between 3 000 cubic metres (m^3) to 4 500 m^3 per day. The plant will be equipped with a filter press and thickener to clarify the plant water for re-use. The plant will make maximum use of recycled water. Effluent from the plant will be pumped to the process water tank for re-use.

1.4.3.4.3 Surface Run-Off Water:

Run-off water from disturbed areas will be collected and stored in holding ponds located near the pits. The water will be routed to the holding area, utilising a series of diversion berms. Collected water will be used for the mining and treatment processes.

All water generated by the mining activities will be stored in a High-Density Polyethylene (HDPE) -lined Pollution Control Dam (PCD) and re-used in the beneficiation plant as well as for dust-control purposes on the haul roads.

1.4.3.4.4 Mine Closure:

It is predicted that the pit will start decanting post closure. Monitoring will be implemented post closure according to DWS WULA and NEMA closure recommendations.

1.4.3.4.5 Water Treatment Plant

The location of the water treatment plant has not been determined at this point, as it is considered that water treatment will only be required towards the end of the Life of Mine (LOM).

1.4.3.5 Surface Infrastructure

1.4.3.5.1 Brake Test Ramp

A brake test ramp has been included to test the braking capabilities of vehicles into the pit. The gradient of the brake test ramp will be similar to the maximum gradient experienced at the opencast pit. There will be a dedicated parking area for the rigid dump trucks with safety berms and the vehicles will be approached from the rear in the parking area. The brake test ramp is located at the exit of the parking area to ensure the brakes are functional immediately after start up.

1.4.3.5.2 Storm and Polluted Water Management:

Storm water cut – off drains and deflection berms will be designed and constructed on site, according to site topographic conditions. The principal of separation of clean and dirty water systems will be adhered to, and where possible and practical, storm water runoff will be routed around the site, and away from potential contamination areas. Clean water drains and berms will be redirected towards the natural watercourses in the area. Clean water drains are earth lined (velocities permitting).

Areas such as workshops, fuel storage bays, conveyor routes, discard dumps, wash down areas, stockpiles and the tip areas are regarded as contaminated/polluted. These areas will have a network of concrete lined drains and pipe culverts that will gravitate towards a PCD. All inflows will be routed through a silt trap and oil separation system to ensure dam capacity is not compromised through sediment deposition.

The PCD (dirty water dam) will be HDPE lined and sized to accommodate a 1:100 year storm period with an 800mm freeboard. The full design capacity of the dam will be maintained at all times, with zero allowance for environmental flows at or below the design storm intensity. Water contained within the dam subsequent to a rainfall event will be used to augment mine water. And emphasis will be placed on maximum recovery and reuse of all water (where practical and permissible).

1.4.3.5.3 Security Fencing – Perimeter

2.4 m high galvanised high security fencing will be used as perimeter fencing. One point of access will be provided, this makes access control easier.

1.4.3.5.4 Security Fencing – Infrastructure Complex

Electrical medium security fencing will be used in and around the shaft complex area.

1.4.3.5.5 Bus Terminal

Bus shelter and sufficient turning areas with separate disembarking and embarking areas provided at the terminal.

1.4.3.5.6 Parking Area

Sufficient Parking for visitors, office personnel and mine vehicles. Covered parking will be available for office personnel. The parking layout is structured to allow for future expansion requirements. The cost of the future expansion is not included in the capital estimate.

1.4.3.5.7 Sewage Reticulation and Sewage Treatment

Sewage treatment will be carried out to comply with health requirements and to maximise water recovery. Reticulation has been designed to take advantage of the fall of the topography and thus avoid pumping wherever possible. Sewage from the mining complex area will be collected in the sewage network and flows by gravity to the treatment plant. The sewer network will comprise of 110mm and 160 mm diameter pipes with manholes spaced at maximum of 100m intervals on straight sections as well as at all bends and junctions. Manholes will be of the precast concrete ring type.

1.4.3.5.7.1 The Sewage Treatment Plant is a packaged plant.

The plant has been designed according to the following parameters:

- Average Daily Flow : 60m^3/day (400PE@150L/person/day)
- Peak Factor : 3 (assumed)
- Influent : Typical Domestic Raw Sewage (350mg/L BOD)
- Treated Effluent : Department of Water and Sanitation (DWS) General Limits
- Stormwater Infiltration : 15% of total daily flow is added

1.4.3.5.8 Conveyors

The conveyor will be totally enclosed with security fencing. Armco or similar safety barriers will separate the service road from conveyors, where required.

1.4.3.5.9 Terraces

Terraces will be built at the mine to accommodate the surface buildings, transfer structures, etc. Because of the lack of geotechnical information we assumed that terraces will be constructed using a combination of in situ and commercial materials.

1.4.3.5.10 Foundations

Should fill material for foundations, terraces and roads be required, dump rock screened over a grizzly to remove oversize material, will be used as a fill to replace the poor quality in-situ material. For larger structures that are found to require more substantial backfill material for their founding, consideration will be given and using mass concrete as a backfill material may also be used.

1.4.3.6 Civil Works

1.4.3.6.1 Mini Subs

The mini sub structures consist of an open plinth with a bund arrangement.

1.4.3.6.2 Conveyors

The civil work will comprise of restricted earthworks, bases, plinths and cast in items for the conveyor structure.

1.4.3.6.3 Transfer Points

Should it be required, the civil work at the transfer towers will consist of bases, plinths, cast in items and bund walls to keep any coal that falls of at the transfer inside the transfer tower area.

1.4.3.7 Buildings

1.4.3.7.1 Change House

The change house will accommodate a total of 500 people and because of the 24/7 hour operation a four shift rotation system will be used. The philosophy used is one of clean and dirty flow separation.

The change house split caters for both male and female as well as for officials and skilled labour. Lockers design caters for a split between personal clothing and Personal Protective Equipment (PPE).

1.4.3.7.2 Workshop

A workshop with dedicated areas for rigid dump trucks, dragline buckets and mine vehicles will be constructed at the mining complex area. This will be an open-sided, steel portal building with overhead travelling crane(s).

1.4.3.7.3 Store

The storage building is a steel structure with sheet cladding and roofing. Three separate small store facilities will be provided for Oxy, Paint and Gas Stores. Fenced Open storage areas will be provided for store yard, solid waste and cable yard. A concrete hard stand has been included for the solid waste yard. A separate hard stand slab is included specifically for the loading and offloading of large machinery such as rigid dump trucks.

1.4.3.7.4 Offices

The offices will comprise of face brickwork construction. This building shall include the control room, green rooms, boardrooms, offices, kitchen, small change house for visitors and senior management, ablution facilities for male and female as well as disabled facilities.

1.4.3.7.5 Gate House

The Gate house will consist of a main security room with a reception hatch, search room, ablution facilities and turnstiles.

1.4.3.7.6 Diesel and Wash bays

A diesel and wash bay is provided for refuelling and washing of vehicles and equipment.

1.4.3.8 Substations

Bulk power supply will be delivered via two dedicated Overhead Power lines to the Indoor Sub-Station. Based on the position of the resources, there is no suitable Eskom infrastructure in the immediate vicinity to the site. A high-level review was undertaken to establish where there is current 'large power' infrastructure. It was found that Louis Trichardt (Makhado) would be the nearest town to draw electricity from.

Figure 6: Satellite Picture "High Power" ESKOM Infrastructure

Eskom's Limpopo division were engaged to establish various scenarios for the power supply to the site. There is an option to tie into the existing national grid at 132 kilovolts (kV) or 88 kV high voltage level at the existing Eskom substations. The power would be conveyed to the sites by single overhead lines.

The reticulation concept for the site would comprise the following:

- A continuous connected supply from the national grid, generated, and controlled by Eskom at a 'Notified Maximum Demand' level; and
- 'Onsite automated standby 'power supply generators that would be sufficient to maintain operation of critical machines, emergency plant operations, and essential lighting and security requirements of the mine site.

Eskom supply distribution at Berenice will consist of a switching yard that will be constructed at the site and will comprise of the following:

- A 132/ 88 kV supply line connected to the national network, terminated in a distribution yard constructed on Universal Coal property.
- Envisaged one by 15 megavolt amperes (MVA) 132/ 88 kV to 11 kV transformers will be connected to the 132/ 88 kV yard distribution network at the site.
- The 11 kV terminals from the respective transformers will be connected to an 11 kV distribution network via the site main intake substation that will supply power to the site.

An Intake Substation will be constructed adjacent to the Eskom yard that will house the incoming supply and distribution switchgear supplying the various major plant sections. This substation will also house the power supply 'maximum demand' and kilowatt hour (kWhr) metering, surge protection instrumentation, and power factor correction (PFC) equipment.

An earlier power supply point for the early development operations will be required. A containerised substation would be erected to satisfy the supply and distribution requirement. The equipment installed would be repositioned into the main incomer substation when constructed.

1.4.4 Minerals applied for:

Coal.

1.5 Policy and Legislative Context

1.5.1.1 The South African Constitution

This section provides an overview of the legislative requirements applicable to this project and it includes the Acts, guidelines and policies considered in the compilation of this report. The legislative motivation for this project is underpinned by the Constitution of South Africa, 1996 (Act No. 108 of 1996), which states that:

The State must, in compliance with Section 7(2) of the Constitution, respect, protect, promote and fulfil the rights enshrined in the Bill of Rights, which is the cornerstone of democracy in South Africa. Section 24 of the Constitution:

24. Environment

-Everyone has the right-

(a) to an environment that is not harmful to their health or well-being; and

(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that-

(i) prevent pollution and ecological degradation;

(ii) promote conservation; and

(iii) secure ecologically sustainable development and use of natural resources while promoting a justifiable economic and social development.

Section 24 of the Constitution of South Africa (Act No. 108 of 1996) requires that all activities that may significantly affect the environment and require authorisation by law must be assessed prior to approval. In addition, it provides for the Minister of Environmental Affairs or the relevant provincial Ministers to identify:

- new activities that require approval;
- areas within which activities require approval; and
- existing activities that should be assessed and reported on.

Section 28(1) of the Constitution of South Africa (Act No. 108 of 1996) states that: *"every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring".* If such pollution or degradation cannot be prevented then appropriate measures must be taken to minimise or rectify such pollution or degradation. These measures may include:

- Assessing the impact on the environment;
- Informing and educating employees about the environmental risks of their work and ways of minimising these risks;

- Ceasing, modifying or controlling actions which cause pollution/degradation;
- Containing pollutants or preventing movement of pollutants;
- Eliminating the source of pollution or degradation; and
- Remedying the effects of the pollution or degradation.

Applicability: Public participation process and consultation at every stage of the EIA phase. A public participation process will be followed and consultations will be done regarding the proposed project. An EMP and awareness plan will be designed according to the issues raised during this process

1.5.1.2 National Environmental Management Act

The NEMA Act under sections 24(2), 24(5), 24D and 44, read with section 47A (1) (b) of National Environmental Management Act (107/1998): Environmental Impact Assessment Regulations, 2014, is regarded as one of the important pieces of general environmental legislation as it provides a framework for environmental law reform. The main objective of this act is to ensure that ecosystem services and biodiversity are protected and maintained for sustainable development. Furthermore, Section 28 (1) of the NEMA requires that "every person who causes has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring".

NEMA strives to regulate national environmental management policy and is focussed primarily on co-operative governance, public participation and sustainable development. NEMA makes provisions for co-operative environmental governance by establishing principles for decision making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by Organs of State and to provide for matters connected therewith.

A scoping report addressing the requirements of GN R 982 of the NEMA was compiled and submitted to the DMR on the 14th of October 2016. The Scoping Report contained information necessary for the understanding of the process, including all preferred alternatives location alternatives, the scope of the assessment. A description of the consultation process undertaken during the Scoping phase and to be undertaken through the environmental impact assessment process was also included. The DMR accepted the Scoping Report and Plan of study contained therein and requested that the applicant commence with the EIA phase of the assessment, including the detailed specialist studies.

(a) details of-

  I. *the EAP who prepared the report; and*
  II. *the expertise of the EAP, including a curriculum vitae;*

(b) the location of the activity, including-

I. *the 21 digit Surveyor General code of each cadastral land parcel;*
II. *where available, the physical address and farm name;*
III. *where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;*

(c) a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is-

I. *a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or*
II. *on land where the property has not been defined, the coordinates within which the activity is to be undertaken*;

(d) a description of the scope of the proposed activity, including-

I. *all listed and specified activities triggered;*
II. *a description of the activities to be undertaken, including associated structures and infrastructure;*

(e) a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process;

(f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;

(h) a full description of the process followed to reach the proposed preferred activity, site and location within the site, including-

I. *details of all the alternatives considered;*
II. *details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;*
III. *a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;*
IV. *the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;*
V. *the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts-*
    a) *can be reversed;*
    b) *may cause irreplaceable loss of resources; and*
    c) *can be avoided, managed or mitigated;*
VI. *the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;*
VII. *positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;*
VIII. *the possible mitigation measures that could be applied and level of residual risk;*
IX. *the outcome of the site selection matrix;*

X. *if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such and*

XI. *a concluding statement indicating the preferred alternatives, including preferred location of the activity;*

Applicability: Baseline environmental information of the project area has been assessed in form of specialist reports. Mitigation measures and recommendations where provided according to best practice standards. This scoping and EIA/EMP report complies with the requirements of the NEMA act.

1.5.1.3 Mineral and Petroleum Resources Development Act

The MPRDA makes provision, for persons to apply for a mining right. A mining right granted in terms of the MPRDA is a limited real right in respect of the type of resources and the land to which the right relates. The holder of a mining right is entitled to the rights referred to in the MPRDA or any other law.

The applicant requires a mining right and environmental authorisation from the DMR. Acceptance of the application by DMR only permits the applicant to continue with the necessary process and does not constitute authorisation. The acceptance details the outstanding requirements for the application, which includes:

(a) the submission of an EMP; and
(b) notification and consultation with IAPs, including land owners or lawful occupiers of land, on which the proposed mining is to be conducted;
(c) Details on how the applicant will substantially and meaningfully expand opportunities for historically disadvantaged persons**.**

Applicability: A mining right was lodged with the DMR and is still pending.

1.5.1.4 National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)

The overarching aim of the National Environmental Management: Biodiversity Act, 2004 (NEMBA), within the framework of NEMA, is to provide for:

- *The management and conservation of biological diversity within South Africa as well as for the components of such biological diversity;*
- *The use of indigenous biological resources in a sustainable manner and*
- *The fair and equitable sharing among stakeholders of benefits arising from bio-prospecting involving indigenous biological resources.*

As part of its implementation strategy of NEMBA, the National Spatial Biodiversity Assessment was developed. This assessment classifies areas as worthy of protection based on its biophysical characteristics, which are ranked according to priority levels. The approach used for biodiversity planning is systematic and entails the following three key principles:

- *The need to conserve a representative sample of biodiversity pattern, such as species and habitats (the principle of representation);*
- *The need to conserve the ecological and evolutionary processes that allow biodiversity to persist over time (the principle of persistence); and*
- *The need to set quantitative biodiversity targets that quantifies the degree of conservation required for each biodiversity feature in order to maintain functioning landscapes and seascapes.*

Furthermore, the South African National Biodiversity Institute (SANBI) was established by the NEMBA, its purpose being (*inter alia*) to report on the status of the country's biodiversity and the conservation status of all listed threatened or protected species and ecosystems. NEMBA provides for a range of measures to protect ecosystems and for the protection of species that are threatened or in need of protection to ensure their survival in the wild, including a prohibition on carrying out a "restricted activity" involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 8 of the Act. Lists of critically endangered, endangered, vulnerable and protected species have been published and a permit system for listed species has been established.

It is also appropriate to undertake an Ecological (Fauna and Flora) Impact Assessment for developments in an area that is considered ecologically sensitive and which requires environmental authorisation in terms of NEMA, with such assessment taking place during the Scoping or EIA phase. The Applicant is therefore required to take appropriate reasonable measures to limit the impacts on biodiversity, to obtain permits if required.

1.5.1.5 National Forest Act, 1998 (Act 84 of 1998)

The purposes of National Forest Act, 1998 (act 84 of 1998) (NFA) includes *inter alia:*

> (*c) provide special measures for the protection of certain forests and trees:*
>
> *(d) promote the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes.*

Applicability: A flora and fauna study has been done (refer to Annexure 5: Specialist Reports-Appendix 4 and 5) to determine the tree species in the project area and specify if there are any endangered species. A permit for the removal / destruction of protected trees will be applied for with the relevant department in terms of Section 15 of the NFA before construction.

1.5.1.6 National Environmental Management: Air Quality Act (Act No 39 of 2004)

Section 28 (1) of NEMA places a general duty of care on any person who causes pollution, to take reasonable measures to prevent such pollution from occurring. The objective of the National Environmental Management: Air Quality Act, 2004 (NEM:AQA) is to regulate air quality in order to protect, restore and enhance the quality of air in the Republic, taking into account the need for sustainable development. Furthermore, the provision of national norms and standards regulating air quality monitoring, management and the control by all spheres of government determine that specific air quality measures should be adhered to. Dust created during the construction and operational phases of the proposed Berenice Coal Mine could influence air quality and thus make this legislation relevant to this development. Air quality management and mitigation measures during the mining phase will be considered to be a measure to exercise this duty of care, since it aim to minimise volumes of dust emissions emanating from the operational activities.

An air emission license will not be required for the application process but air quality monitoring will be implemented.

<u>Applicability: All phases of the project will result in dust production which will have an impact on ambient air quality. Refer to Annexure 5-Appendix 3 for the Baseline Air Quality Assessment</u>.

1.5.1.7 Conservation of Agricultural Resources Act (Act 43 of 1983)

The aim of the Conservation of Agricultural Resources Act,1983 (Act 43 of 1983) (CARA) is to provide for control over the utilisation of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants and for matters connected therewith. The EIA phase of the project will take into account the requirements of CARA as well as determine the potential direct and indirect impacts on agricultural resources as a result of the proposed mining development.

<u>Applicability: The project area is mainly used for Game Farming and the project has potential to impact on soils and land use in the area. A soil and land capability impact study has been conducted as part of the application. Annexure 5_ Refer to Appendix 7</u>

1.5.1.8 National Environmental Management: Waste Act (Act 59 of 2008)

The National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEM:WA) and Waste Classification and Management Regulations, 2003 (GNR: 634 – 635): To reform the law regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development; to provide for institutional arrangements and planning matters; to provide for national norms and standards for regulating the management of waste by all spheres of government; to provide for specific waste management activities; to provide for the remediation of contaminated land; to provide for the national waste information system; to provide for compliance and enforcement; and to provide for matters connected therewith.

The operational activities associated with the proposed mining program shall be in accordance with the requirements of National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEM:WA) and Waste Classification and Management Regulations, 2003 (GNR: 634 – 635). Berenice Coal Mine will manage its waste in a legally compliant manner, tailings – will be returned to the pit as backfill and is excluded from NEM:WA).

Applicability: Waste classification and an Integrated Water and Waste Management Plan will be compiled as part of the Water use licence and will be integrated in the Draft EIAr which will be available for public review during the EIA phase.

1.5.1.9 Occupational Health and Safety Act (Act 85 of 1993)

The aim of the Occupational Health and Safety Act, 1993 (act 85 of 1993) (OHSA) is to provide for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery ; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work; to establish an advisory council for occupational health and safety as well as to provide for matters connected therewith.

Section 8 which deals with the general duties of employers and their employees states that:

1) *"Every employer shall provide and maintain, as far as is reasonably practicable, a working environment that is safe and without risk to the health of the employees."*
2) *''Without derogating from the generality of an employer's duties under subsection (1), the matters to which those duties refer include in particular:*
    a. *The provision and maintenance of systems of work, plant and machinery that, as far as reasonably practicable, are safe and without risk to health;*

    b. *Taking such steps as may be reasonably practicable to eliminate or mitigate any hazard or potential hazard to the safety and health of employees;*

    c. *Making arrangement for ensuring as far as reasonably practicable, the safety and absence of risks to health in connection with the production, processing, use, handling, storage and transport of articles or substances;*

    d. *Establishing, as far as reasonably practicable, what hazards to the health or safety of persons are attached to any work which is performed, any article or substance which is produced, processed, used, handled, stored or transported and any plant or machinery which is used* *in his business, and he shall, as far as reasonably practicable, further establish what precautionary measures should be taken with respect to such work, article, substance, plant or machinery in order to protect the health and safety of persons, and he shall provide the necessary means to apply such precautionary measures;*

e. Providing such information, instruction, training and supervision as may be necessary to ensure, as far as reasonably practicable, the health and safety of employees;

f. As far as reasonably practicable, not permitting any employee to do any work or to produce, process, use, handle, store, or transport any article or substance or to operate any plant or machinery, unless precautionary measures contemplated in paragraph (b) and (d), or any precautionary measures which may be prescribed, have been taken;

g. Taking all necessary measures to ensure that the requirements of this act are complied with by every person in his employment or on the premises under his control where plant and machinery is used;

h. Enforcing such measures as may be necessary in the interest of health and safety;

i. Ensuring that work is performed and that plant and machinery is used under the general supervision of a person trained to understand the hazards associated with it and who has the authority to ensure that precautionary measures taken by the employer are implemented and

j. Causing any employees to be informed regarding the scope of their authority as contemplated in section 37(1)(b).”

1.5.1.10 National Heritage Resources Act

National Heritage Resource Act, 1999 (Act No. 25 of 1999)

The proposed Berenice Coal Mine project must comply with the requirements stipulated in the National Heritage Resources Act, 1999 (Act 25 of 1998) (NHRA). The NHRA legislates the necessity for cultural and Heritage Impact Assessment (HIA) in areas earmarked for development, which exceed 0.5 ha or linear development exceeding 300 metres in length. The Act makes provision for the potential destruction to existing sites, pending the archaeologist’s recommendations through permitting procedures. Permits are administered by the South African Heritage Resources Agency (SAHRA).

Section 38(1) of NHRA, subject to the provisions of subsections (7), (8) and (9), requires that any person who intends to undertake a development categorised as:

*(a) The construction of **a road**, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;*

(b) The construction of a bridge or similar structure exceeding 50m in length;

(c) Any development or other activity which will change the character of a site-

(i)Exceeding 5 000 m^2 in extent; or

(ii)Involving three or more existing erven or subdivisions thereof; or

(iii)Involving three or more erven or divisions thereof which have been consolidated within the past five years; or

(iv)The costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

(d) The re-zoning of a site exceeding 10 000 m^2 in extent; or

(e) Any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

Archaeological impact assessments (AIAs) are often commissioned as part of the heritage component of an EIA and are required under Section 38(1) of the NHRA of 1999, Section 38(8) of the NEMA and the MPRDA.

The process of archaeological assessment usually takes the form of:

1. A scoping or initial pre-assessment phase where the archaeologist and developer's representative establish the scope of the project and terms of reference for the project;

2. A Phase 1 AIA;

3. A Phase 2 archaeological mitigation proposal; and

4. A Phase 3 heritage site management plan.

Phase 1: Archaeological Impact Assessment (refer to Appendix 6 for the Heritage Impact Assessment).

A Phase 1 AIA generally involves the identification and assessment of sites during a field survey of a portion of land that is going to be affected by a potentially destructive or landscape altering activity. The locations of the sites are recorded and the sites are described and characterised. The archaeologist assesses the significance of the sites and the potential impact of the development on the sites and makes recommendations. It is essential that the report supply the heritage authority with sufficient information about the sites to assess, with confidence, whether or not it has any objection to a development, indicate the conditions upon which such development might proceed and assess which sites require permits for destruction, which sites require mitigation and what measures should be put in place to protect sites that should be conserved.

Minimum standards for reports, site documentation and descriptions are clearly set out by the SAHRA and supported by the Association of Southern African Professional Archaeologists (ASAPA). The sustainable conservation of archaeological material (*in situ*) is always the best option for any sites that are deemed to be of importance. The report needs to indicate which sites these are, explain why they are significant and recommend management measures. In certain kinds of developments which involve massive intervention (mining, dam construction, etc.), it is not possible to reach a conservation solution other than to develop a programme of mitigation which is likely to involve the total or partial "rescue" of archaeological material and its indefinite storage in a place of safety.

Phase 2: Archaeological Mitigation Proposal

If the Phase 1 report finds that certain archaeological sites in a development area are of low significance, it is possible to seek permission from the heritage authority for their destruction. The final decision is then taken by the heritage resources authority, which should give a permit or a formal letter of permission, or in the case of an EIA issue a comment allowing destruction.

Phase 2 archaeological projects are primarily based on salvage or mitigation excavations preceding development that will destroy or impact on a site. This may involve collecting of artefacts from the surface, excavation of representative samples of the artefact material to allow characterisation of the site and the collection of suitable materials for dating the sites. The purpose is to obtain a general idea of the age, significance and meaning of the site that is to be lost and to store a sample that can be consulted at a later date for research purposes. Phase 2 excavations should be done under a permit issued by SAHRA, or other appropriate heritage agency, to the appointed archaeologist. Permit conditions are prescribed by SAHRA, or other appropriate heritage agencies. Conditions may include as minimum requirements reporting back strategies to SAHRA, or other appropriate heritage agencies and/or deposition of excavated material at an accredited repository.

Should further material be discovered during the course of development, this must be reported to the archaeologist or to the heritage resources authority and it may be necessary to give the archaeologist time to rescue and document the findings. In situations where the area is considered archaeologically sensitive the developer will be asked to have an archaeologist monitor earth-moving activities.

Phase 3: Management plan for conservation and planning, site museums and displays

On occasion Phase 2 may require a Phase 3 program involving one of the following:

- The modification of the site;
- The incorporation of the site into the development itself as a site museum;
- A special conservation area; or
- A display.

Alternatively, it is often possible to re-locate or plan the development in such a way as to conserve the archaeological site or any other special heritage significance the area may have. For example in a wilderness or open space areas where such sites are of public interest, the development of interpretative material is recommended since it adds value to the development. Permission for the development to proceed can be given only once the heritage resources authority is satisfied that measures are in place to ensure that the archaeological sites will not be damaged by the impact of the development or that they have been adequately recorded and sampled. Careful planning can minimise the impact of archaeological surveys on development projects by selecting options that cause the least amount of inconvenience and delay. The process as explained above allows the rescue and preservation of information relating to our past heritage for future generations. It balances the requirements of developers and the conservation and protection of our cultural heritage as required of SAHRA and the provincial heritage resources authorities.

Applicability: A Phase One Heritage study has been conducted and it is recommended that prior to construction of infrastructure and the open cast pits that a Paleontological Study be done and a phase 2 Heritage Study for grave relocation permits when applicable.

1.5.1.11 National Water Act, 1998 (Act No.36 of 1998)

The National Water Act, 1998 (Act 36 of 1998) (NWA) aims to provide management of the national water resources to achieve sustainable use of water for the benefit of all water users. This requires that the quality of water resources is protected as well as integrated management of water resources with the delegation of powers to institutions at the regional or catchment level.

The purpose of the NWA is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways, which take into account:

- Meeting the basic human needs of present and future generations;
- Promoting equitable access to water;
- Redressing the results of past racial discrimination;
- Promoting the efficient, sustainable and beneficial use of water in the public interest;
- Facilitating social and economic development;

- Providing for growing demand for water use;
- Protecting aquatic and associated ecosystems and their biological diversity;
- Reducing and preventing pollution and degradation of water resources;
- Meeting international obligations and
- Managing floods and droughts.

Some of the activities of the proposed Berenice Colliery fall within the ambit of water uses defined in section 21 of the National Water Act, 1998 (Act No. 36 of 1998) (NWA), and would be permissible if authorised under the NWA. The water uses are summarized in the tabulation below.

Table 4: Summary of Key Water Uses

Section 21 Water Use	Activity Description
21(a) taking water from a water resource	Groundwater abstraction boreholes
	Use of water removed from the mine workings
21 (b) Storing Water	Raw water reservoir
	Potable water storage tank
21(g) disposing of waste in a manner which may detrimentally impact on a water resource	Package sewage treatment plant
	Pollution control dam 1
	Pollution control dam 2
	Coal discard and slurry disposal facility
	Soft overburden stockpile
	Hard overburden stockpile
	Product (coal) stockpile
	Backfilling of mined out pit areas with overburden (soft and hard)
	Dust suppression with water containing waste
21 (c) and (i) altering the bed, banks, course or characteristics of a watercourse	Mining of a depression pan 2
	Mining of a depression pan 3
	Infrastructure/mining within 500 m from depression pan 4
21(j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people	Dewatering of mine open pit workings

Applicability: Due to the nature of the activities a water use license will be required and the IWULA process is underway, a pre-application meeting and a site visit has been conducted by Headwaters and the DWS.

1.5.1.12 Other Applicable National legislations

- Hazardous Substances Act, 1973 (Act No. 15 of 1973);
- Roads Ordinance Amendment Act, 1998 (Act No. 17 of 1998);
- South African National Roads Agency Limited and National Roads Act, 1998 (Act No. 7 of 1998).

1.5.1.12.1.1 Provincial Legislative Framework

Table 5: Provincial legislation, policies and guidelines considered

TITLE OF LEGISLATION, POLICY OR GUIDELINE	APPLICABILITY TO THIS PROJECT	ADMINISTERING AUTHORITY	DATE
DEA&DP and DEA Guidelines on Public Participation	Used as a guide to inform of the public participation process.	Department of Environmental Affairs and Development Planning Department of Environmental Affairs	2012 2014
DEA&DP and DEA Guidelines on Alternatives	Used as a guide to inform on the use and presentation of alternatives in the EIA process.	Department of Environmental Affairs and Development Planning Department of Environmental Affairs	2012
DEA&DP and DEA Guidelines on Need and Desirability	Used as a guide to inform on the need and desirability of the upgrade in conjunction with the above mentioned SDF's and IDP's.	Department of Environmental Affairs and Development Planning Department of Environmental Affairs	
The Vegetation of South Africa, Lesotho and Swaziland. Mucina & Rutherford (2006). SANBI, Pretoria	Utilised as a reference guide for the identification specific environmental information	Cape Nature	2006

1.5.1.12.2 Applicable Legislation and Approvals Required

The proposed Berenice Coal mining project requires the following main approvals before the project may commence:

- Mining Right and Environmental authorization from the Department of Mineral Resources in terms of the MPRDA (Act 28 of 2002) and National Environmental Management Act (Act 107 of 1998) and associated Environmental Impact Assessment Regulations, 2014.

- Approval of an Environmental Management Programme, in terms of the MPRDA DMR.

In addition to the main legal approvals, the following approvals will be required:

- The South African Heritage Resources Agency needs to approve a heritage assessment, to be conducted as part of the overall EIA process, in terms of the **National Heritage Resources Act** (No 25 of 1999). Permits will be required for the destruction or removal of any heritage resources affected by the development.

- Prior to construction, a tree removal permit will have to be obtained prior to removal, relocation or destruction of indigenous and protected species. This is in terms of the **National Environmental Management: Biodiversity Act** (No 10 of 2004).

1.6 Need and desirability of the proposed activities.

(Motivate the need and desirability of the proposed development including the need and desirability of the activity in the context of the preferred location).

Mining industry is of great importance to the South African economy. South Africa has one of the world's largest coal reserves. Eskom currently relies on coal fired power stations to produce approximately 95% of the electricity generated in South Africa and until such time as alternative energy generation options can be implemented on a sufficiently large scale, Eskom is totally dependent on coal mining. The market for coal products is increasingly defined by generally accepted local and international standard quality products for which physical and financial markets exist for trading these standard coal products. In the South African market, the most common coal product quality standard is known as 'API4', which refers to a particular South African produced, thermal coal product with its point of delivery free on board ocean vessel (FOB) Richards Bay Coal Terminal (RBCT).

The Berenice secondary product is defined by the combination of its high Ash (30 % air-dried (ad)) and medium Volatile Matter content (28 % ad).

This quality of coal finds application in the following industry sectors:

- South African power generation (Eskom and other local coal independent power producers (IPPs))
- Indian coal-fired power generation
- Cement production
- Production of liquid synthetic fuels – synfuel (e.g. Sasol)
- Sponge Iron (predominantly in India)

With the exception of Sponge Iron, where coal is used as a metallurgical product, all the other applications are thermal in nature. The coal is sought after and priced primarily for its energy content, which is quantitatively described by the Gross CV parameter.

Notwithstanding the potential application as a metallurgical coal in Sponge Iron production, the Berenice secondary coal product is best described as a thermal coal where it is more likely to find application. This is due to the location of the Berenice resource in South Africa (majority of the world's Sponge Iron production is located in India) and the significantly smaller volumes of coal that is consumed by the Sponge Iron industry compared to power generation, cement, and synfuels.

Mitigation measures are aimed at lessening negative consequences of the proposed mining operation. The mitigation measures include designs and management practises that will be embarked on, to prevent the identified impacts on the social, cultural and environmental aspects. For each significance identified, mitigation measures were specified. These mitigation measures are described in more detail in the environmental management programme.

Opportunities that exist within mining are as follows:

- Constant demand on the market for commodities;
- Establishment of a permanent working group between the Municipality and the mine managers responsible from developing local economic development initiatives;
- Encourage local SMME's and entrepreneurs to take advantage of procurement;
- Develop a database of available labour and skills to encourage the employment of local people;
- Provide skills training and support programmes;
- Instigate mining procurement opportunities in consultation with the mines, develop a database of such opportunities and ensure that this information is made available to local businesses and communities.

For these to be achievable, investment and skills development, technology and infrastructure, as well as broadening of the supplier base, will need to be addressed. Due to the increased mechanisation of mining activities, there has been an overall jobless growth within this sector. Rand volatility of late has not made things easier. The lack of diversification within the industry has led to a mainly commodity export driven industry.

1.7 Motivation for the preferred development footprint within the approved site including a full description of the process followed to reach the proposed development footprint within the approved site.

NB!! – This section is about the determination of the specific site layout and the location of infrastructure and activities on site, having taken into consideration the issues raised by interested and affected parties, and the consideration of alternatives to the initially proposed site layout.

The alternative land use for the project area is grazing and conservation/ tourism which is economically sustainable. However, in the development of the impact assessment and environmental management programme, the following alternatives have been considered:

1.7.1 Details of the development footprint alternatives considered.

With reference to the site plan provided as Annexure 5_Appendix 1 and the location of the individual activities on site, provide details of the alternatives considered with respect to:

1. the property on which or location where it is proposed to undertake the activity;
2. the type of activity to be undertaken;
3. the design or layout of the activity;
4. the technology to be used in the activity;
5. the operational aspects of the activity; and
6. The option of not implementing the activity.

Table 6: Alternatives Considered

TYPE OF ALTERNATIVE: property on which or location where it is proposed to undertake the activity
Develop on an alternative property No alternatives have been investigated in terms of location due to the coal ore which underlies the study area and should the proposed mine be relocated to another location the applicant will not be able to utilise the resource.
TYPE OF ALTERNATIVE: type of activity to be undertaken
Mining Method- Open Cast vs Underground In most mining projects, the alternative mining options are underground or open cast methods. Due to the shallow depth and thickness of the coal seams, the strip ratios for surface mining are regarded as favourable. The Berenice Project will therefore be an opencast mine operated by a suitably qualified opencast mining contractor. With opencast mining, the main advantage over underground mining is the much higher resource extraction thus underground mining is not considered a viable or appropriate mining option and will not be investigated further. **Water management infrastructure (PCDs)**

The proposed PCD will be sized to accommodate all dirty storm water and mine water throughout the life of mine and post closure. No other alternatives can be considered for the PCD construction as it is essential in mine water management.

Water treatment plant

Alternatives considered for the water treatment is the stage at which it is constructed. It would be advantageous to have the water treatment plant commissioned in the early stages of production to enable Universal Coal Development II to treat and store water for domestic use.

TYPE OF ALTERNATIVE: Design or layout of the activity

Layout

i. Open Cast areas

The positions of the proposed pits OC1- OC4 have been selected based on the occurrence of reserves on the farms Longford, Doorvaardt, Celine and Berenice.

The alternative implemented for the pit locations is exclusion of areas which fall within floodlines and riparian area. The advantage of the exclusion is in the reduction of impacts on the Brak River and the riparian area.

ii. Infrastructure

Due to the high conservation value of the hill southwest of Longford- Storm water management Infrastructure will be developed around the hill to preserve the vegetation. The purpose of the clean water drain (No. 3 on plan) is to divert the upslope (clean) runoff (from the hill) away from the dirty area, and then allow release to the Brak River. Due to the vegetation sensitivity of the hill an alternative has been proposed for an earth cut-off berm to be considered for the same purpose which will be advantageous for conservation efforts.

iii. Workshops and offices alternative

The proposed workshops have been moved from Gezelschap to Matsuri as the former has a larger view shed radius as an alternative to reduce visual impacts. It is recommended that should UCDII acquire the land from the landowners, use of current infrastructure on site should be used as an alternative for offices. This will have the advantage of reducing the footprint of the area that needs vegetation clearance.

iv. Discard Dump and Pollution control Dams

As a measure to minimise negative impacts on the Brak River the discard dump and pollution control dams have been located away from the river (at least 500m), as well as any water features on site.

v. Roads and Rail

There is a large network of already existing gravel roads on and off the site. The layout alternative is to use current roads on the site currently being used for game hunting.
Two proposed rail lines to the Waterpoort Station have been proposed, but these alternatives will need to be further investigated and specialist studies will need to be conducted to assess the linear developments. Currently the alternative chosen is to deliver the coal via road to Waterpoort Station.

TYPE OF ALTERNATIVE: The technology to be used in the activity

Mineral Processing Methods

The consideration of alternatives for mineral processing is restricted to proven technologies that have similar environmental consequences. As such the criteria for selecting alternatives are mainly operational and economic.

Options considered

Beneficiation of ores may be defined as the method of upgrading and enriching the useful mineral content of the ores, by removing undesirable and deleterious components. The processes adopted depend on the physical and chemical characteristics of the ore minerals, to take advantage of properties like specific carbon content, gravity, magnetism, surface characteristics etc.

Options for producing standard grade ores:

- Crushing and screening of ROM
- Selective mining of ores
- Washing or ores

The coal will be beneficiated through a double-stage dense medium washing plant. The advantage of the beneficiation process is that it reduces impurities from the final product increasing its value.

TYPE OF ALTERNATIVE: Operational Aspect

Transport, Power and Water Supply Routes

1. *Transport routes*

The options for project related transportation include road transport and railway transport. The following transport routes are located in the project area:
Roads:
A good internal network of roads, from the mine to the plant, will be built. The external road network allows easy excess onto the property.
Railways:
The Transnet railway siding at Waterpoort will be used to dispatch ore via the national railway system.

A proposed rail line connection is proposed to join with the Waterpoort station. The feasibility of this option should be investigated further. The preferred alternative is to use haul trucks and establish a siding in Waterpoort to limit the 30km rail road extensions impacts

2. *Ore and waste haulage:*

- Conveyor belts
- Haul trucks

As a result of their application flexibility, truck and shovel systems are always popular and widely applied in mining. This is a standard in the coal mining industry and it's been proven to be advantageous.

3. *Power supply and routes*

- Electricity for the mine will be supplied mainly by Eskom through the national grid system and the mine's own transformer system. Make up electricity by diesel power.

4. *Water supply and routes*

The following sources of water supply are available

- Production water will be sourced from boreholes. The feasibility of the water sources and availability will be finalized as part of the WULA process that is currently underway.
- Drinking water will be obtained from the Makhado Municipality
- Open cast mine water used for dust suppression

5. *Mineral waste*

Mine residue stockpiles are required to accommodate mining overburden, partings and plant discards on the mine surface. Design philosophy is based on the requirement to minimise the volume and surface area required for stockpiling by starting in-pit backfilling as soon as possible during the mining operation as double handling of the material is costly. It is envisaged that the dumping of material on the surface will be required for a period of three years after which the material mined from the pit and discards from the plant will be returned to the pit minimising the fill material during the rehabilitation process. Mine residue stockpiles are categorised as topsoil stockpiles, non-carbonaceous stockpiles and carbonaceous stockpiles.

6. General waste and sewage effluent

The alternatives considered for sewage effluent is a sewage treatment facility
Sewage effluent will be managed as follow:

➢ As part of the waste and water use license application a sewage treatment plant will be designed and constructed in line with relevant legislation. ➢ As a minimum, treatment will adhere to the General Standards and chemical dosing will be applied for final effluent disinfection (chlorine contact basin). ➢ There will be no sewage or contaminated effluent disposal allowed on site.
TYPE OF ALTERNATIVE: No-Go, t*he option of not undertaking and implementing the activity at all.*
The advantage of not implementing the activity means the project area will retain its status quo, and the advantages of the project in terms of employment creation and investment will be lost. Not implementing the mining activity will not reach a beneficiation phase where the local, regional and national socio-economic environment will not be able to benefit from the coal mining activities, which pose a significant advantage through job creations and power supply.

1.8 Details of the Public Participation Process Followed

Describe the process undertaken to consult interested and affected parties including public meetings and one on one consultation. NB the affected parties must be specifically consulted regardless of whether or not they attended public meetings. (Information to be provided to affected parties must include sufficient detail of the intended operation to enable them to assess what impact the activities will have on them or on the use of their land.

This section of the report provides an overview of the tasks undertaken for the Public Participation Process (PPP) to date. The PPP was conducted in terms of Chapter 6 of the NEMA and included the following:

1. Identification of key Interested and Affected Parties (affected and adjacent landowners) and other stakeholders (organs of state and other parties)
2. Placement of site notices on farms, municipal area and other accessible public areas
3. Formal notification of the application to key Interested and Affected Parties (all adjacent landowners) and other stakeholders;
4. Consultation and correspondence with I&AP's and Stakeholders and the addressing of their comments;
5. Public meetings at a central accessible location identified by interested and affected parties;
6. Newspaper adverts; and

Identification of key Interested and Affected Parties

Public Participation is the involvement of all parties who are either potentially interested and/or affected by the proposed development. The principal objective of public participation is to inform and enrich decision-making. This is also its key role in this Environmental Impact Assessment (EIA) process.

Land owners (affected and adjacent) were identified through a search conducted via online search engines accessing the Title Deed office database. In addition to land owners, other relevant organisations where identified and notified of the application. This includes municipal and State departments with jurisdiction in the project area and Non-Governmental Organisations (NGOs) with an interest. Interested and Affected parties (I&AP's) representing the following sectors of society were identified:

- National, provincial and local government;
- Agriculture, including local landowners;
- Community Based Organisations (Vhembe forum, Waterpoort farmers association);

- Non-Governmental Organisations (EWT);
- Department of Water and sanitation
- LEDET;
- Industry and mining;
- Commerce; and
- Other stakeholders.

1.8.1 Scoping Phase public participation

1.8.1.1 Formal notification of the application to key Interested and Affected Parties (adjacent landowners) and other stakeholders

The project was announced as follows:

1. Newspaper advertisement

The project announcement advertisement was published on 23 September 2016. The advertisement was also used to inform the stakeholders of the availability of the Scoping Report. The adverts also invited I&APs to submit their comments to Jomela. It was noted that the adverts came out after the scoping report had been released for review. To remedy this the commenting and registering phase was extending and additional adverts where placed to notify I&AP's. Comments received where added to the comments and register report and an updated I&AP database was submitted to the department on the 24th of October. Any additional comments received have been recorded in the summary of I&AP comments.

Adverts were placed as follows:
- 23rd of September 2016 _Limpopo Mirror
- 23rd of September 2016 _Zoutpansberger

Additional Adverts were placed as follows:
- 28th of October 2016 _Limpopo Mirror
- 28th of October 2016 _Zoutpansberger

2. Site notice placement

In order to inform surrounding communities and adjacent landowners of the proposed development, site notices were erected on site and at visible locations close to the site. Additional notices were placed at the Makhado Local municipalities and Makhado library. *Refer to Annexure 4 Consultation report.*

3. Written notification

I&AP's and other key stakeholders were notified of the status of the project on the 13th of September 2016 and the scoping report was sent to all registered I&AP's for a 30-day commenting period from the 13th of September to the 13th of October 2016. The scoping period was kept open until the 15th of November when the scoping was accepted as comments would be addressed in the EIA and an additional advert was published encouraging interested and affected parties to register and send their comments which would be addressed in the EIA phase.

4. Public Meeting

A scoping phase public Meeting was held on the 8th of October 2016 at Waterpoort Farmers Association Hall. Verbatim minutes of the meeting were compiled into an Issues and responses report, capturing the issues raised and the responses provided by the EIA team and the applicant.

1.8.1.2 Release of the Scoping Report to I&AP's and stakeholders for review and comment.

The draft scoping report was made available to I&AP's, including the relevant organ of state and authorities in hard copy and electronic format for a 30-day commenting period from the 13th of September to the 13th of October 2016. The scoping report commenting period was extended for another 30 days, until 13 November 2016. The comments received and responses provided during this phase have been included in the updated IRR and a summary of the issues and responses has been included in the Public Participation section of this report.

1.8.1.3 Consultation and correspondence with I&AP's and Stakeholders and the addressing of their comments (continuous).

The EIA team has been in correspondence with the registered I&APs throughout the process during the public meetings, correspondence via letters, e mails and telephonic calls. Environmental issues raised during the scoping phase included but not limited to:

- Ecological Sensitivity of the area and the loss of flora and fauna due to the mining activities
- Noise and visual related aspects due to the operations.
- Groundwater related aspects.

- Air quality related aspects.
- Surface water related aspects.
- Economy related aspects.
- Waste management related aspects.
- Community aspects.
- Request for a regional water study, focusing on the potential dewatering in the area due to increased mining activity

1.8.2 EIA phase public Participation

1.8.2.1 Newspaper Advert

Publication of media advertisement was placed notifying the public of the availability of the Draft EIAR and Integrated Water and Waste Management Plan. The adverts also encouraged I&AP's to submit their comments to Jomela and Headwaters within 30 days of the release of the reports.

Adverts were placed as follows:

- 24th of March 2017 _Limpopo Mirror
- 24th of March 2017 _Zoutpansberger

The advert also notified interested and affected parties of the Public Meeting scheduled for the 22nd of April 2016 at the Waterpoort Farmers Hall. This meeting is open to all I&Aps.

1.8.2.2 Email Notifications

I&AP's and other key stakeholders were notified on the 17th of March 2017 of the availability of the Draft EIA/EMP report, including the specialist studies reports. The report was made available to registered I&AP's for a 30-day commenting period from the 31st of March to the 5th of May 2017. The hard copies of the reports were made available at the Makhado Library at the Makhado Municipality and the electronic copies were made available on the Jomela website (www.jomela.co.za). I&Aps with access to dropbox were informed that they could request electronic copies to be sent via dropbox, or on a CD.

1.8.2.3 Site Notices

Site notices notifying I&APs of the availability of the Draft EIA/EMP report, including the specialist studies reports were erected around the project area on the 31st of March 2017.

1.8.2.4 Public Meeting

The EIA phase public meeting was held on the 22^{nd} of April 2017 and verbatim minutes of the meeting were included in the Final EIAR. The issues raised and responses provided during the commenting phase are included in the final IRR that will be submitted to the DMR as part of the Final EIAR.

1.8.3 Summary of issues raised by I&AP's

Comments and issues raised during the public participation have been attached under Annexure 2: Consultation report –Appendix 11_Comments and responses. Scoping and EIA Proof of consultation is also under this annexure.

1.8.4 EA advertisement and appeal

Following receipt of the EA issued by the DMRE on the 06 March 2020, the public and other stakeholder were accordingly informed of the decision. Subsequent to the engagements, appeals were submitted to the DFFE and were eventually dismissed. As part of the appeal phase the DFFE recommended that further studies, i.e. the Climate Change Impact Assessment be undertaken and the EIR updated to include impacts of climate change. Further the amended report would need to be released for public review and comment.

This updated report and the attached CCIA are therefore prepared and submitted for review in line with the recommendation from the DFFE. The public participation will, therefore, be as follows.

1.8.4.1 Newspaper Advert

Publication of media advertisement notifying the public of the availability of the amended EIAR and CCIA report will be as follows:

- 30^{th} of June 2022 _Limpopo Mirror
- 30^{th} of June 2022_Zoutpansberger

The adverts will inform the public of the availability of the reports for review and comment within 30 days from date of advertisement and encouraged I&AP's to submit their comments to Nsovo Environmental Consulting within the timeframe provided. The advert will also provide all I&APs an opportunity to request focus group meetings within the timeframe provided.

The hard copies of the reports will be available at the Makhado Library at the Makhado Municipality and the electronic copies will be made available on the Nsovo's website (www.nsovo.co.za).

1.8.4.2 Email Notifications

Registered I&AP's and other key stakeholders will be notified of the availability of the amended EIA/EMP report and CCIA for review and comment for a 30-day period starting on the 01st July 2022. Reports will be made available via a link shared on their respective emails alternatively downloaded on the Nsovo website (www.nsovo.co.za). Hard copies will only be provided at the Makhado Library at the Makhado Municipality.

1.8.4.3 Site Notices

Site notices notifying I&APs of the availability of the Draft amended EIA/EMP report, including the specialist report (CCIAR) will be erected around the project area on the 30 of June 2022.

1.8.4.4 Public Meeting

The I&APs are encouraged to request one face to face or online focus group meetings should the need arise.

1.8.5 Summary of issues raised by I&AP's

Comments and issues raised during the public participation will be attached in the final submission to the DMRE and the DFFE.

1.9 Baseline Environment

The Environmental attributes associated with the development footprint alternatives.

(The environmental attributed described must include socio-economic, social, heritage, cultural, geographical, physical and biological aspects)

1.9.1 Regional Setting

Limpopo Province is South Africa’s northernmost province which shares borders with Mozambique, Zimbabwe and Botswana, making it the ideal entrance to Africa. Named after the great Limpopo River that flows along its northern border, this province is rich in wildlife, spectacular scenery and a wealth of historical and cultural treasures.

The province contains much of the Waterberg Biosphere, a designated Biosphere Reserve. The Waterberg Biosphere, a massif of approximately 15,000 km² shaped by hundreds of millions of years of riverine erosion to yield diverse bluff and butte landforms. The Waterberg ecosystem can be characterised as a dry deciduous forest or Bushveld. Within the Waterberg, archaeological finds date to the Stone Age. Nearby are early evolutionary finds related to the origin of humans.

1.9.1.1 Industry

Limpopo's rich mineral deposits include platinum group metals, iron ore, chromium high- and middle-grade coking coal, diamonds, antimony, phosphate and copper, as well as mineral reserves such as gold, emeralds, scheelite, magnetite, vermiculite, silicon and mica. Base commodities such as black granite, corundum and feldspar are also found. Mining contributes to more than a fifth of the provincial economy.

The province is a typical developing area, exporting primary products and importing manufactured goods and services. It has a high potential for development, with resources such as tourism, rain-fed agriculture, minerals and abundant labour offering excellent investment opportunities.

1.9.1.2 Agriculture

The bushveld is cattle country, where extensive ranching operations are often supplemented by controlled hunting. About 80% of South Africa's hunting industry is found in Limpopo. Sunflowers, cotton, maize and peanuts are cultivated in the Bela-Bela and Modimolle areas. Modimolle is also known for its table-grape crops. Tropical fruit, such as bananas, litchis, pineapples, mangoes and pawpaws, as well as a variety of nuts, are grown in the Tzaneen and Makhado areas. Tzaneen is also at the centre of extensive tea and coffee plantations.

Limpopo, known as the "garden of South Africa" produces about the majority of South Africa's mangoes, papayas, avocados and tomatoes. As well as thousands of tons of potatoes, the province also produces tea, citrus, bananas, and litchis in abundance. Extensive forestry plantations are also found in the region, including hardwood for furniture manufacture.

In addition to commercial agriculture, subsistence farming is the mainstay of a large section of the rural population.

Figure 7: Location of the Limpopo Province of South Africa.

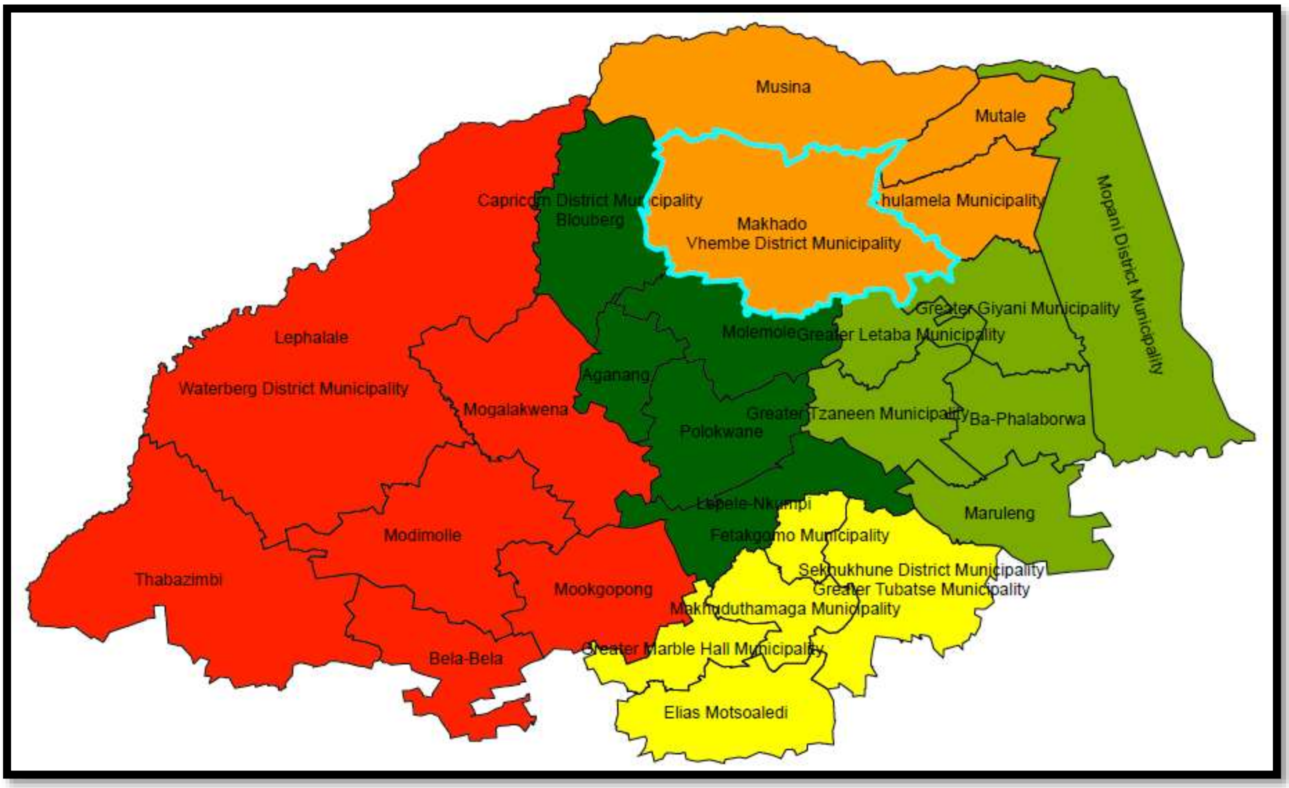


Figure 8: Location of Makhado Municipality in the Limpopo Province

Makhado Local Municipality is one of four local municipalities in the Vhembe District. It borders with Musina in the north, Thulamela in the east, Molemole in the west (Capricorn District) and Giyani in the south (Mopani District). The Municipality of Makhado is located in the northern parts of Limpopo Province. Its territory covers an area of 8567.38 km².

It is connected to major cities in Gauteng Province via the N1, which is an important asset for the further development of the area and to connect it with outside markets. The Trans-Limpopo Corridor proceeds through the Municipality and follows the N1 from Polokwane in the south through Makhado into Musina and Zimbabwe in the north.

The proximity to the N1 highway and districts roads such as R521, R523 and R522 which connects the municipality to African and national markets, productive fresh produce farms, good climatic conditions, availability of a rail network, gives the area a competitive advantage.

Type of environment affected by the proposed activity.
(Its current geographical, physical, biological, socio- economic, and cultural character).

Baseline Environmental attributes associated with the sites

Key aspects of the baseline environment that are likely to impact on the scope of the impact assessment and management measures that are implemented as well as project decisions regarding alternatives are listed below.

1.9.2 Climate

Limpopo Province is situated in a dry savannah sub region, characterized by open grasslands with scattered trees and bushes. Visible manifestations of underlying geology, contributing to slope and the formation of landscapes, comprising the visible features of an area of land, including the physical elements of landforms such as mountains, ridges, hills, plains and water bodies. The southern limit of the MRA area is underlain by the hard and resistant quartzites and conglomerates of the Soutpansberg Group and this give rise to prominent east-west striking mountains and valleys. The Soutpansberg mountain range is a major regional topographic feature and it extends in an east-west direction for a distance of approximately 130 km. The regional climate is strongly influenced by the east-west orientated mountain range which represents an effective barrier between the south-easterly maritime climate influences from the Indian Ocean and the continental climate influences (predominantly the Inter-Tropical Convergence Zone and the Congo Air Mass) coming from the north.

The climate for the municipal area ranges between 18 degrees Celsius in the mountainous areas to 28 degrees Celsius in the rest of the area, with an average of 25, 5 degrees Celsius. Maximum temperatures occur during the month of January while the minimum temperatures occur in July.

Across the globe, environmental stresses and major changes in climate conditions are influencing the lives and livelihoods of ordinary people and communities everywhere. The average monthly temperature and relative humidity for the Berenice Coal Project area for the period are presented n figures below. The project is located in a semi-arid zone characterised with high temperatures and low rainfall.

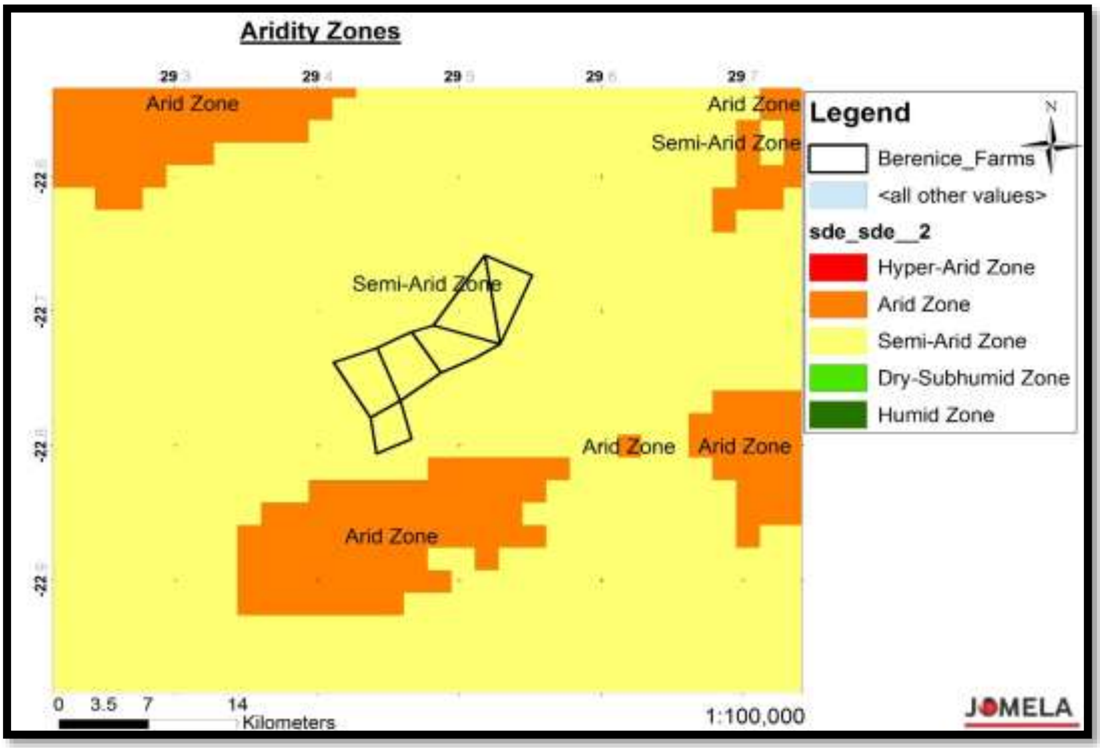


Figure 9: Aridity Zones

Summer temperatures of the project area range from 29.3 ºC to over 31 ºC with minimum winter temperature >17 ºC.

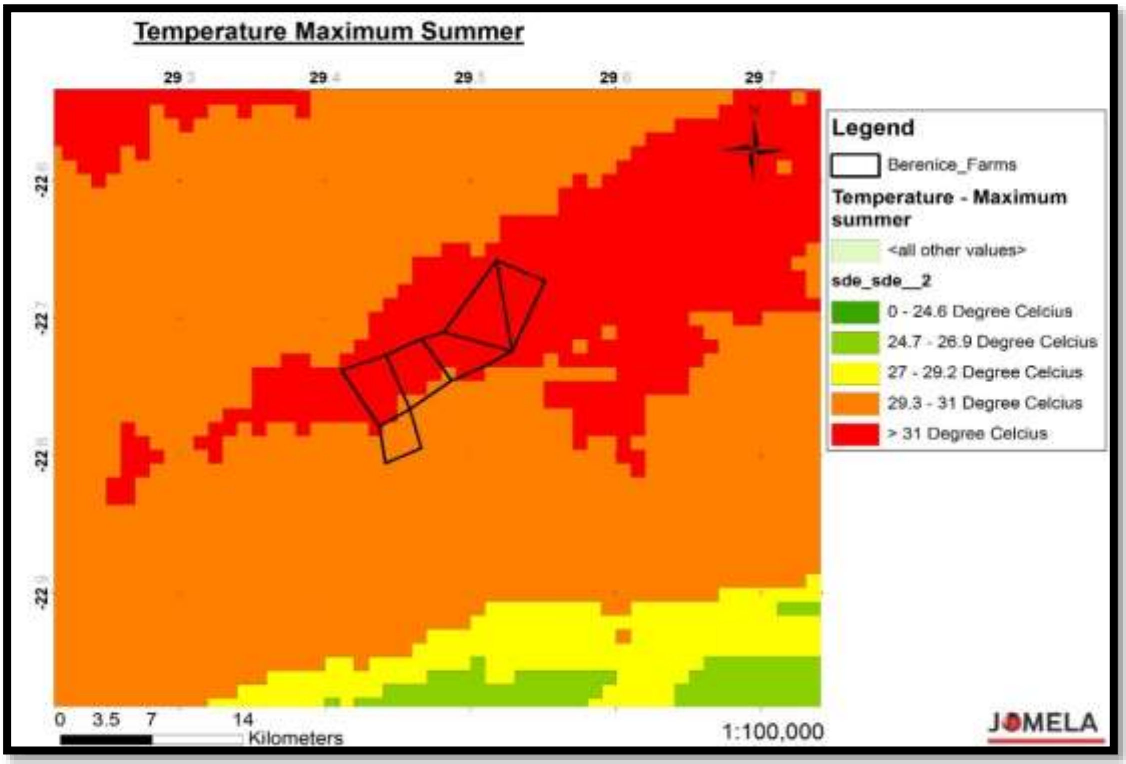


Figure 10: Temperature: Maximum Summer

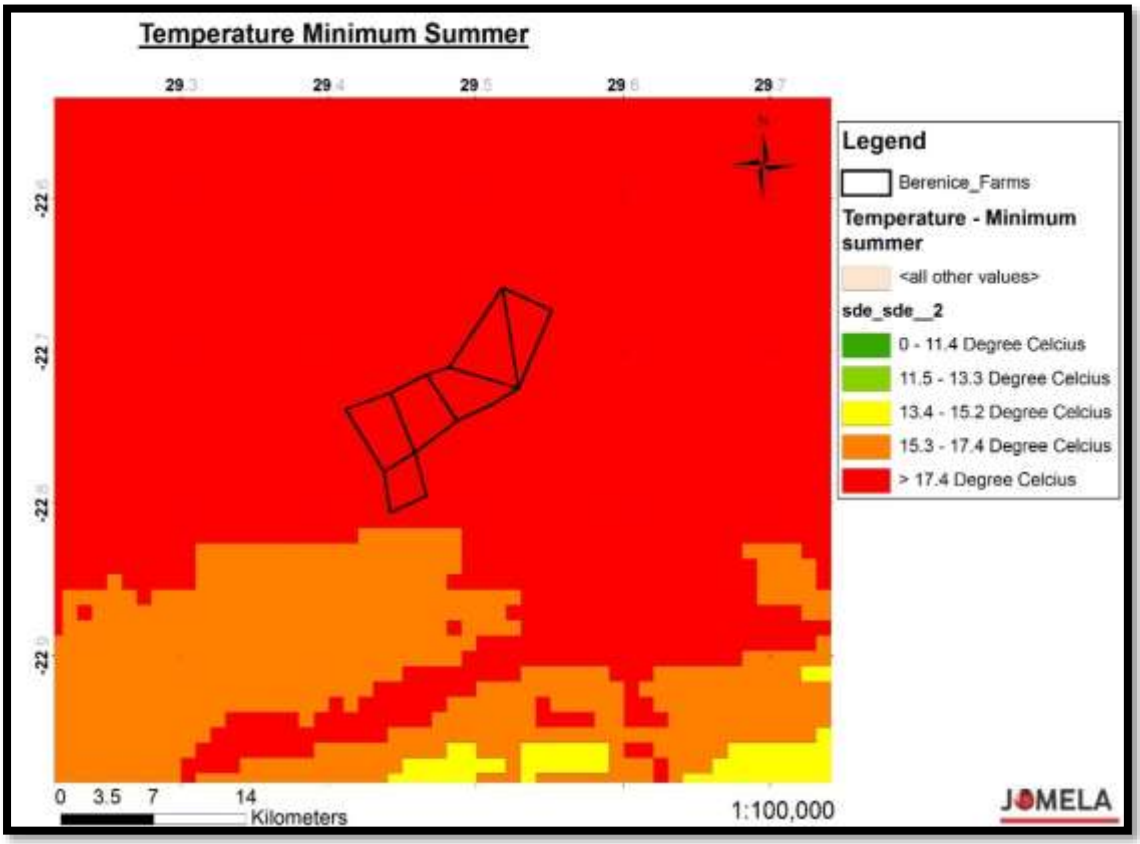


Figure 11: Temperature: Minimum Summer

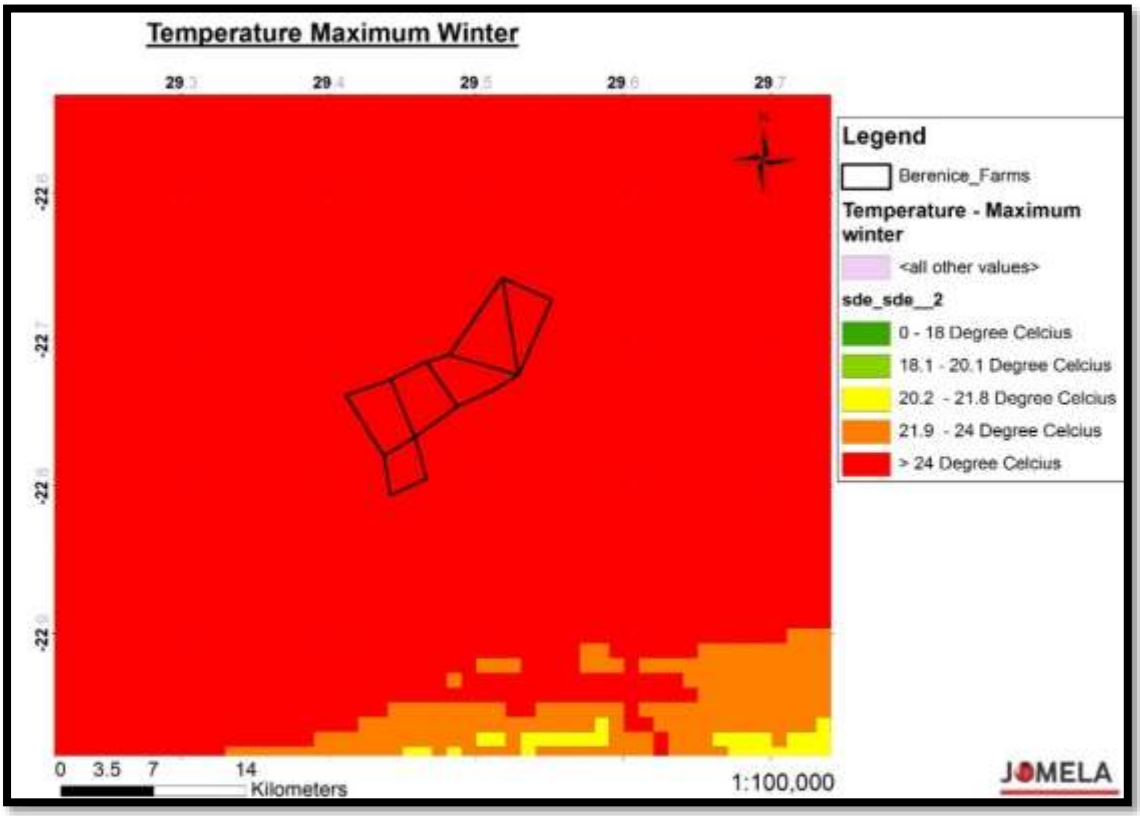


Figure 12: Temperature: Maximum Winter

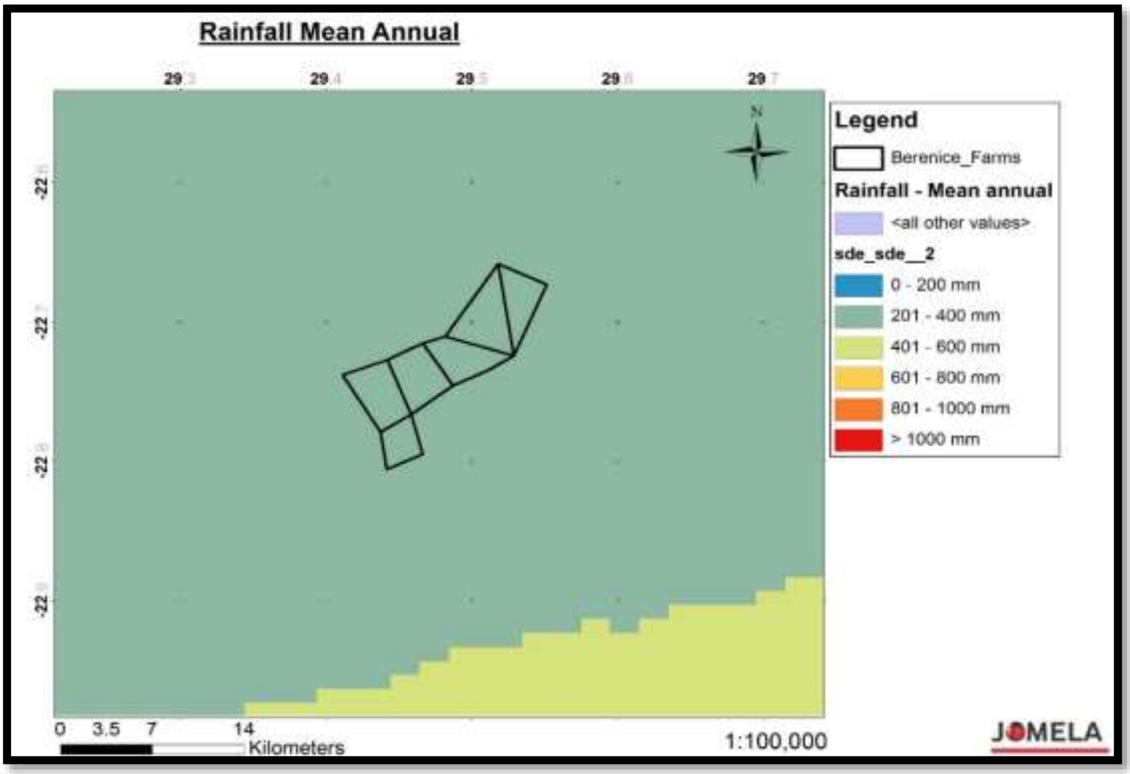


Figure 13: Rainfall: Annual Mean

The main period for rainfall is January to February with an annual rainfall of 450mm in the low-lying plains to 2300mm in the Soutpansberg. The general average rainfall for the Municipal area ranges between 450mm to 800mm. The areas north of the Soutpansberg have less rainfall than the lower western foothills and central and eastern high lying areas of the mountain itself. In conclusion, higher rainfall occurs on the higher lying areas of the Soutpansberg and foothills of the mountain.

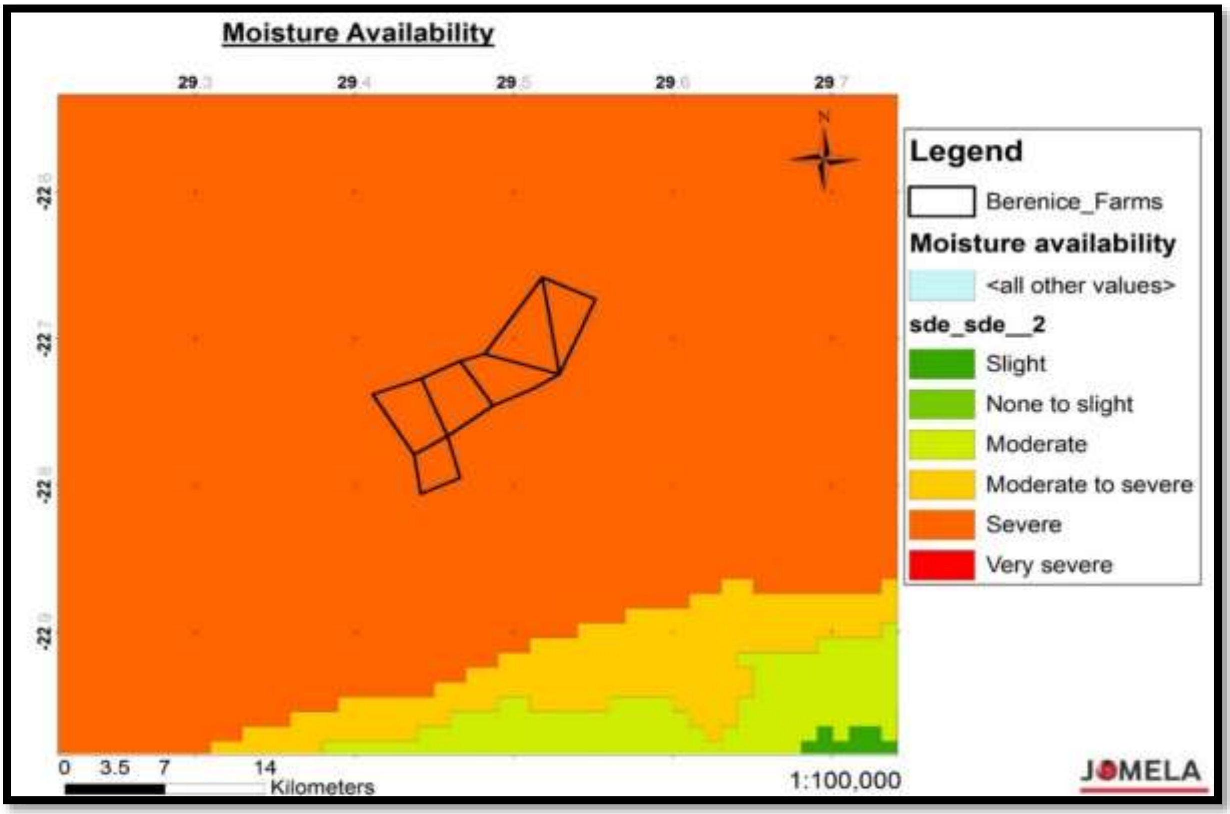


Figure 14: Moisture Availability

Due to high temperatures the project area lies within a high evaporation climate.

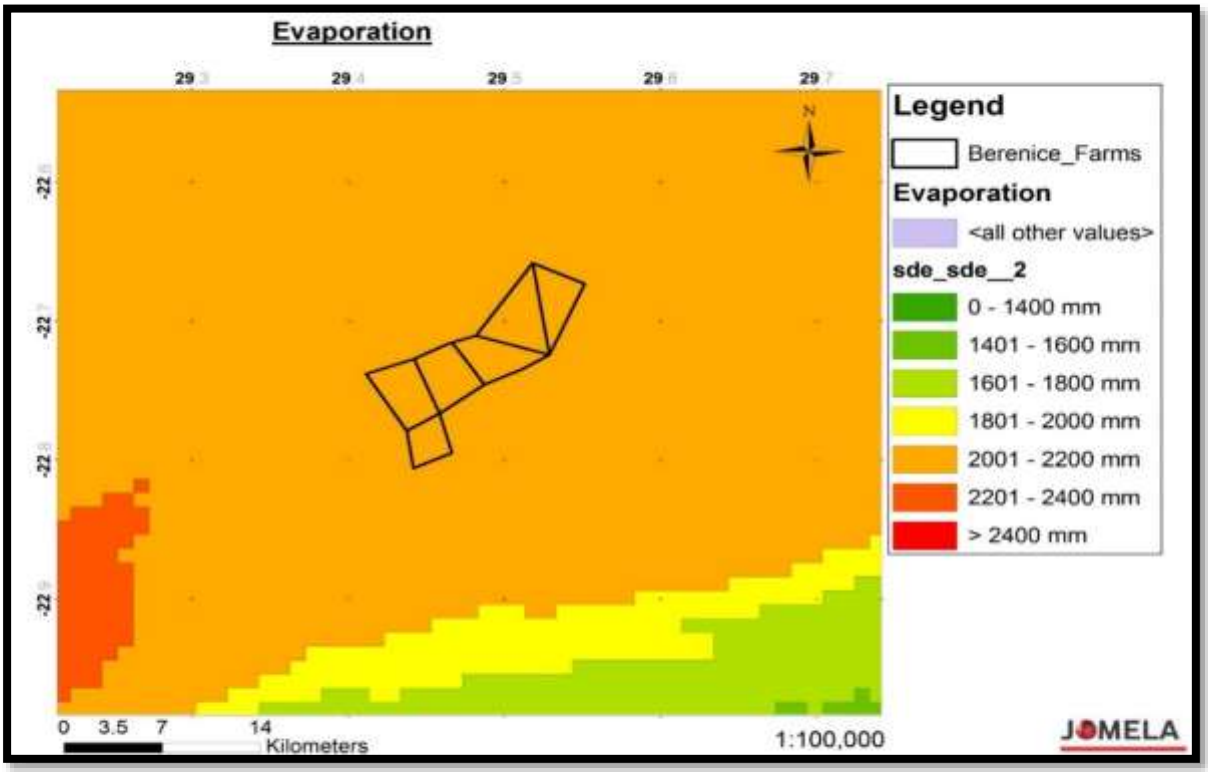


Figure 15: Evaporation

1.9.2.1 Climate Change

GHG emissions from all sources accumulate in the atmosphere and contribute to global climate change. One of the main GHGs is carbon dioxide (CO_2). Like all GHGs, CO_2 contributes to climate change by trapping heat in the atmosphere. The greater the concentration of GHGs, the greater the warming effect.

As a result of the continuous emissions of GHGs, it is highly likely that a warming of global average temperatures will exceed 1.5°C above pre-industrial levels by 2100. Heavy precipitation events will become more intense and frequent. The irreversible melting of the ice sheets will be initiated, resulting in harmful sea level rise. Furthermore, tropical cyclones and wind speeds are likely to increase globally. These climatic changes increase the possibility of irreversible changes in the way the planet, and in turn, human societies and economies will function (Promethium Carbon,2022).

Based on the most recent climate change projections for the Southern African region[1], South Africa is warming at twice the global rate of temperature increase. Temperatures could rise from 3°C, up to more than 7°C (Figure 2). Extreme weather events, such as droughts, storms and floods are likely to become more intense, frequent, and unpredictable. Water stress will increase. The western parts of the country are projected to become hotter and drier, and the eastern parts wetter.[2]

[1] Engelbrecht, F., Le Roux, A., Arnold, K. & Malherbe, J. 2019. Green Book. Detailed projections of future climate change over South Africa. Pretoria: CSIR. Available at: https://pta-gis-2-web1.csir.co.za/portal/apps/GBCascade/index.html?appid=b161b2f892194ed5938374fe2192e537.

[2] Republic of South Africa. 2021. First Nationally Determined Contribution under the Paris Agreement (Updated September 2021). Republic of South Africa, Pretoria.

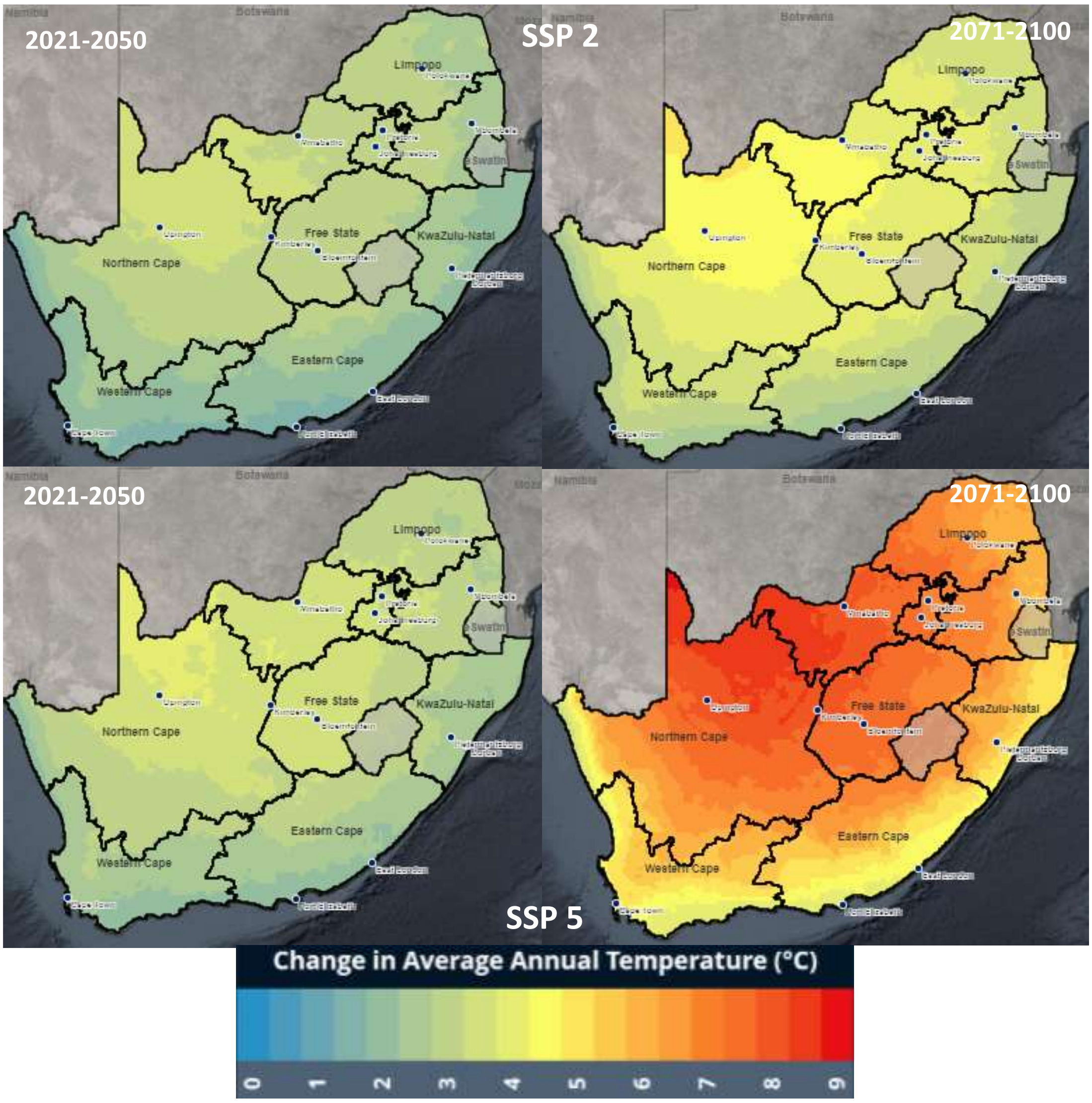


Figure 16: Projected change in average annual temperatures (90th percentile) for the Shared Socio-economic Pathway (SSP) 2 (previously RCP 4.5) and Shared Socio-economic Pathway 5 (previously RCP 8.5)

To collectively prevent changes in the natural system to the extent that they can no longer support socio-economic activities, as we know them, we need to understand how much more GHGs the global community can afford to emit and this can be done using global carbon budgets.

Thus, the guiding principle considered for a carbon budget will be the emission limits set out in South Africa's Nationally Determined Contribution[3] (NDC), updated in 2021. Thus, the cumulative emissions from 2020 to 2050 across the low and high emissions scenarios are 7 758 MtCO2e and 9 585 MtCO2e, respectively. These figures are the low and high emission carbon budgets for South Africa. The low emission carbon budget will be used as a conservative estimate of a carbon budget against which to measure the impact of the proposed Berenice Mine.

[3] Republic of South Africa (2021). *South Africa – First Nationally Determined Contribution Under the Paris Agreement*.

The climate change projections for the Project within Limpopo indicate that annual average ambient temperatures are likely to increase by 1-2˚C in the near future. Furthermore, it is identified that Limpopo will experience decreased rainfall and be exposed to flooding, droughts, fires, and an outbreak of diseases. Such climatic changes would have an impact on the Berenice Coal Mine project in terms of its core operations, value chain and broader socio-economic and natural environment.

The assessment of the climate change impact of this project has been done on the impact of the project on climate change, the resilience of the project to climate change, as well as the options for mitigation of the impacts.

The impact of the project on climate change was assessed in the context of both GHG emissions from the project, as well as the potential positive impact the project will have for the transition to a low-carbon economy.

The project will emit 14 460 ktCO_2e/year during the operational phase and 361 500 ktCO_2e over its lifetime. The global economy will not be able to move to a lower GHG emissions scenario (or 2°C scenario) without a substantial increase in renewable energy infrastructure development, which will require steel and coking coal. The Project will therefore have a positive net climate change impact.

In accordance with the findings of this CCIA, the specialist advises that the proposed Berenice Coal Mine should not be refused environmental authorisation on the basis of climate change related issues.

1.9.3 Geology

1.9.3.1 Regional Geology

This coalfield is characterised by intensive faulting. Dislocations both parallel to strike and at a high angle thereto are common and sub-divide the coalfield into numerous irregular-sized blocks. Displacements vary between 20 m and 200 m. Syn-depositional faulting has to some degree controlled the size of individual coal 'blocks' and has affected coal distribution significantly. The result is the tendency for coal quality and thickness to vary markedly from place to place, due to varying local depositional environments.

The thickest coal zone in this region is to be found some distance to the east of Waterpoort, comprising up to nine composite seams separated by carbonaceous mudstone, over a stratigraphic interval of about 40 m. The coal rank increases progressively eastwards across the coalfield.

The coal zones in this area are developed within the Ecca Group in strata that may be broadly correlated to the Mikambeni and Madzaringwe Formations from the area near Makhado towards the southeast .The Mikambeni and Madzaringwe Formations are the local representatives of the Vryheid and Volksrust Formations of the Main Karoo Basin. These formations consist principally of fine-grained sediments such as siltstone, mudstone, and shale and a number of zones/ seams of coal.

The first major sandstone package in the sequence is that of the Fripp Formation that unconformably overlies the Ecca Mudstones and generally forms a useful stratigraphic marker. The Fripp sandstone tends to be laterally persistent and is typically 30 m thick. This sandstone package is reasonably resistant to erosion and may be found as outcrop. Above the Fripp Formation, the Solitude Formation of the Beaufort Group occurs in the deeper areas and comprises mostly siltstone and red mudstone/ shale.

The Ecca Group strata are underlain by varying thicknesses of the Tshidzi Formation (Dwyka Group) comprising a glacial sequence of tillite, diamictite, etc., representing the encroachment of the Karoo Supergroup over the pre-Karoo basement.

The Karoo Sequence rocks in the Soutpansberg Coalfield overlie the Limpopo Mobile Belt and Soutpansberg-age rocks and dip at 2 ° to 20 ° northwards, terminating against east to west trending strike faults forming the northern margins of the coalfield.

Regionally, the nature of the coal deposits ranges from multi-seam, coal-mudstone associations (coal zones), about 40 m thick in the west, with seven discrete coal zones (Mabelebele Sector and Waterpoort area). There are two separate seams in the east (Parfuri Sector and Tshikondeni area), where an upper seam of~ 3 m thickness and a lower seam of about 2 m thick occur, separated by ~ 100 m of sediments.

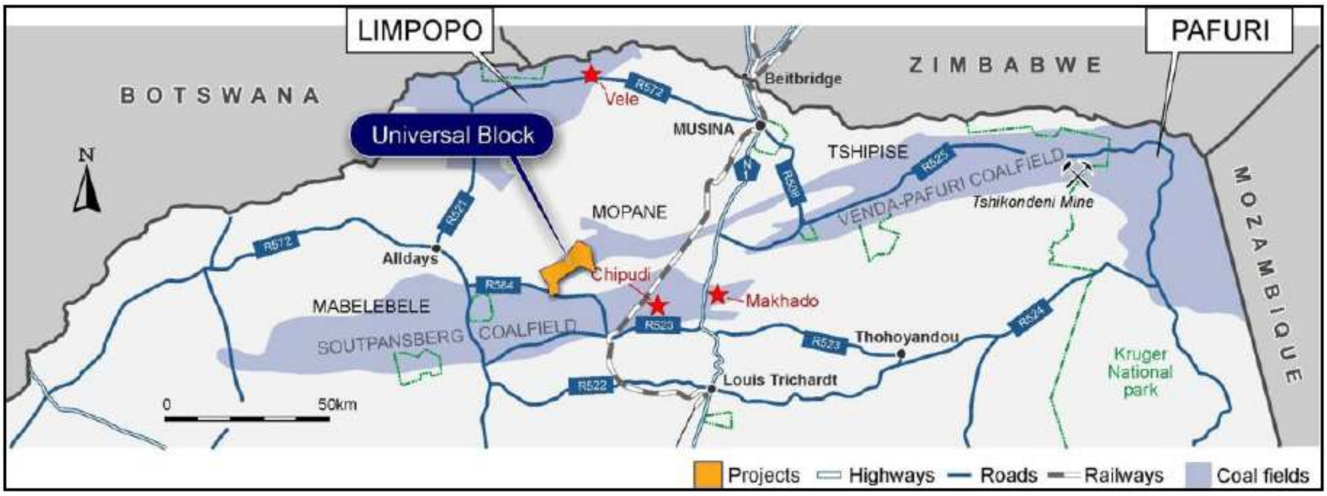


Figure 17: Sectors of the Soutpansberg/ Venda-Parfuri Coalfields

1.9.3.2 Local Geology

The Berenice Project is located northwest of Waterpoort, within the B-Block of the Mopane sector of the Soutpansberg Coalfield. Here the coal-bearing strata are deposited in a half-graben within the basement (Limpopo Mobile Belt) bedrock, fault-bounded toward the northwest and sub-outcropping towards the southeast. The full Karoo Sequence is present in the Berenice area with the coal-rich Ecca Formation underlain by tillite and diamictite of the Tshidzi Formation (Dwyka Group) and overlain by the sandstone package of the Fripp Formations. In the deeper parts of the basin, the Fripp Formation is overlain by siltstones and red mudstone/ shales of the Beaufort Group.

The coal deposits of this locality consist of bright coal/ carbonaceous mudstone associations, forming a series of composite coal 'zones'. Three coal zones can be identified and are named from top to bottom:

- Upper Coal Zone
- Middle (Main) Coal Zone
- Lower Coal Zone

The Upper and Main Coal Zones consist mostly of interlaminated to interbedded mudstone, coal, and shale, while the Lower Zone, where developed, tends to be formed of a number of relatively thin coal beds or seams separated by non-carbonaceous or carbonaceous partings. The Main Coal Zone, where preserved from weathering and erosion, is persistently well-developed and contains a number of sub-zones comprising plies with a significant proportion of bright coal.

The Upper Coal Zone comprises between two and five plies and appears to be more variable in terms of thickness and is seemingly absent in some localities.

The upper portion of this Zone generally contains a slightly greater proportion of coal to the lower section and in some areas 'shaling-out' of plies is indicated.

The Lower Coal Zone appears to be only significantly developed towards the west of the exploration area and is seemingly absent in general in the east.

The coal zones were split into a number of coal plies representing the main coal sub-zone units and intra-zone partings. The 'plies' are designated as follows:

- Upper: S01 (S01A/S01B)
- Main: S02, P03, S04, P05, S06, P07, S08, S09, P10, S11, P11, S12, P13, S14, S15, S16
- Lower: S18

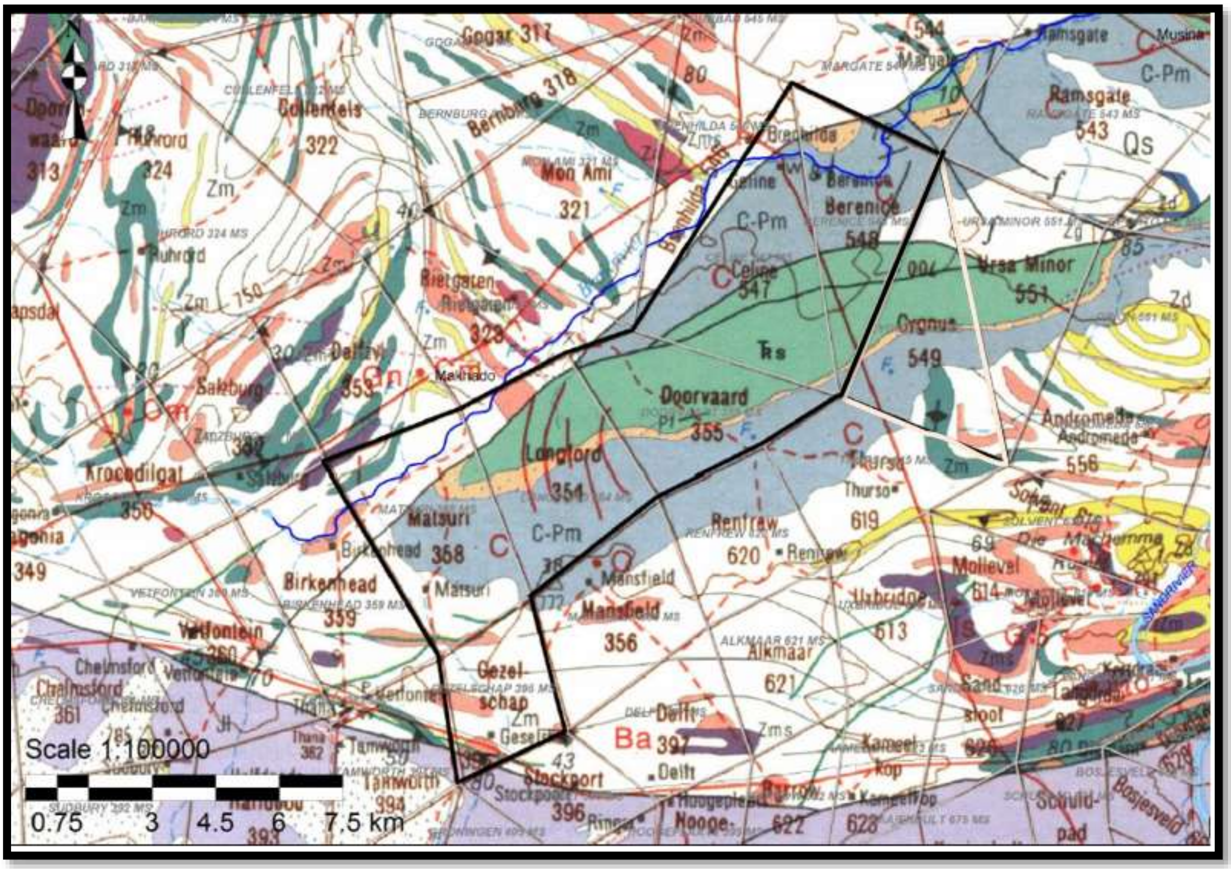


Figure 18: Local geology map

1.9.4 Soils

Most of the area is underlain by rocks of the Archaean Beit Bridge Complex, with gneisses and meta-sediments in a structurally complex area. Substrates vary from deep red sandy soil to lighter-coloured soil imbedded with limestone calcareous rock and gravel, to alluvial soil along the Brak River.

The project area land types include Mispah, Glenrosa, Hutton and Clovelly soils, all having grazing land capabilities, with the Mispah and Hutton soils tending towards wilderness status when shallow and rocky; detailed soil surveys indicated deep and shallow rocky Mispah soils, with wilderness/grazing land capabilities respectively.

1. **Fc574: Glenrosa and/or Mispah forms** (other soils may occur).
   - Lime generally present in the entire landscape. Parent material is: basalt of the Letaba formation in the Lebombo group - Karoo sequence. leucogneiss, amphibolite, metapelite of the Malala drift group.
   - Soil depth: 450mm - 750mm.

- Profile available water (PAW) content is between 21 - 40 mm indicating very low potential soils.

2. **Ae305: Hutton 30/31/32**
   - Red-yellow apedal, freely drained soils. Red, high base status > 300 mm deep (no dunes).
   - Parent material is: mainly sand of the quaternary system.
   - Soil depth: >750mm.
   - Profile available water (PAW) content is between 41 - 60 mm, indicating low potential soils.
3. **Ah89: Hutton + Clovelly 36**
   - Red-yellow apedal, freely drained soils.
   - Red and yellow colours, high base status, usually < 15% clay.
   - A small part of the Berenice falls within this class.
   - Parent material is: Beit bridge complex, Malala drift formation; leucogneiss, metaquartzite, and amphibolite; marble, gneiss; metaquartzite and amphibolite.
   - Soil depth: 450mm - 750mm.
   - Profile available water (PAW) content is between 41 - 60 mm, indicating low potential soils.
4. **Ae303 Hutton 34/35**
   - Red, structure less,
   - Soil depth: 400mm - 6000mm.
   - sandy soils on rock

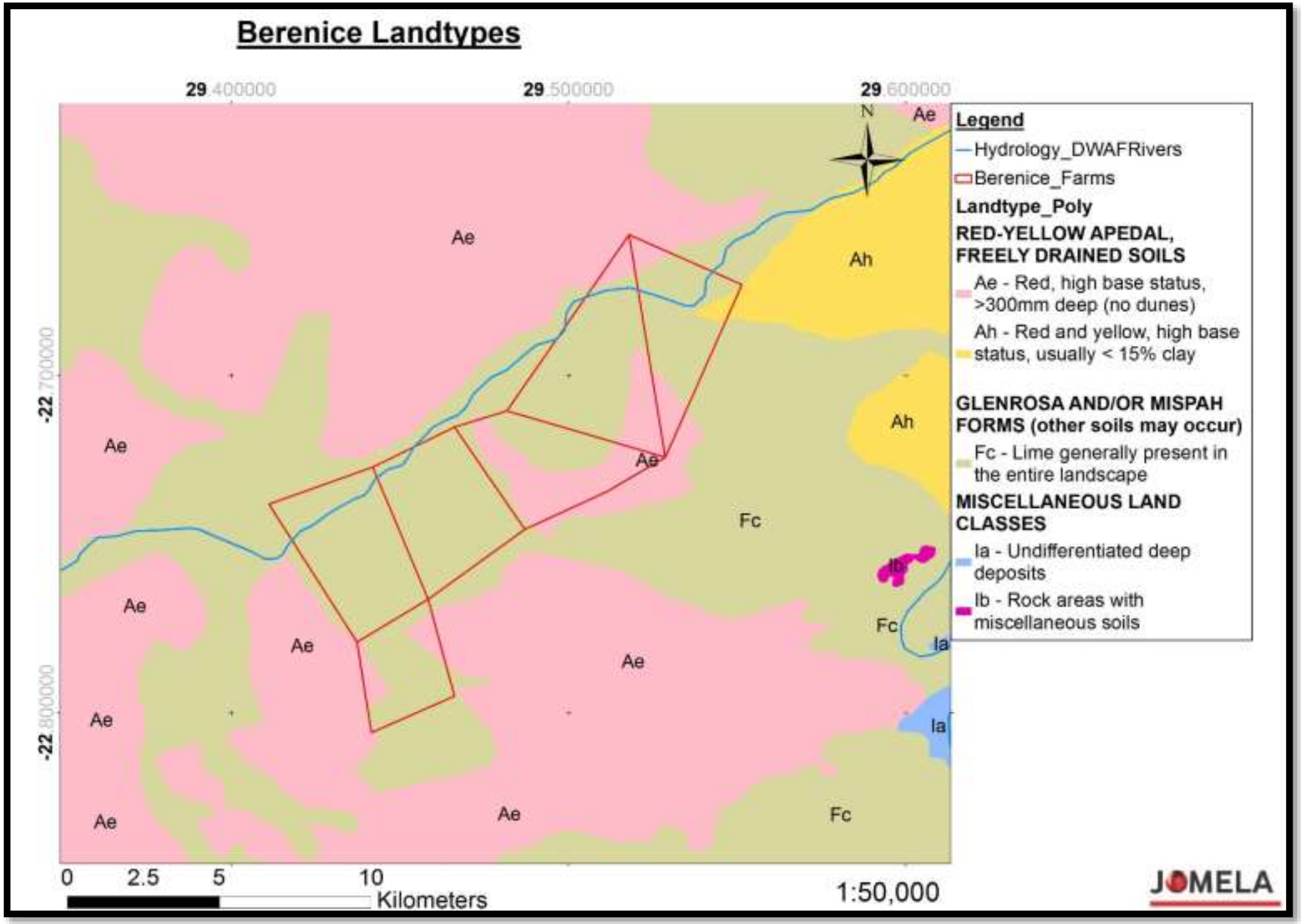


Figure 19: Soil of the Study Area

1.9.4.1 Land Capability

The proposed mining area has a low to moderate agricultural land use capability. This is largely due to a combination of land use stressors associated with soil structures and the general regional climate. Land in Class V; (d) grazing of natural pastures or, at the same level, woodland.

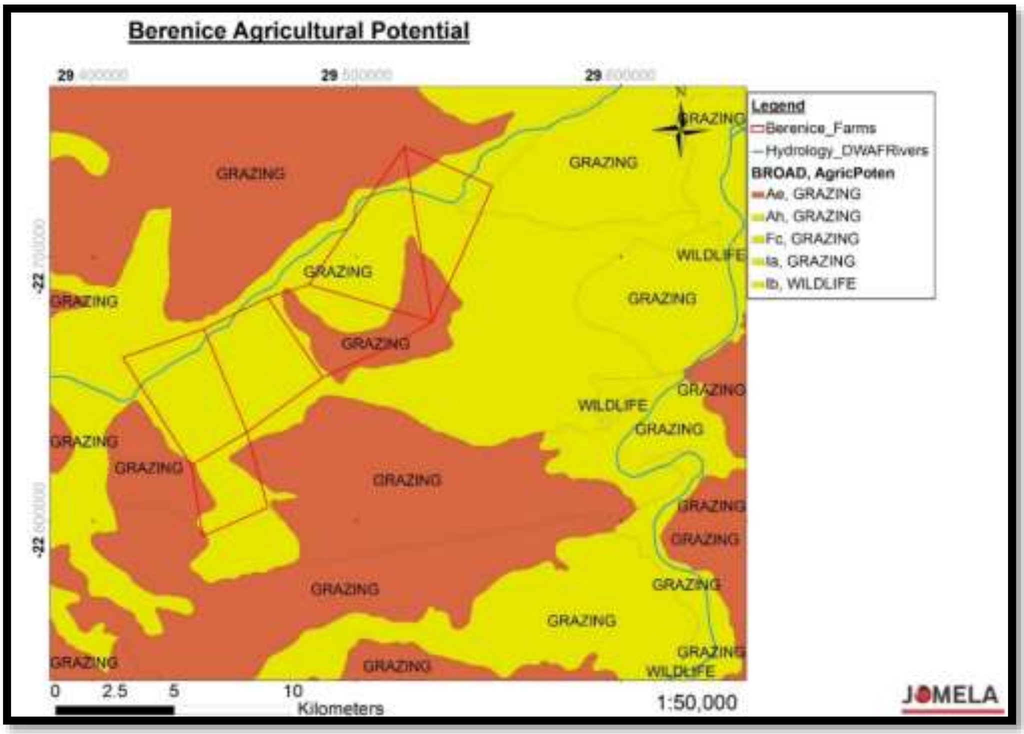


Figure 20: Agriculture Potential

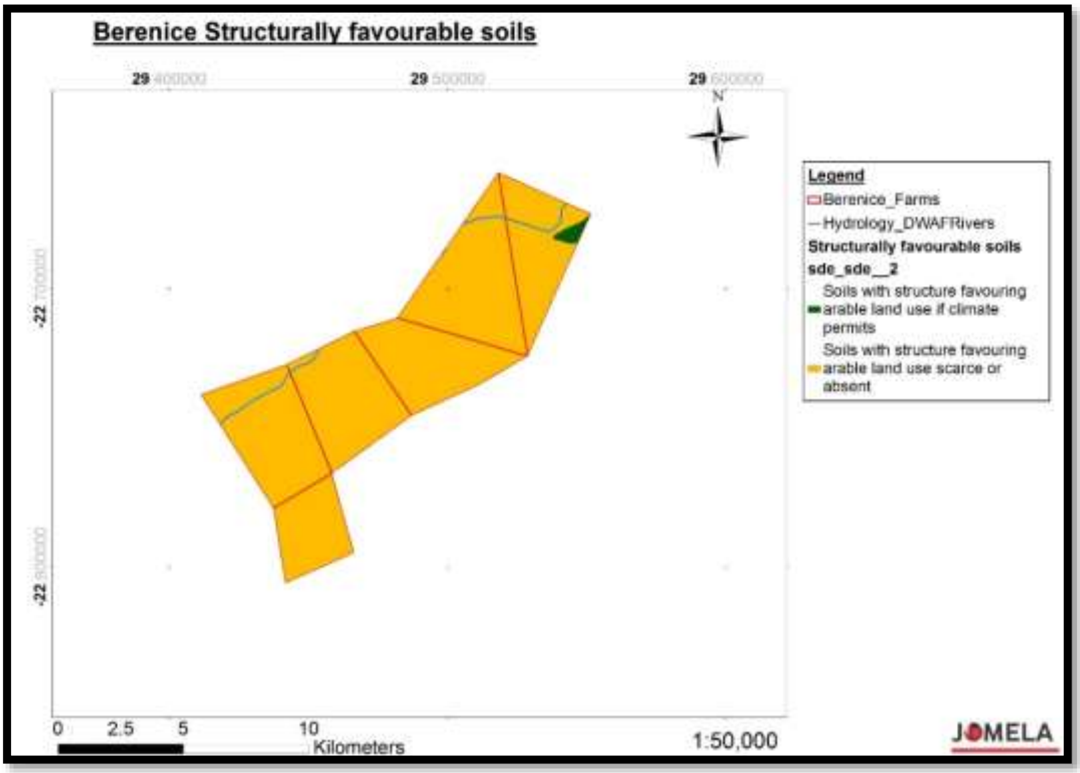


Figure 21: Structurally favourable soils

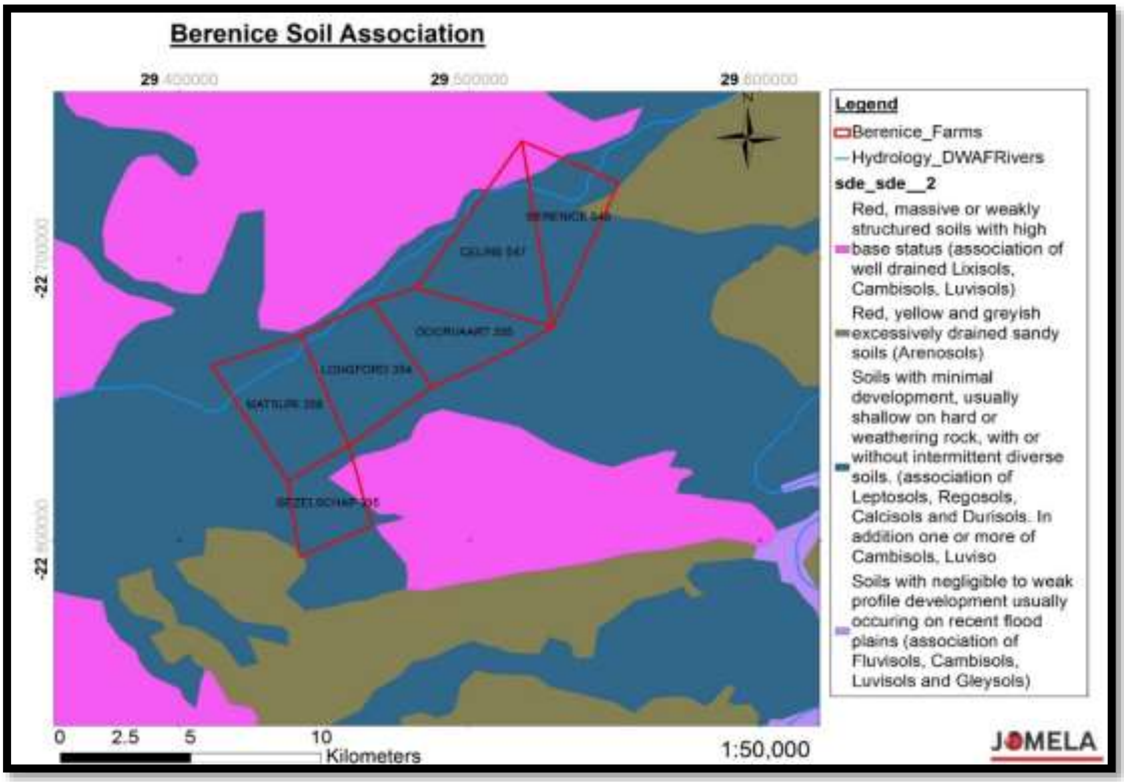


Figure 22: Soil Association

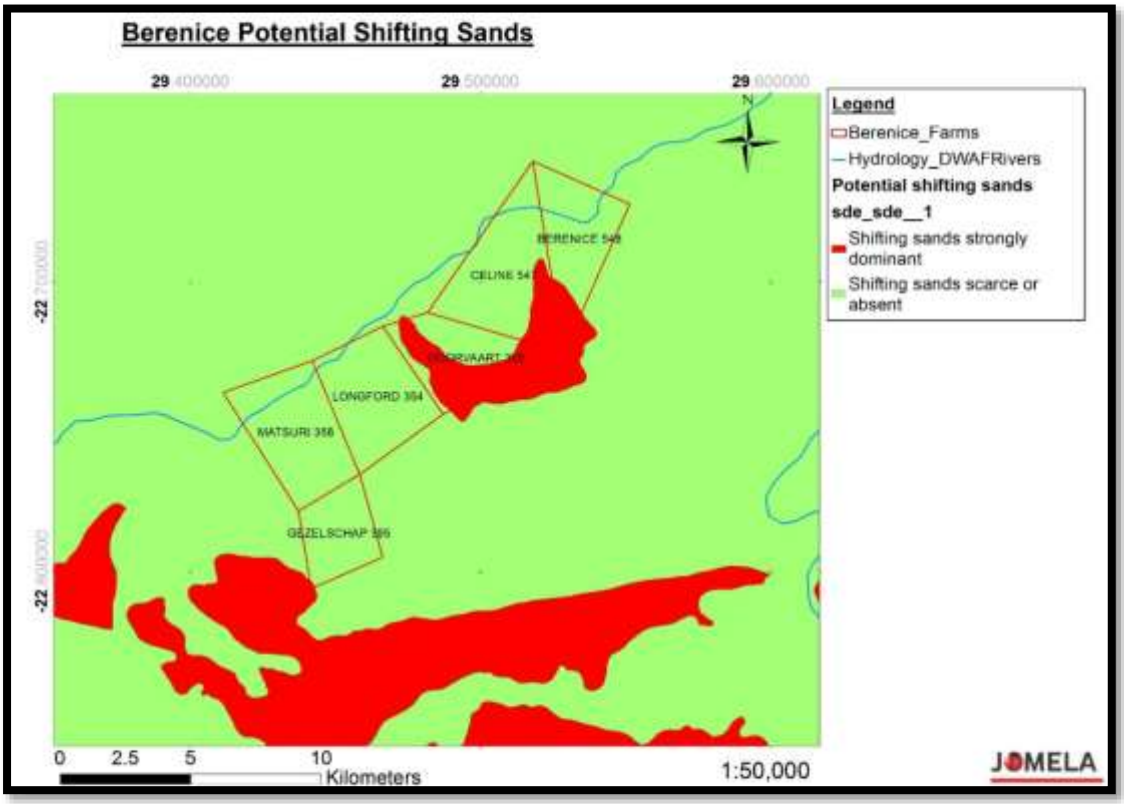


Figure 23: Potential Shifting Sands

1.9.5 Biodiversity

Veld Description

The proposed Berenice Opencast Coal Mine site is located on approximately 7761 hectares of Dry Sweet Bushveld in the Waterpoort District between the Soutpansberg Mountain Range and the Limpopo River.

1.9.5.1 Flora

The plains directly north of the Soutpansberg were mapped as Arid Sweet Bushveld veld type (Veld Type 14), and specifically as *Adansonia* – Mixed Thornveld as described by Acocks (1988). According to Low & Rebelo (1996) the site is within Sweet Bushveld (Vegetation Type 10). Mucina and Rutherford (2006) erroneously mapped this savanna vegetation as Musina Mopane Bushveld (Mostert, Bredenkamp & Mostert 2009), as this vegetation is more closely related to the Limpopo Sweet Bushveld (SVcb 19) of Rutherford & Mucina (2006).

According to Mucina and Rutherford (2006) the vegetation of this entire area is mapped as Musina Mopane Bushveld, however, the vegetation survey on the site indicates that the vegetation rather represents Arid Sweet Bushveld. This is particularly indicated by the prominence of *Senegalia mellifera, Senegalia erubescens* and *Vachellia tortilis* and *Vachellia grandicornuta*.

Table 7: The following twelve vegetation mapping units were identified within the study area:

Mapping units / Plant Community	**Sensitivity**
1. Mixed Thornveld	Medium-Low
2. Open Shrubveld	Medium-Low
3. Open Calcareous Areas	Medium-Low
4. Dense Calcareous Areas	Medium
5. Vegetation on Hills	Medium-High
6. Dense *Terminalia prunioides* Bush on red sand	Medium
7. Open Thornveld on Brak River Floodplains	High
8. Mixed Bushveld on yellow sand	Medium-High
9. Mixed Mopaneveld	Medium-Low
10. Old Fields	Low
11. Pan	High

12. Brak River Riparian Vegetation	High

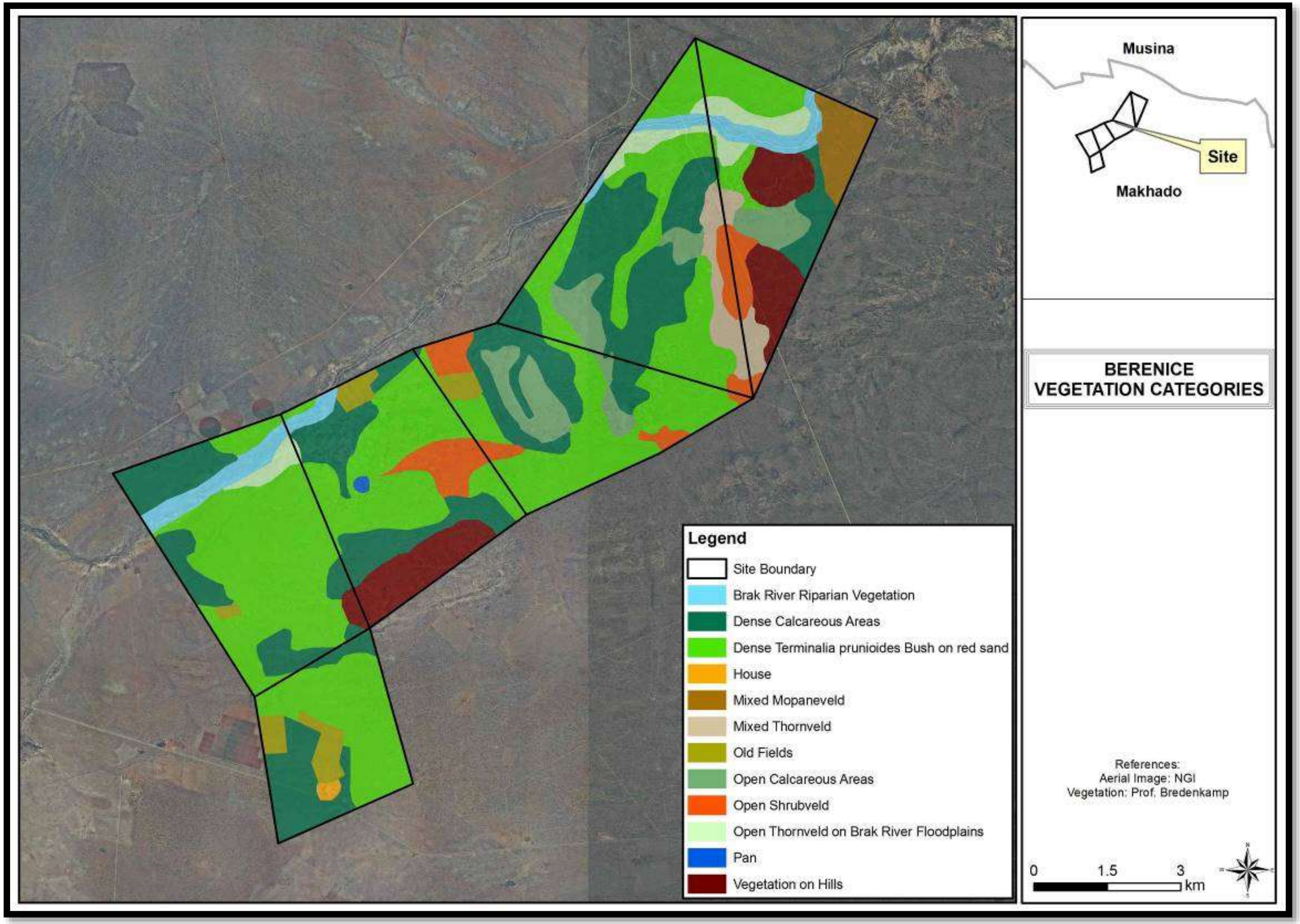


Figure 24: Vegetation map of the study site

Most plant communities were in a good condition, representing natural, close to pristine vegetation. The result of the sensitivity assessment indicates that the Brak River and associated Floodplains and Pan (all wetlands) are considered to be highly sensitive. The Dense Calcareous Areas and Dense *Terminalia prunioides* Bush have medium sensitivity. The sensitivity of the Mixed Bushveld on yellow sand was rated as Medium-High. The other plant communities identified were rated between Medium-Low and Low. This is mainly due to differences in plant species composition and plant species richness, which is a result of habitat differences and the regional importance of the vegetation.

Several Nationally Protected tree (National Forests Act 1998) or NEMBA plant species (Government Notice No. 2007, National Environmental Management: Biodiversity Act, 2004) were recorded from within the study area. These include:

- *Adansonia digitata*
- *Balanites maughanii*
- *Boscia albitrunca*
- *Combretum imberbe*
- *Sclerocarya birrea*

Boscia albitrunca (Sheppard tree, Witgat, Matoppie) is particularly widespread and many individuals (probably hundreds) occur on the study site. The other species listed above are fairly rare and only few individuals were noted.

No important invasive woody plant species were recorded within the relevant study site, though some herbaceous weeds do occur along the Brak River. The development of the proposed Berenice opencast coal mine will result in definite negative impacts on vegetation and flora. There is a pon on Longford which will be destroyed during mining of OC4.

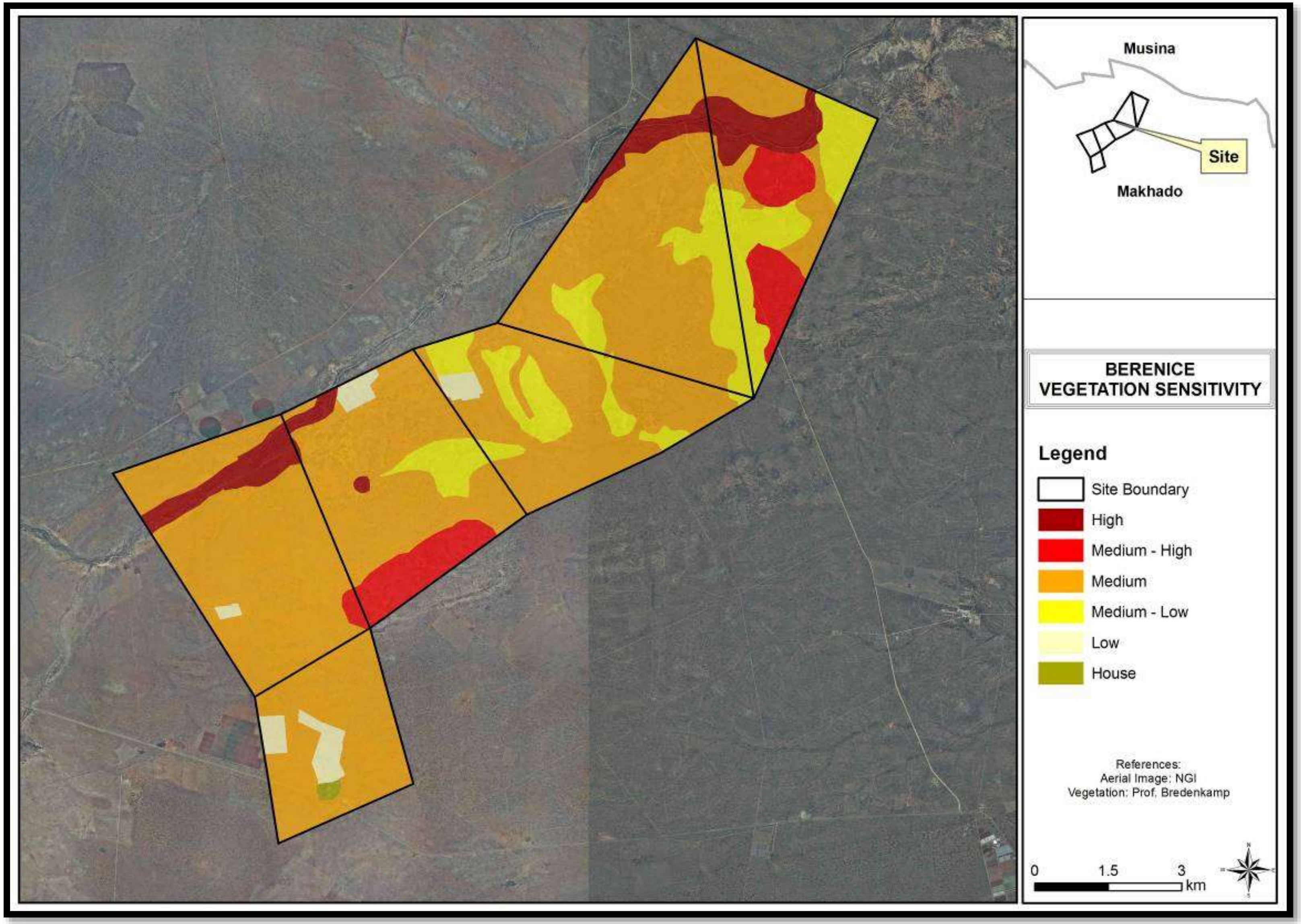


Figure 25: Sensitivity map of the study site

1.9.5.1.1 Mixed Thornveld

This Thornveld (**Figure 24**) is mainly restricted to the eastern part of the study site. The Mixed Thornveld is found on red, somewhat clayey soil with no rocks on the soil surface. Prominent woody species that were recorded include *Boscia foetida*, *Boscia albitrunca* and *Lycium bosciifolium*. Although the herbaceous layer has a very low cover, species such as *Cenchrus ciliaris* and *Urochloa mosambicensis* were conspicuously present. Forbs were found only scattered with very low cover (see **Image 1).**

Image 1: The Mixed Thornveld on the site

The following plant species were recorded from this plant community:

- Trees and shrubs, dwarf shrubs

Boscia albitrunca	P	*Lycium bosciifolium*	
Boscia foetida		*Mundulea sericea*	
Commiphora marlothii		*Senegalia erubescens*	d
Commiphora tenuipetiolata		*Senegalia mellifera*	d
Dichrostachys cinerea		*Vachellia grandicornuta*	
Grewia bicolor		*Vachellia tortilis*	d

- Grasses and sedges

Aristida congesta barbicollis	*Panicum coloratum*	
Eragrostis superba	*Urochloa mosambicensis*	d
Heteropogon contortus		

- Forbs

Abutilon austro-africanum

Hibiscus micranthus

Ipomoea sinensis

Jatropha zeyheri

Melhania acuminata

Plectroniella armata

Senna italica

Solanum tettense

Waltheria indica

Discussion

This Thornveld has medium plant species richness, but no protected tree species or red data species occur. The grass layer is poorly developed and baredue to periodic drought.

1.9.5.1.2 Open Shrubveld

This plant community occurs scattered over the study site and represents open areas with a sparse herbaceous layer and bare soil **(Image 2**). The most prominent tree species are *Boscia albitrunca, Boscia foetida* and *Vachellia tortilis.* The herbaceous layer was quite dry, with the grass *Urochloa mosambicensis* and the forb *Plectroniella armata* scattered about.

Image 2: An example of Open Shrubveld

The following plant species were recorded in this plant community:

➢ Trees, Shrubs and Dwarf shrubs

Boscia albitrunca	Pd	*Vachellia grandicornuta*	
Boscia foetida		*Vachellia tortilis*	d
Senegalia mellifera			

➢ Grasses and sedges

Schmidtia pappophoroides

Urochloa mosambicensis

➢ Forbs

Ocimum americanum

Waltheria indica

Plectroniella armata

Discussion

The area is dominated by bare areas.

1.9.5.1.3 Open Calcareous Areas

Calcareous areas occur widespread and scattered over the study site. Some of these areas are quite open with sparse vegetation, though other areas are covered with dense *Terminalia prunioides* Bush. Trees and shrubs occur sparsely on the open calcareous areas, while the herbaceous layer is poorly developed. The denser bush areas are related to the *Terminalia prunioides* Bush **(Image 3)**

Image 3: Example of Open Calcareous Areas.

The dominant woody plants of this landscape are *Boscia foetida, Vachellia grandicornuta Senegalia senegal* var *senegal, Lycium bosciifolium* and *Sesamothamnus lugardii.*

The herbaceous layer is scanty, with much calcareous rock covering the soil surface. The most conspicuous grass species are *Schmidtia pappophoroides* and *Urochloa mosambicensis* while forbs include *Plectroniella armata* and *Sericorema remotiflora.*

The following plant species were recorded in this plant community:

➢ Trees and Shrubs

Boscia albitrunca	P	*Salvadora australis*	
Boscia foetida		*Senegalia senegal senegal*	
Catophractes alexandri		*Sesamothamnus lugardii*	
Ehretia rigida		*Vachellia grandicornuta*	
Lycium bosciifolium		*Vachellia tortilis*	
Maerua juncea		*Zygophyllum* sp	

- Grasses and sedges

Schmidtia pappophoroides	d	*Urochloa mosambicensis*	

- Forbs

Geigeria burkei		*Sericorema remotiflora*	
Plectroniella armata		*Solanum tettense*	

Discussion

This is a dry, bare area with only few plant species, though probably good habitat for specific fauna.

1.9.5.1.4 Dense Calcareous Areas

The dense calcareous areas are the sections where the soil is underlain with limestone and white-coloured calcareous limestone rocks and gravel occur widespread over the entire study area. The vegetation is dense bush, covering 50-70%, often clumped into bush groups, but individual trees also occur. *Terminalia prunioides* is the most dominant tree species.

The following plant species were recorded in this plant community:

- Trees, Shrubs and Dwarf shrubs

Adansonia digitata	P	*Grewia flavescens*	
Albizia anthelmintica		*Grewia inaequilatera*	
Balanites maughamii	P	*Lycium bosciifolium*	
Boscia albitrunca	P	*Salvadora australis*	
Combretum apiculatum		*Senegalia mellifera*	
Commiphora africana		*Senegalia senegal* var *leiorachis*	
Commiphora pyracanthoides		*Sesamothamnus lugardi*	
Commiphora mollis		*Terminalia prunioides*	D
Dichrostachys cinerea		*Vachellia grandicornuta*	
Grewia bicolor		*Vachellia tortilis*	
Grewia flava			

- Grasses and sedges

Schmidtia pappophoroides

Urochloa mosambicensis

- Forbs

Plectroniella armata

Hibiscus micranthus

Kalanchoe paniculata

Solanum lichtensteinii

Sphedamnocarpus sp

Waltheria indica

Discussion

Several woody species occur in this vegetation, with three tree species being nationally protected. Due to the dense bush, the herbaceous layer is poorly developed, but more species may occur under the bush.

Image 4: A collage of Dense Calcareous Bush

1.9.5.1.5 Vegetation on small Hills

There are limited, low hills present in the study area, namely a small hill on Bernice and a hill on the southern boundary of Matsuri and Longford. Hills often represent special habitats for various plant and faunal species, and heritage sites often occur on these types of hills. The hills are therefore considered to have high conservation value.

The hills are normally covered with dense bush, with *Terminalia prunioides* prominent, though several woody species are present. The herbaceous layer is poorly developed.

Image 5: The dense bush on the hills

The most prominent species include:

- Trees and Shrubs

Albizia anthelminthica		*Grewia bicolor*	
Balanites maughamii	P	*Grewia flavescens*	
Boscia foetida		*Lycium cinereum*	
Combretum apiculatum		*Maerua parvifolia*	
Commiphora africana		*Senegalia erubescens*	
Commiphora mollis		*Senegalia mellifera*	
Croton gratissimus		*Terminalia prunioides*	D
Dichrostachys cinerea		*Vachellia tortilis*	
Dombeya rotundifolia		*Vachellia grandicornuta*	
Ehretia rigida		*Sesamothamnus lugardi*	

- Grasses and Sedges

Enneapogon cenchroides	*Cenchrus ciliaris*
Eragrostis superba	*Panicum maximum*
Melinis repens	*Schmidtia pappophoroides*
Panicum coloratum	*Stipagrostis uniplumis*

- Forbs

Plectroniella armata	*Kyphocarpa angustifolia*
Hibiscus micrantha	*Pavonia burchellii*
Sphedamnocarpus sp	

Discussion

Rocky hills represent habitat for specific plant and fauna species and are considered to have high conservation value.

1.9.5.1.6 Dense *Terminalia prunioides* Bush on red sand

This plant community is restricted to red sandy to sandy loam soils that occur scattered over the entire study area. The woody vegetation is quite dense, and the herbaceous layer is covered with grass but may locally be scanty with bare soil (Image 6). The most prominent woody species include *Terminalia prunioides* but several other woody species are present, particularly *Combretum apiculatum* and *Commiphora* species.

Image 6: A collage of photos of Dense *Terminalia prunioides* Bush on red sand

Species recorded in this vegetation include:

- **Trees and Shrubs**

Boscia albitrunca	P	*Grewia flava*	
Boscia foetida		*Grewia hexamita*	
Combretum apiculatum		*Grewia retinervis*	
Commiphora africana		*Maerua parvifolia*	
Commiphora marlothii		*Senegalia mellifera*	
Commiphora mollis		*Senegalia rostrata* subsp *leiorachis*	
Commiphora pyracanthoides		*Sesamothamnus lugardi*	
Dichrostachys cinerea		*Terminalia prunioides*	D
Grewia bicolor		*Vachellia tortilis*	d

- **Grasses and Sedges**

Eragrostis lehmanniana	*Tragus berteronianus*

- **Forbs**

Hermannia boraginiflora	*Indigofera flavicans*
Hermannia glanduligera	*Kyphocarpa angustifolia*
Hibiscus micrantha	*Sericorema remotiflora*

Discussion

This vegetation occurs widespread in the area. Of concern is the presence of the protected tree *Boscia albitrunca* and the several *Commiphora* species.

1.9.5.1.7 Open Thornveld along Brak River

Limited flood plain vegetation occurs, especially along the north-eastern parts of the Brak River. This vegetation is open thornveld, dominated by *Vachellia tortilis* and a fairly well developed grass layer, though this is often grazed by game species.

The most prominent species include:

- Trees and Shrubs

Boscia albitrunca	P	*Senegalia mellifera*	
Boscia foetida		*Terminalia prunioides*	
Cadaba aphylla		*Vachellia grandicornuta*	
Grewia bicolor		*Vachellia tortilis*	**d**
Lycium bosciifolium			

- Grasses and Sedges

Eragrostis superba	*Tragus berteronianus*
Panicum coloratum	*Urochloa mossambicense*

- Forbs

Indigofera sp	*Kyphocarpa angustifolia*
Geigeria burkei	*Pavonia burchellii*

Image 7: Open Thornveld on Brak River Floodplains

Discussion

This vegetation is restricted to flood plains along the Brak River, and as such considered to have a High sensitivity.

1.9.5.1.8 Mixed Bushveld on yellow sand

A small patch of this vegetation occurs on the Farm Doorvaart at about 22°44'01.5"S; 29°28'11.1"E (not on vegetation map). This is where an individual of the protected (RDL) baobab, *Adansonia digitata* was recorded. This vegetation occurs on deep yellow sand. The vegetation is mixed bushveld with species such as *Combretum apiculatum, Senegalia erubescens* and *Commiphora* species.

Image 8: Mixed Bushveld on yellow sand

Species recorded in this vegetation include:

- **Trees and Shrubs**

Adansonia digitata	P	*Grewia bicolor*	
Boscia albitrunca	P	*Grewia flava*	
Boscia foetida		*Grewia flavescens*	
Combretum apiculatum		*Grewia retinervis*	
Commiphora mollis		*Senegalia erubescens*	
Commiphora pyracanthoides		*Sesamothamnus lugardi*	
Dichrostachys cinerea		*Vachellia tortilis*	

- **Grasses and Sedges**

Aristida adscensionis	*Eragrostis lehmanniana*
Aristida stipitata	*Tragus berteronianus*

- **Forbs**

Hermannia boraginiflora	*Hibiscus micrantha*
Hermannia glanduligera	*Kyphocarpa angustifolia*

Discussion

This vegetation has a limited distribution on the study site and contains the nationally protected trees *Adansonia digitata* and *Boscia albitrunca.* It is therefore regarded to have medium-High conservation value. Also of concern is the presence of several *Commiphora* species.

1.9.5.1.9 Mixed Mopaneveld

The Mixed Mopaneveld is limited to the eastern corner of the Farm Berenice, and is absent from the rest of the study site. In this area *Colophospermum mopane* is dominant (Figure 12), though several other plant species are also present.

The following plant species were recorded in this plant community:

- Trees and Shrubs

Boscia foetida		*Maerua angolense*	
Cissus cornifolia		*Maerua parvifolia*	
Colophospermum mopane	D	*Ozoroa paniculosa*	
Dalbergia melanoxylon		*Sclerocarya birrea*	P
Dichrostachys cinerea		*Terminalia prunoides*	
Flueggea virosa		*Terminalia sericea*	
Grewia bicolor		*Vachellia tortilis*	
Grewia villosa		*Ximenia americana*	

- Grasses and sedges

Aristida adscensionis
Aristida congesta barbicollis
Eragrostis lehmanniana
Heteropogon contortus
Melinis repens
Panicum maximum
Pogonarthria squarrosa
Schmidtia pappophoroides
Stipagrostis uniplumis
Themeda triandra
Urochloa mosambicensis

- Forbs

Abutilon angulatum; Blepharis spinosa
Evolvulus alsinoides; Fimbristylis hispidula
Hermbstaedtia odorata; Hibiscus calyphyllus
Hibiscus micranthus;Indigofera sp
Leucas glabrata; Ocimum americanum
Pavonia sp; Sida dregei
Solanum kwebense; Waltheria indica
Xenostegia tridentate

Image 9: Mixed Mopaneveld

Discussion

In general this vegetation is not rare and not threatened, except that it is often prone to droughts and often overgrazed. There is concern on the presence of a few individuals of *Sclerocarya birrea*, which is a protected tree. A permit from the provincial department of Forestry for the removal of the species will be required in terms of the Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) and the National Forests Act, 2006 (Act 84 of 1998 as amended in 2006).

1.9.5.1.10 Old Fields

Limited Old Field occur within the study area. These are located on Doorvaart, Longford, Matsuri and Gezelschap. These old field were long ago cultivated, and are now covered with secondary bushveld, dominated by *Vachellia tortilis* and *Dichrostachys cinerea*, while the herbaceous layer is often scanty with few species, such as *Urochloa mosambicensis, Geigeria burkei* and *Commicarpus* sp..

Discussion

These areas have low conservation value, though in the context of game farming they have some value as an additional habitat type and grazing.

Image 10: An Old Field

1.9.5.1.11 Pan

A single small pan occurs on the Farm Longford. There is a bird hide at the pan. The pan is located within Dense Calcareous Area, but *Vachellia tortilis* is dominant on the pan fringe.

Image 11: The Pan. Note the dominance of *Vachellia tortilis*

1.9.5.1.12 Brak River vegetation

The Brak River is a dry, seasonal river that has flowing water only seasonally, during higher rainfall years. However, great floods may occur occasionally. Flood plains do occur at some localities (plant community described above), especially in the eastern part of the River, usually directly outside the riparian on the banks of the River (**Figure 24**).

The most abundant large trees include *Combretum imberbe, Ziziphus mucronata, Senegalia nigrescens* and *Grewia bicolor* (Image 12), while some grass species such as *Panicum coloratum, Panicum maximum, Cenchrus ciliaris* and *Urochloa mossanbicensis* are abundantly present. Conspicuous forbs that were noted include weeds e.g.*Flaveria bidentis* and *Datura stramonium.*

The following plant species were recorded:

- Trees and Shrubs

Colophospermum mopane		*Gardenia volkensii*	
Combretum apiculatum		*Grewia hexamita*	
Combretum imberbe	P	*Gymnosporia senegalensis*	d
Dichrostachys cinerea		*Lycium cinereum*	
Ehretia amoena		*Mundulea sericea*	

Senegalia nigrescens	d	*Vachellia tortilis*	d
Vachellia grandicornuta		*Ziziphus mucronata*	dM

- Grasses and sedges

Bothriochloa radicans
Cenchrus ciliaris
Eragrostis lehmanniana
Melinis repens
Panicum coloratum
Panicum maximum
Urochloa mosambicensis

- Forbs

Datura stramonium	W
Flaveria bidentis	W
Heliotropium steudneri	
Hermbstaedtia odorata	
Hibiscus calyphyllus	
Justicia flava	
Vernonia sp	
Waltheria indica	
Xanthium strumarium	W

Image 12: The Brak River

Discussion

The River is considered to be ecologically sensitive. All river system in South Africa are protected by the National Water Act.

1.9.5.1.13 Species of Conservation Concern

A list of Species of Conservation Concern for the grids 2229CB, 2229CD and 2229 DA was obtained from the database on the SANBI (POSA 2016) website. Threatened species are those that are facing high risk of extinction, indicated by the categories Critically Endangered (CE), Endangered (EN) and Vulnerable (VU). Species of Conservation Concern include the Threatened Species, but additionally have the categories Near Threatened (NT), Data Deficient (DD), Critically Rare (CR), Rare (R) and Declining (D). This is in accordance with the new Red List for South African Plants (Raimondo *et al*. 2009).

The following plant species of conservation concern were previously recorded from the grids 2229CB, 2229CD and 2229 DA, as listed by SANBI.

Table 8: plant species of conservation concern

Family	Species	Status
Acanthaceae	*Justicia montis-salinarum* A.Meeuse	Rare
Apocynaceae	*Ceropegia cimiciodora* Oberm.	VU
Myrothamnaceae	*Myrothamnus flabellifolius* Welw.	DDT

*None of these species were found within the study area, they occur on the Soutpansberg Mountains.

1.9.5.1.14 Protected species

Several Nationally Protected tree (National Forests Act 1998) or NEMBA plant species (Government Notice No. 2007, National Environmental Management: Biodiversity Act, 2004) were recorded from within the study area. These include:

Adansonia digitata

Balanites maughanii

Boscia albitrunca

Combretum imberbe

Sclerocarya birrea

Boscia albitrunca (Sheppard tree, Witgat, Matoppie) is particularly widespread and many individuals (probably hundreds) occur on the study site. The other species listed above are fairly rare and only few individuals were noted.

1.9.5.2 Fauna

The fauna study determined that a variety of mammals inhabit the proposed project as a result of the undisturbed conditions that predominate especially on top of the hills. The species richness of vertebrates is close to the historical state for this area. Some of the game species have been re-introduced and dynamically managed; only elephants and lions have not been re-introduced. It is concluded that no less than 437 species of vertebrates are resident or vagrants to the site (111 mammal species, 225 birds and 101 reptiles and amphibians). Of these 71 species (16%) are Red Listed, and therefore of significant conservation concern.

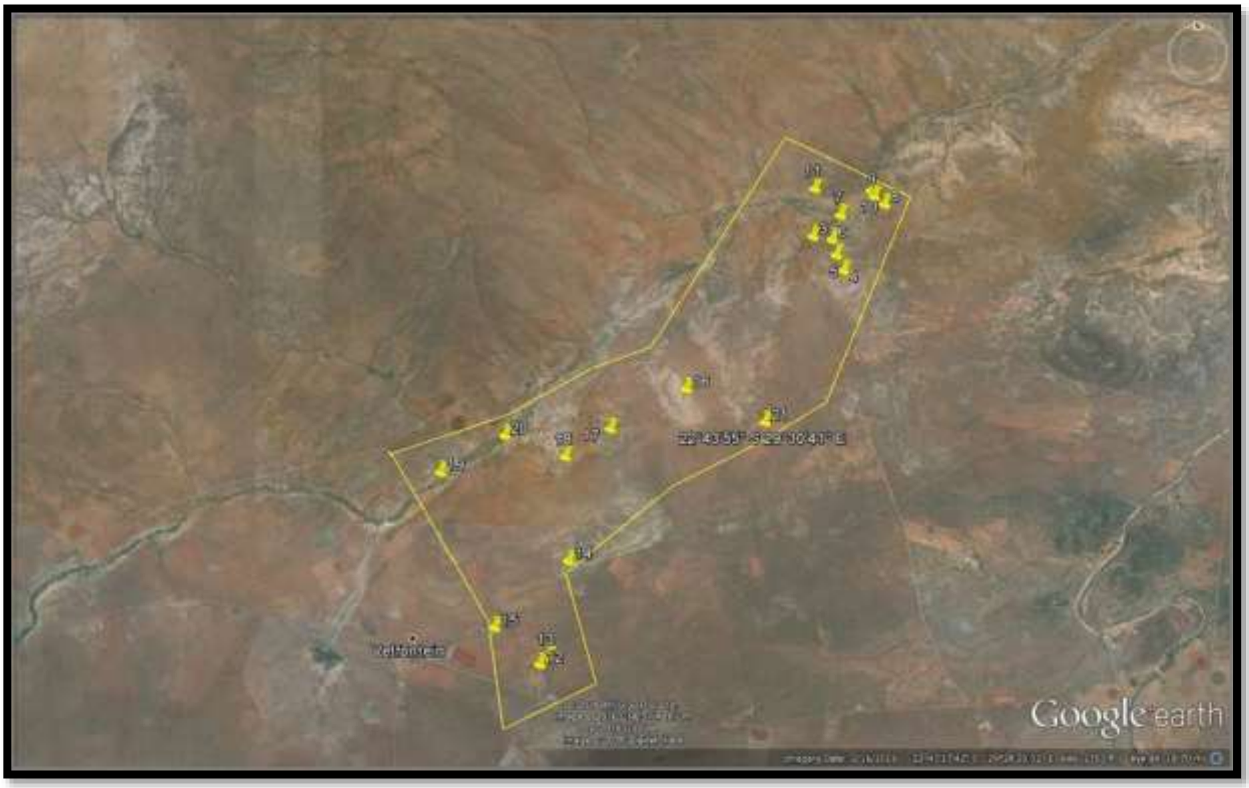


Figure 26: Sampling Points for fauna

The project site is indeed diversified, but within the broad context of a savannah. To augment descriptions of the presence, variation and characteristics of the various habitats, 19 sampling sites were randomly selected and assessed (for more information refer to the Fauna Assessment report in Annexure 5- Specialist Studies).

1.9.5.2.1 Mammals:

During the visit the site was surveyed and assessed for the potential occurrence of Red Data and/or wetland-associated species such as Juliana's golden mole (*Neamblosomus juliana*), Highveld golden mole (*Amblysomus septentrionalis*), Rough-haired golden mole (*Chrysospalax villosus*), African marsh rat (*Dasymys incomtus*), Angoni vlei rat (*Otomys angoniensis*), Vlei rat (*Otomys irroratus*), White-tailed rat (*Mystromys albicaudatus*), a member of shrews such as the Forest shrew (*Myosorex varius*), Southern African hedgehog *(Atelerix frontalis), a number of bats such as the* Short-eared trident bat (*Cloeotis percivali*), African clawless otter (*Aonyx capensis*), Spotted-necked otter (*Lutra maculicollis*), Marsh mongoose (*Atilax paludinosus*), Brown hyena (*Parahyaena brunnea*), etc.

1.9.5.2.2 Birds:

A desktop study was undertaken in which bird species that potentially occur at the site and in the surrounding areas were identified using data from the first and second South African Bird Atlas Projects (SABAP 1 and 2). SABAP 2 data are based on records for pentads (i.e., 5' X 5'), where SABAP 1 data were based on quarter-degree grid cells (i.e., 15' X 15'). A list of species potentially occurring at the site was developed using data for all the SABAP 2 pentads within which the project is located, plus surrounding pentads (Figure 1). The pentads at the four corners of this region are: NW: 2235_2920; NE: 2235_2935; SE: 2250_2935; SW: 2250_2920. The area considered during the desktop study is thus much larger than the area likely to be affected by the project (**Figure 27**). This approach is adopted to ensure that all species potentially occurring at the site, whether resident, nomadic, or migratory, are identified. Red- listed species were identified using the most recent (2015) edition of the Red Data Book for South Africa, Lesotho and Swaziland (Taylor et al. 2015).

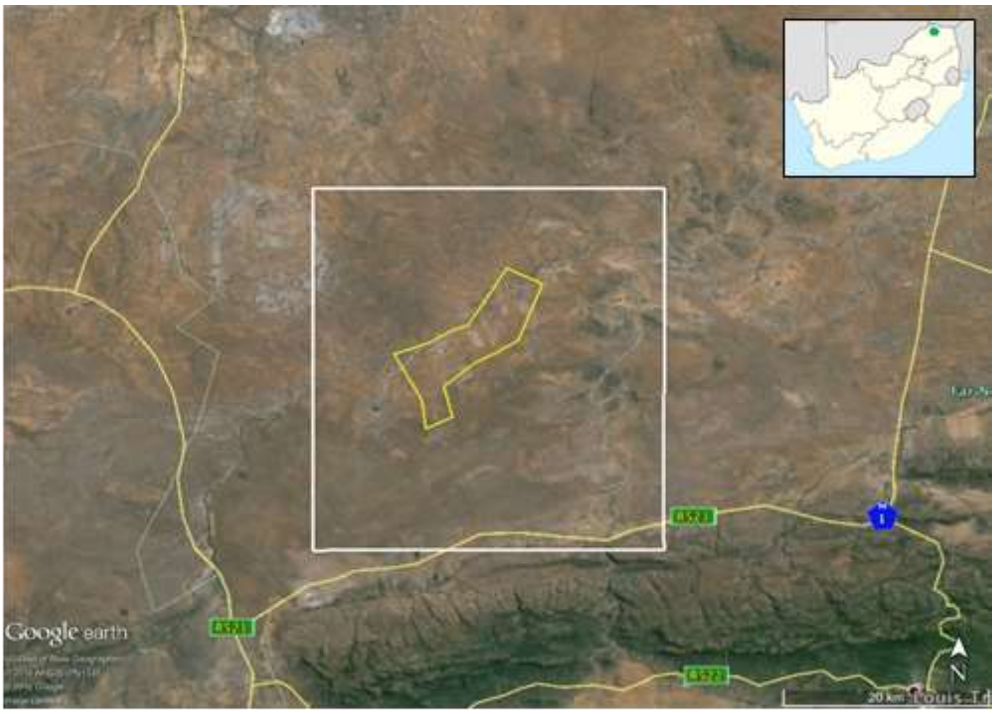


Figure 27: Approximate extent of area included (white square) when generating the list of birds potentially occurring at the site of the proposed mine.

1.9.5.2.3 Herpetofauna:

During the visit the site was surveyed and assessed for the potential occurrence of Red Data herpetofauna species in the Limpopo Province; (Minter, et al, 2004, Alexander & Marais, 2007, Du Preez & Carruthers, 2009 and Bates, et al, 2014). The following RDL species were identified.

1.9.5.2.4 Habitat

Arboreal habitat is predominant and offers numerous opportunities for tree-living vertebrates, such as for nesting, roosting sites, perches, nourishment and sanctuary. A wide variety of savannah trees are recorded and documented in the floral overview within the auspices of this assignment. Some of the trees are Red Listed (baobab, Sheppard trees, marula trees and lead-wood) and will require special attention given their statutory conservation status. By-and-large the horizon of the woodland is that of scrub or thicket with a height of < 3 meters and varies in density from sparse to almost impenetrably dense. In spite of the drought during the 2015-16 rainfall season, this habitat-type does not show signs of ecological stress and, given the present land-use practice it is in fact in a pristine conservation state.

The terrestrial major habitat type is equally extensive and is represented in a two-dimensional aspect by surface conditions. The soils are generally deep, fertile and red and could be either sandy or compacted as result of clay content. At places calcareous rubble is found on the surface. Termitaria are present throughout the study site: these structures are important components of a terrestrial habitat since they provide nourishment for specialized mammals such as aardvarks and aardwolves, and also refuge for creatures such as pygmy mice and dwarf shrews. As result of the drought during the 2015-16 summer, basal cover is currently sparse and largely restricted to weedy plants and sour grass. The conservation status of this habitat type is rated as high even though it is presently experiencing an ecological bottle-neck on account of drought conditions.

The undulating plains are here-and-there crested by low rocky ridges (randjies). These provide adequate habitat for specialist rupiculous vertebrates such as dassies, red rock rabbits, Namaqua rock rats and elephant shrews. The conservation status of this habitat type is rated as above-average in spite of the recent drought.

Wetland habitat is poorly developed and is represented by the seasonal Brak River, a few drainage lines and a few artificial watering points for game. The river's riparian zone is poorly developed and is only lush during and after rains.

No deep caves suitable for cave-dwelling bats were recorded, although deep rock crevices may provide adequate roosting opportunities for some cave-dwelling bats. It is furthermore possible that man-made structures such as houses and sheds are used by bats.

Table 9: Mammal diversity- The species observed or deduced to occupy the site

	SCIENTIFIC NAME	ENGLISH NAME	Habitat
	Order Macroscelididae		
	Family Macroscelididae		
DD*	*Elephantulus brachyrhynchus*	Short-snouted elephant shrew	Terr.
*****	*Elephantulus intufi*	Bushveld elephant shrew	Terr.
*****	*Elephantulus myurus*	Eastern rock elephant shrew	Rup.
	Order Tubulidentata		
	Family Orycteropodidae		
√	*Orycteropus afer*	Aardvark	Terr.
	Order Hyracoidea		
	Family Procaviidae		
√	*Procavia capensis*	Rock dassie	Rup.
	Order Lagomorpha		
	Family Leporidae		
√	*Lepus saxatilis*	Scrub hare	Terr.
?	*Lepus capensis*	Cape / desert hare	Terr.
*****	*Pronolagus randensis*	Jameson's red rock rabbit	Rup.
	Order Rodentia		
	Family Bathyergidae		
√	*Cryptomys hottentotus*	African mole rat	Subter.
	Family Hystricidae		
√	*Hystrix africaeaustralis*	Cape porcupine	Terr.
	Family Tryonomyidae		
?	*Thryonomys swinderianus*	Greater cane rat	Terr.
	Family Pedetidae		
√	*Pedetes capensis*	Springhare	Terr.
	Family Sciuridae		
√	*Paraxerus cepapi*	Tree squirrel	Arbor.
	Family Myoxidae		
DD?	*Graphiurus platyops*	Rock dormouse	Rup.
*****	*Graphiurus murinus*	Woodland dormouse	Arbor.
	Family Muridae		
*****	*Acomys spinosissimus*	Spiny mouse	Terr.
DD*	*Lemniscomys rosalia*	Single-striped grass mouse	Terr.
*****	*Rhabdomys pumilio*	Four-striped grass mouse	Terr.
?	*Mus indutus*	Desert pygmy mouse	Terr.

	SCIENTIFIC NAME	ENGLISH NAME	Habitat
*	*Mus minutoides*	Pygmy mouse	Terr.
*	*Mastomys natalensis*	Natal multimammate mouse	Terr.
*	*Mastomys coucha*	Southern multimammate mouse	Terr.
?	*Thallomys paedulcus*	Acacia rat	Arbor.
?	*Thallomys nigricauda*	Black-tailed tree rat	Arbor.
*	*Aethomys ineptus*	Tete veld rat	Terr.
*	*Aethomys namaquensis*	Namaqua rock mouse	Rup.
?	*Otomys angoniensis*	Angoni vlei rat	Wetl.
?	*Otomys irroratus*	Vlei rat	Wetl.
*	*Desmodillus auricularis*	Short-tailed gerbil	Terr.
*	*Gerbillurus paeba*	Hairy-footed gerbil	Terr.
DD*	*Gerbilliscus leucogaster*	Bushveld gerbil	Terr.
*	*Saccostomus campestris*	Pouched mouse	Terr.
*	*Dendromus melanotis*	Grey pygmy climbing mouse	Terr.
*	*Dendromus mesomelas*	Brants' climbing mouse	Terr.
*	*Dendromus mystacalis*	Chestnut climbing mouse	Terr.
*	*Steatomys pratensis*	Fat mouse	Terr.
	Order Primates		
	Family Galagidae		
√	*Galago moholi*	South African galago	Arbor.
	Family Cercopithecidae		
√	*Papio hamadryas*	Chacma baboon	Terr.
√	*Cercopithecus pygerythrus*	Vervet monkey	Terr./Arbor.
	Order Eulipotypha		
	Family Soricidae		
DD?	*Suncus lixus*	Greater dwarf shrew	Terr.
DD?	*Suncus infinitesimus*	Least dwarf shrew	Terr.
DD?	*Crocidura mariquensis*	Swamp musk shrew	Wetl.
DD?	*Crocidura fuscomurina*	Tiny musk shrew	Wetl.
DD?	*Cricidura maquassiensis*	Maquassie musk shrew	Wetl.
DD*	*Crocidura cyanea*	Reddish-grey musk shrew	Terr.
DD?	*Crocidura silacea*	Lesser grey-brown musk shrew	Terr.
DD*	*Crocidura hirta*	Lesser red musk shrew	Terr.
	Family Erinaceidae		
NT√	*Atelerix frontalis*	Southern African hedgehog	Terr.
	Order Chiroptera		
	Family Pteropidae		

√	*Epomophorus wahlbergi*	Wahlberg's epauletted fruit bat	Aerial
	Family Embalonuridae		
*	*Taphozous mauritianus*	Mauritian tomb bat	Aerial

	SCIENTIFIC NAME	ENGLISH NAME	Habitat
	Family Molossidae		
*	*Tadarida aegyptiaca*	Egyptian free-tailed bat	Aerial
*	*Chaerephon pumila*	Little free-tailed bat	Aerial
	Family Vespertilionidae		
NT?	*Miniopterus schreibersii*	Schreibers' long-fingered bat	Aerial
NT*	*Pipistrellus rusticus*	Rusty pipistrelle	Aerial
?	*Neoromicia nanus*	Banana bat	Aerial
*	*Neoromicia capensis*	Cape serotine bat	Aerial
?	*Neoromicia zuluensis*	Aloe bat	Aerial
NT?	*Myotis welwitchii*	Welwitsch's hairy bat	Aerial
*	*Pipistrellus hesperidus*	African (Kuhl's) pipistrelle	Aerial
NT*	*Pipistrellus rusticus*	Rusty bat	Aerial
√	*Neoromicia capensis*	Cape serotine bat	Aerial
√	*Scotophilus dinganii*	African yellow house bat	Aerial
√	*Scotophilus viridis*	Greenish yellow house bat	Aerial
√	*Nycticeinops schlieffeni*	Schlieffen's bat	Aerial
	Family Nycteridae		
?	*Nycteris thebaica*	Egyptian slit-faced bat	Aerial
	Family Rhinolophidae		
NT?	*Rhinolophus clivosus*	Geoffroy's horseshoe bat	Aerial
NT?	*Rhinolophus darlingi*	Darling's horseshoe bat	Aerial
V?	*Rhinolophus blasii*	Blasius's horseshoe bat	Aerial
?	*Rhinolophus simulator*	Bushveld horseshoe bat	Aerial
	Family Hipposideridae		
DD?	*Hipposideros caffer*	Sundevall's roundleaf bat	Aerial
	Order Pholidota		
	Family Manidae		
Vu√	*Manis temminckii*	Ground pangolin	Terr.
	Order Carnivora		
	Family Hyaenidae		
√	*Proteles cristatus*	Aardwolf	Terr.
NT√	*Parahyaena brunnea*	Brown hyena	Terr.
NT√	*Crocuta crocuta*	Spotted hyena	Terr.
	SCIENTIFIC NAME	ENGLISH NAME	Habitat
	Family Felidae		
Vu√	*Acinonyx jubatus*	Cheetah	Terr.
√	*Panthera pardus*	Leopard	Terr. /Arbor.

√	*Caracal caracal*	Caracal	Terr.
√	*Felis silvestris*	African wild cat	Terr.
NT√	*Leptailurus serval*	Serval	Terr.
	Family Viverridae		
?	*Civettictis civetta*	African civet	Terr. /Wetl.
√	*Genetta genetta*	Small-spotted genet	Terr.
√	*Genetta tigrina*	SA large-spotted genet	Terr.
	Family Herpestidae		
√	*Galerella sanguinea*	Slender mongoose	Terr.
?	*Atilax paludinosus*	Marsh mongoose	Terr. /Wetl.
√	*Mungos mungo*	Banded mongoose	Terr.
√	*Helogale parvula*	Dwarf mongoose	Terr.
	Family Canidae		
√	*Otocyon megalotis*	Bat-eared fox	Terr.
√	*Canis mesomelas*	Black-backed jackal	Terr.
	Family Mustelidae		
√	*Mellivora capensis*	Honey badger	Terr.
DD*	*Poecilogale albinucha*	African weasel	Terr.
*****	*Ictonyx striatus*	Striped polecat	Terr.
	Order Perissodactyla		
	Family Equidae		
√	*Equus quagga*	Plains zebra	Terr.
	Family Rhinocerotidae		
√	*Ceratotherium simum*	White rhinoceros	Terr.
	Order Suiformes		
	SCIENTIFIC NAME	ENGLISH NAME	Habitat
	Family Suidae		
√	*Potamochoerus larvatus*	Bushpig	Terr.
√	*Phacochoerus africanus*	Common warthog	Terr.
	Order Ruminanta		
	Family Giraffidae		
√	*Giraffa camelopardalis*	Giraffe	Terr.
	Family Bovidae		

√	*Syncerus caffer*	African buffalo	Terr.
√	*Tragelaphus strepsiceros*	Kudu	Terr.
√	*Tragelaphus angasii*	Nyala	Terr.
√	*Tragelaphus scriptus*	Bushbuck	Terr.
√	*Tragelaphus oryx*	Eland	Terr.
√	*Connochaetes taurinus*	Blue wildebeest	Terr.
√	*Alcelaphus buselaphus*	Red hartebeest	Terr.
√	*Oryx gazella*	Gemsbok	Terr.
√	*Sylvicapra grimmia*	Common duiker	Terr.
√	Redunca arundinum	Southern reedbuck	Terr.
√	Redunca fulvorufula	Mountain reedbuck	Terr.
√	*Kobus ellipsiprymnus*	Waterbuck	Terr.
√	*Raphicerus campestris*	Steenbok	Terr.
NT√	*Raphicerus sharpei*	Sharpe's grysbok	Terr.
√	*Aepyceros melampus*	Impala	Terr.

√ Definitely there or have a high probability to occur;

* Medium probability to occur based on ecological and distributional parameters;

? Low probability to occur based on ecological and distributional parameters.

Red Data species rankings as defined in Friedmann and Daly's S.A. Red Data Book / IUCN (World Conservation Union) (2004) are indicated in the first column: CR= Critically Endangered, En = Endangered, Vu = Vulnerable, LR/cd = Lower risk conservation dependent, LR/nt = Lower Risk near threatened, DD = Data Deficient. All other species are deemed of Least Concern. The fourth column depicts the best-fit habitat preference of a species; Terr. = Terrestrial, Arbor. = Arboreal, Wetl. = Wetland / moisture dependent, Rup. = Rupiculous.

1.9.5.2.5 Red Listed Mammal Species Identified

Table 10. Red-listed mammals whose possible presence at the site of the proposed coal mine was evaluated during the assessment process.

SCIENTIFIC NAME	ENGLISH NAME	CITES[1]	NEMBA[2]	LEMA[3]	Likelihood of occurrence[4]
Elephantulus brachyrhynchus	Short-snouted elephant shrew	**DD**			Definitely
Orycteropus afer	Aardvark			Spec.Pr.	Definitely
Pronolagus randensis	Jameson's red rock rabbit			Pr.	Definitely

Graphiurus platyops	Rock dormouse	**DD**			Likely
Lemniscomys rosalia	Single-striped grass mouse	**DD**			Definitely
Gerbilliscus leucogaster	Bushveld gerbil	**DD**			Definitely
Galago moholi	South African galago			Pr.	Definitely
Suncus lixus	Greater dwarf shrew	**DD**			Possibly
Suncus infinitesimus	Least dwarf shrew	**DD**			Possibly
Crocidura mariquensis	Swamp musk shrew	**DD**			Unlikely
Crocidura fuscomurina	Tiny musk shrew	**DD**			Unlikely
Crocidura maquassiensis	Maquassie musk shrew	**DD**			Unlikely
Crocidura cyanea	Reddish-grey musk shrew	**DD**			Definitely
Crocidura silacea	Lesser grey-brown musk shrew	**DD**			Possibly
Crocidura hirta	Lesser red musk shrew	**DD**			Definitely
Atelerix frontalis	Southern African hedgehog	**NT**	Pr.	Pr.	Definitely
Miniopterus schreibersii	Schreibers' long-fingered bat	**NT**			Unlikely
Pipistrellus rusticus	Rusty pipistrelle	**NT**			Possibly
Myotis welwitchii	Welwitsch's hairy bat	**NT**			Unlikely
Pipistrellus rusticus	Rusty bat	**NT**			Possibly

SCIENTIFIC NAME	**ENGLISH NAME**	**CITES[1]**	**NEMBA[2]**	**LEMA[3]**	**Likelihood of occurrence[4]**
Rhinolophus clivosus	Geoffroy's horseshoe bat	**NT**			Possibly
Rhinolophus darlingi	Darling's horseshoe bat	**NT**			Possibly
Rhinolophus blasii	Blasius's horseshoe bat	**Vu**			Unlikely
Hipposideros caffer	Sundevall's roundleaf bat	**DD**			Possibly
Manis temminckii	Ground pangolin	**Vu**	Vu.	Spec.Pr.	Definitely
Proteles cristatus	Aardwolf			Pr.	Definitely
Parahyaena brunnea	Brown hyena	**NT**	Pr.	Pr.	Definitely
Crocuta crocuta	Spotted hyena	**NT**	Pr.	Pr.	Definitely
Acinonyx jubatus	Cheetah	**Vu**	Vu.	Pr.	Definitely

Panthera pardus	Leopard		Vu.	Pr.	Definitely
Leptailurus serval	Serval	**NT**	Pr.		Definitely
Civettictis civetta	African civet			Pr.	Possibly
Otocyon megalotis	Bat-eared fox			Pr.	Definitely
Mellivora capensis	Honey badger		Pr.	Pr.	Definitely
Poecilogale albinucha	African weasel	**DD**			Possibly
Ceratotherium simum	White rhinoceros		Pr.	Spec.Pr.	Definitely
Giraffa camelopardalis	Giraffe			Pr.	Definitely
Syncerus caffer	African buffalo			Pr.	Definitely
Redunca arundinum	Southern reedbuck			Pr.	Definitely
Redunca fulvorufula	Mountain reedbuck			Pr.	Definitely
Raphicerus sharpei	Sharpe's grysbok	**NT**	Pr.		Definitely

[1]Current IUCN Red List Status for South Africa, Lesotho and Swaziland (Friedman and Daly (editors) 2004). NT = *Near Threatened*; VU = *Vulnerable*; EN = *Endangered*; CR = *Critically Endangered*

[2]Indicates species listed as Protected ("PR") or Vulnerable ("Vu") in the National Environmental Management: Biodiversity Act, 2004 list of Threatened or Protected Species (2004 version)

[3]Indicates species listed as Specially Protected (Spec.Pr.) or Protected (Pr.) in Limpopo Environmental Management Act (Act 7 of 2003).

[4]Definite occurrences based on sight records as well as reported by the owners and guides.

1.9.5.3 Topography

The topography of the greater Makhado area is shown below hereunder and this shows that large areas of the municipal area is characterised by a mountainous makeup but the proposed site is relatively flat. It should also be noted that although settlements are mostly located on slopes less than 9% (1:10), many of the urbanized areas (settlements) are located between the mountainous areas with slopes between 9%-25%, in other words slopes between 1:10 to 1:4.

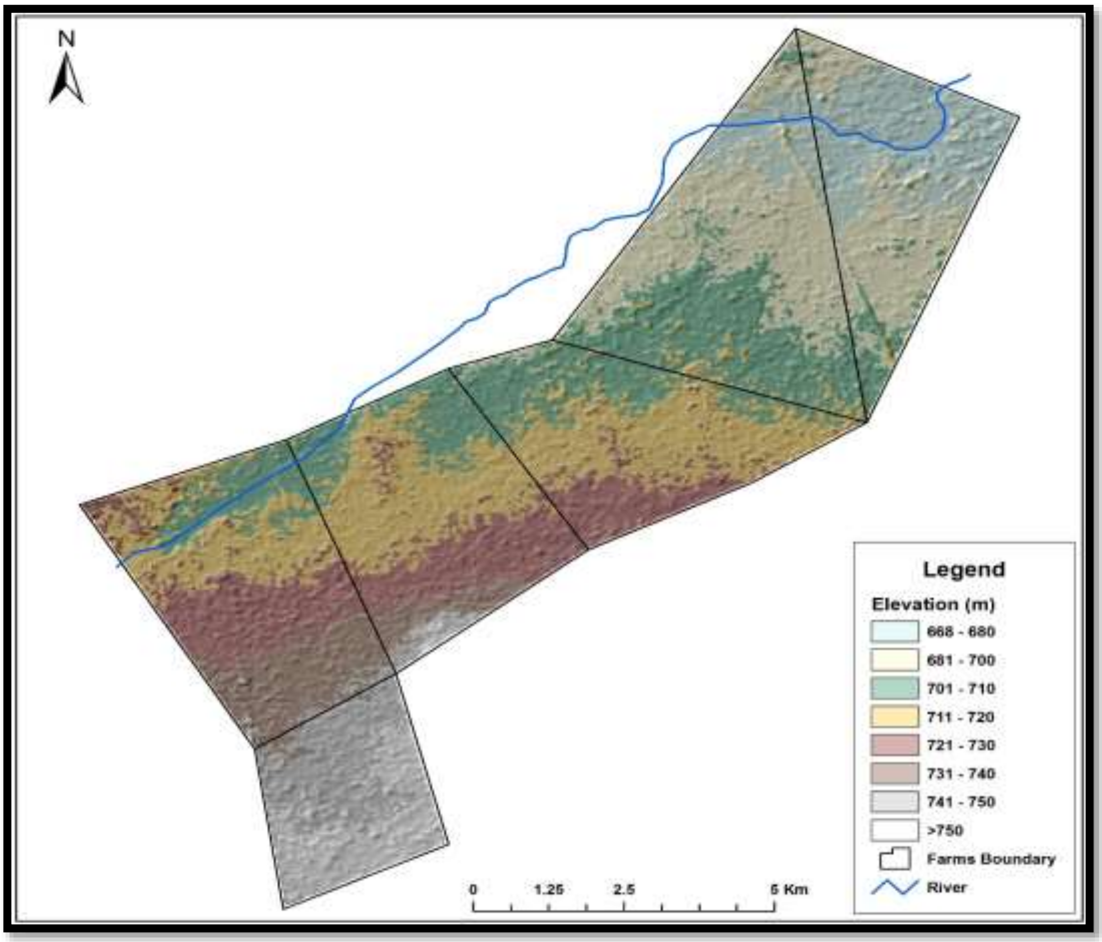


Figure 28: Topography of the Study Area

The Project Area is located in an area which is relatively flat lying with the incision of the Brak River Valley towards the north of the area, at a surface elevation of 690 metres (m) to 735 m above sea level.

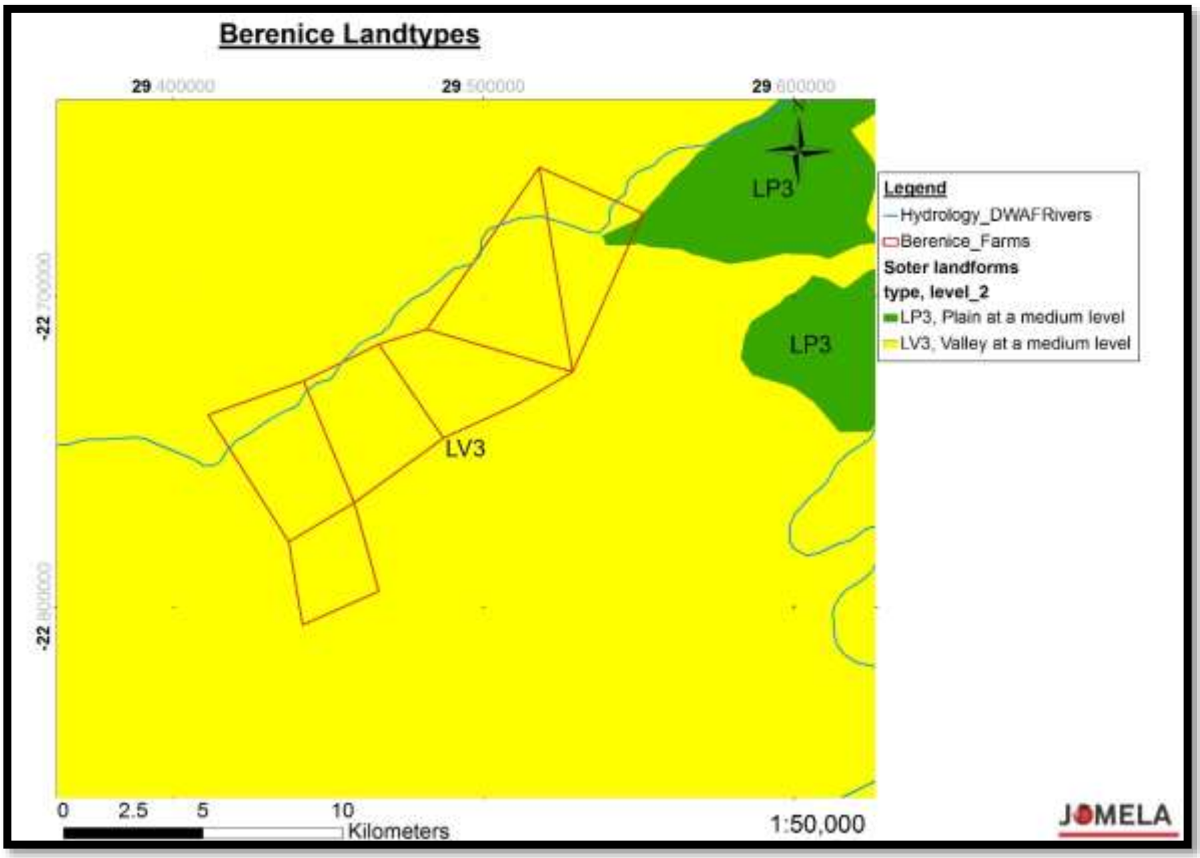


Figure 29: Soter Landforms

1.9.5.4 Surface water

Surface water spatial layers and the site visit reflected the absence of wetlands within the study site. The Brak River and multiple tributaries run through the northern sections of the study site in the farms Berenice, Celine, Longford and Matsuri. The Brak River is a tributary of the Sand River and is seasonal/non-perenial, flowing only during periods of high rainfall. The river can fill up quickly during heavy rains, and there may be a sudden torrent of water after a thunderstorm begins upstream. These flash floods will be considered in the impact assessment.

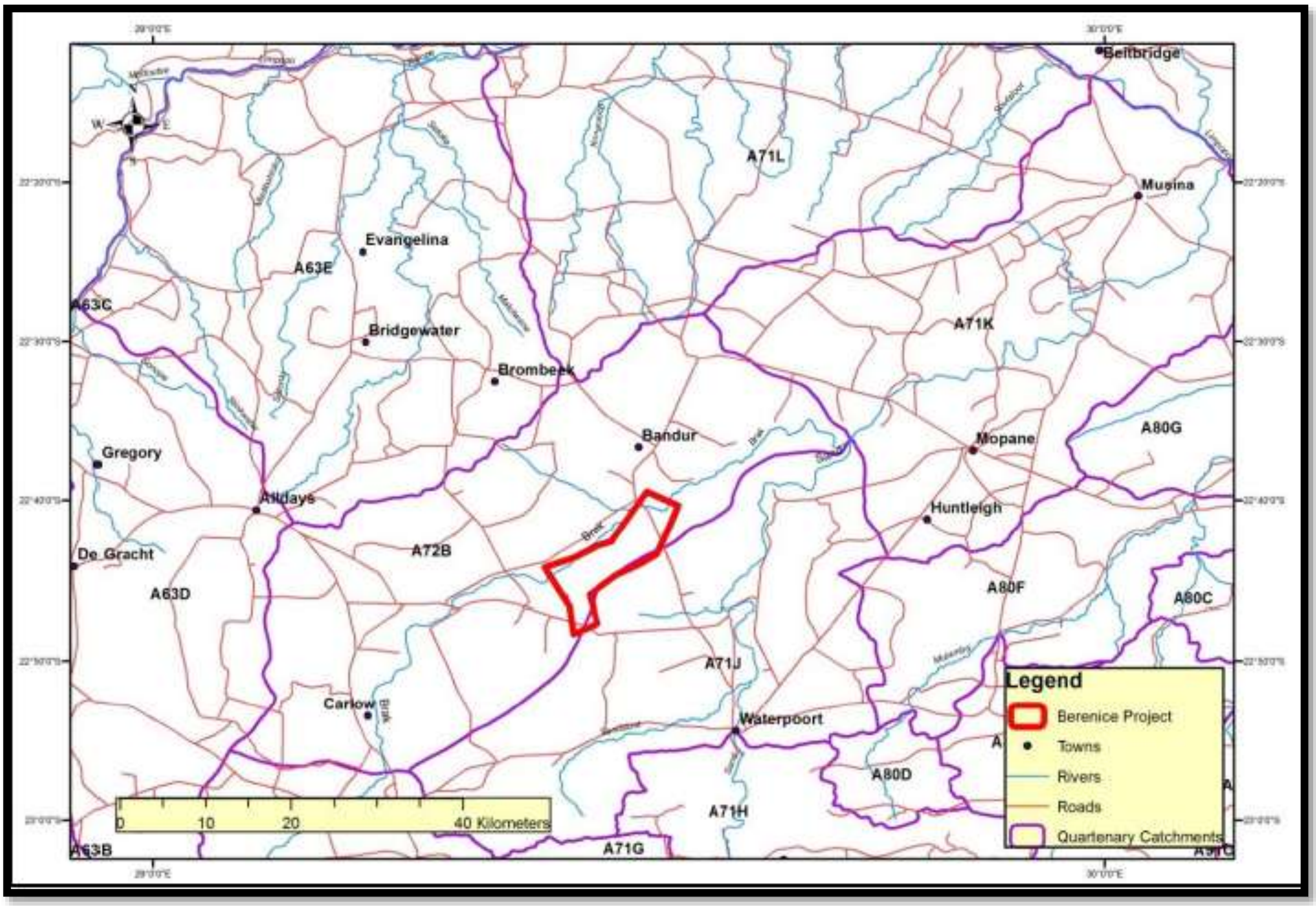


Figure 30: Quaternary Catchment

The Berenice project is located mostly in the quaternary catchment A72B and to a much lesser extent in the A71J. The drainage system in the area is defined by the non-perennial Brak River in the quaternary catchment A72B and the perennial Sand River (A71J) in the north-easterly direction. The Brak River flows in the north-easterly direction, north of the planned mine pits and mine infrastructures.

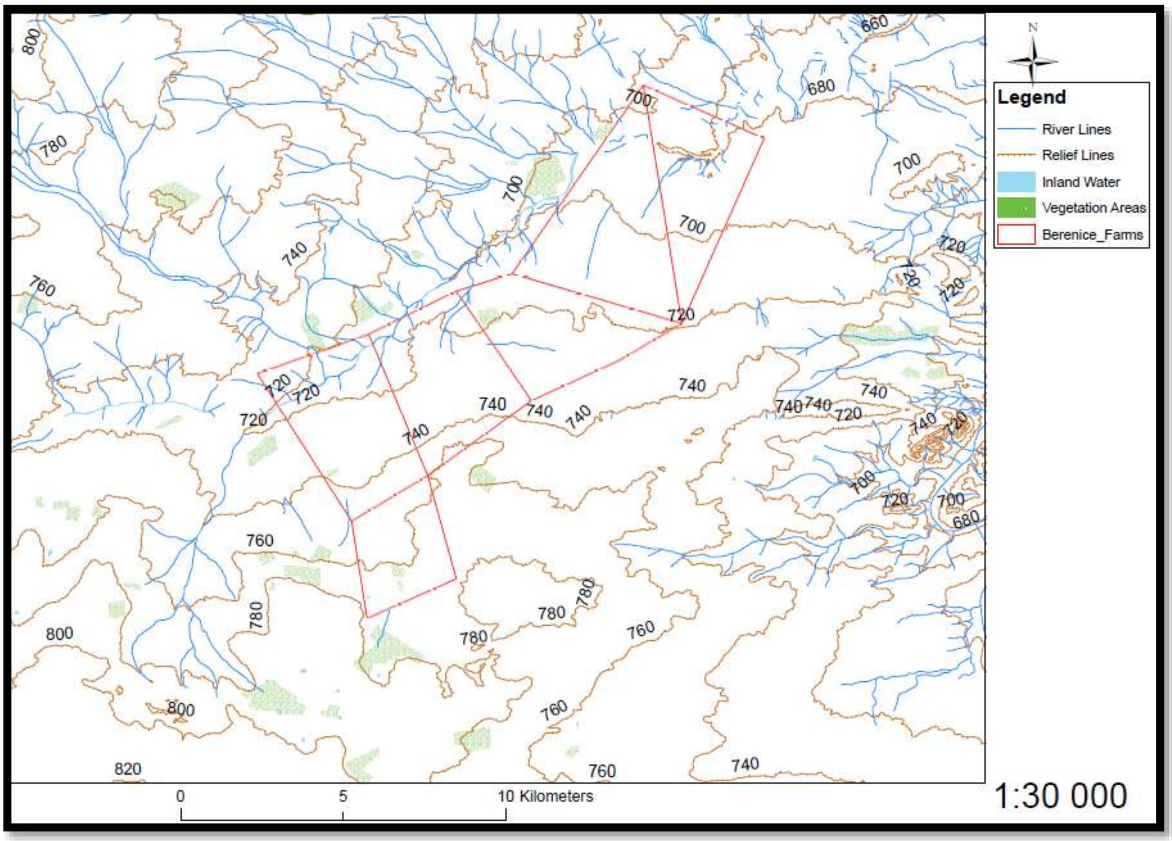


Figure 31: Hydrology of the study site and surrounds as per existing spatial layers.

1.9.5.5 Wetlands and Pans

According to a report compiled by Delterra Consulting (2017), four depression (pans) wetlands were identified on the project site during the field work conducted on the 31st of July 2014. The four pan wetlands were located at the coordinate's states below and were named pan 1 to pan 4.

- Pan 1: 22 42"23.40"S, 29 30"30.35"E
- Pan 2: 22 44"25.73"S, 29 27"27.32"E
- Pan 3: 22 43"18.50"S, 29 30"13.40"E
- Pan 4: 22 42"39.26"S, 29 30"17.06"E

However, during extensive field work conducted on the 13th of March 2017 it was observed that Pan1, 3 and 4 identified by Delterra Consulting (2017), were no longer active, whereas Pan 2 was still functioning even though the water level had dropped. During the field work a pan wetland located at Celine farm, coordinates 22.699875E, 29.520736S was also observed and assessed.
The three pans (pan 1, 3 and 4) which were previously identified by Delterra Consulting (2017), which were not functioning during the latest field assessment were not delineated. Therefore a total

of two active pans were identified and delineated for the current study. This section of results provides information gathered on site during the field work.

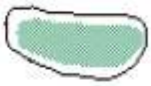
WETLAND TYPE	DESCRIPTION
Depression (including Pans) 	A basin shaped area with a closed elevation contour that allows for the accumulation of surface water (i.e. it is inward draining). It may also receive sub-surface water. An outlet is usually absent, and therefore this type is usually isolated from the stream channel network  Pan1 wetland found on farm Celine 547MS(above)

Figure 32: Pan 1 Celine

The study area consisted of two wetlands both identified as Depression/Pan wetlands according to the HGM classification system. Terrain unit indicator, vegetation type, soil wetness and the hydrology of the wetlands was used as a method to identify and verify the wetlands as depression/pan Wetlands. Of the two wetlands identified, one wetland was located within the Celine Farm and the other within the Longford Farm and the wetlands were approximately 8000m apart. The approximate size of each wetland is about 0.1 ha. The wetlands were characterised with the same wetland conditions and therefore are discussed simultaneously, with each wetland named, based on its chronological order of assessment. The wetland located in the Celine farm was assessed and named depression/pan 1 and the depression/pan wetland in the Longford farm, as depression/pan 2, which was also known as “vleipan”. However depression/pan 1 and 2 were assessed individually, concerning PES and EIS, as it is required for each HGM unit to be assessed individually.

Pan2 Wetland found in Longford farm 354MS

Figure 33: Pan 2 Longford

The location of the wetlands has been plotted below:

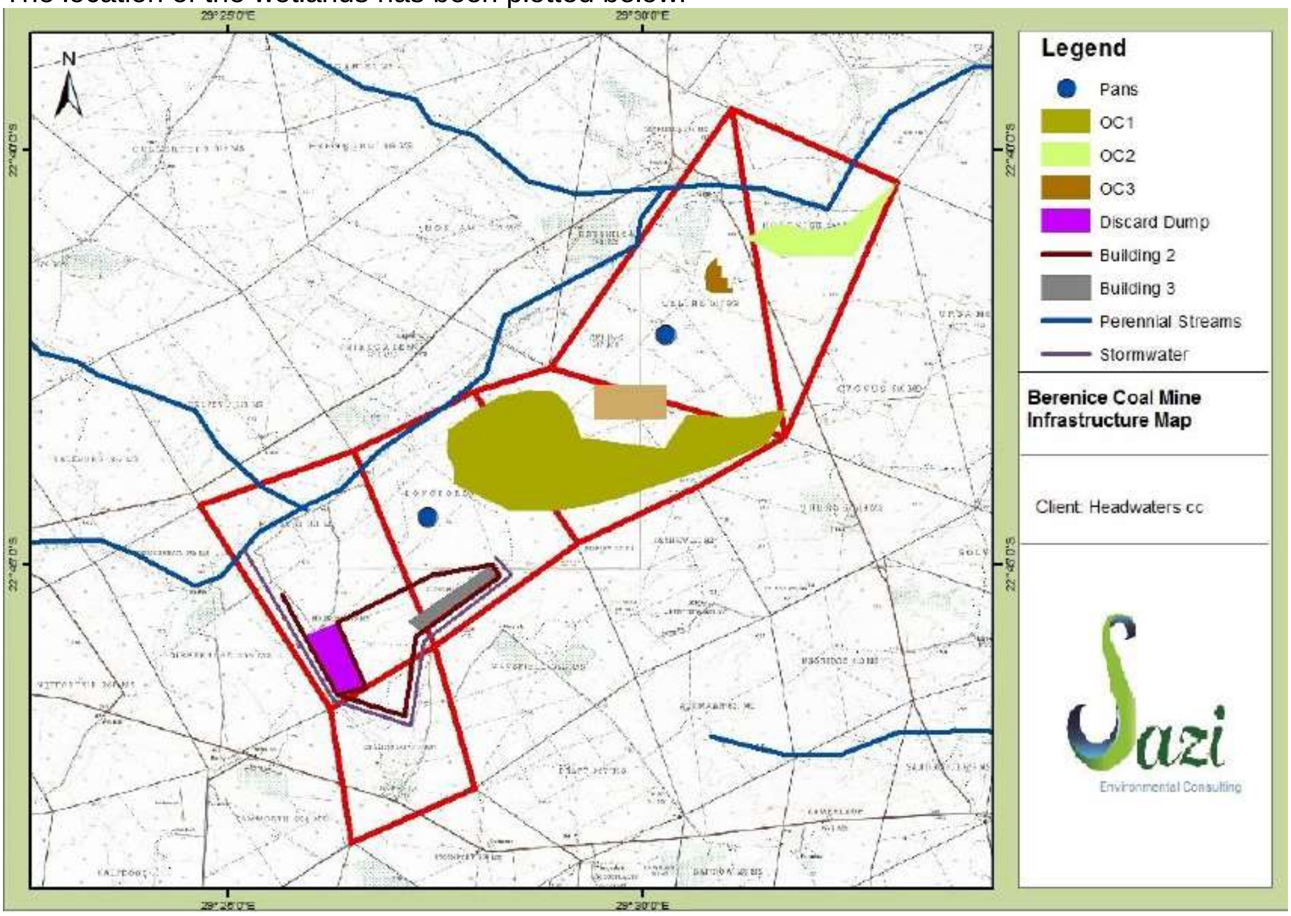


Figure 34: Wetland Location

The wetlands were assessed to be at a moderately modified state, which infers a moderate change in ecosystem processes and loss of natural habitats and biota has taken place but the natural habitat remains predominantly intact which makes the wetlands suitable for hosting a diversity of biota;

- The wetlands contribute towards maintaining biodiversity;
- The wetlands contribute towards maintaining water quality;
- The wetlands are used predominately for game farming by wild animals as a source of water supply; and
- The wetland is an important bird habitat, and birds (ducks) may use it for breeding, nesting, and rearing young. The ducks also use the wetland as a source of drinking water and for feeding, resting, shelter, and social interactions.

However, the following considerations were made about the wetlands:

- The wetlands assessed on site are considered to be intermittent, active during rainy seasons and dry out during dry seasons;
- The wetlands are not located in a protected area and are not RAMSAR sites; and
- The wetlands found on site are not rare.

1.9.5.6 Aquatic Assessment

A site visit was conducted assessing the area visually and identifying possible impacts that might occur as a result of the proposed project activities. In addition, photographs of each site are taken in order to present the condition of the area at the time of survey (10th February 2017). The following factors were taken into consideration;

- Channel condition;
- Channel morphology; and
- Riparian vegetation cover.

The habitat integrity assessment is based on the assessment of the impacts of two components of the river, the riparian zone and instream habitat. The quality of the instream and riparian habitat has a direct influence on the aquatic community. The availability of and diversity of habitats are major determinants of aquatic biota that are present in the stream. Therefore, it is important to assess the impacts of human disturbance on riparian and instream habitat such as bed and channel modification, invasive plants, reduction and transformation of indigenous riparian plants and litter.

Table 11: Summary aquatic assessment findings

Site	Site Description and observation
 **Picture 1: Downstream point of the Brak River**	• The site is located under a bridge and just after the proposed site of the Berenice Colliery, • The site is charachterised by terrestrial plant species such as *Acacia nigrescens, Cinerea dichrostachys, Grewia Flava.* The grass layer is also terrestrial grasses than aquatic. • Invasive species such as *Xanthium sibiricum, Datura stramonium, Argemone Americana and Ricinus communis* occur on the banks of the river. • No water was following. • No signs of erosion of pollution was noted on site
 **Picture 2: Upstream point of the Brak River**	• This is site is located downstream of Kudu Lodge. • A pool of water was encountered onsite but SASS 5 could not be conducted due to no flow of water. • Also the site is characterized by more of terrestrial plants such as *Ziziphus mucronata, Combretum apiculatum, Melia azedarach, and Grewia occidentalis.* Invasive plants such as *Xanthium sibiricum and Solanum mariantanum* were recorded. • No signs of erosion or any dumping was recorded or seen on site. • Erosion and bank scouring was visible.

Site	Site Description and observation
 **Picture 3: DL 1 point**	• This point is located west of the downstream point. • It is located on a non-perennial stream that collects water from the neighboring farm prior to it reaching the Brak River • The site was found to be shallow and dry charachterised by fine sand • Grass species such as *Aristida adscensionis, Eragrostis lehmanniana, Melinis repens* were recorded. With tall species such as *Cinerea dichrostachys, Grewia occidentalis and Grewia bicolor* noticed.
 **Picture 4: DL 2 – drainage line to the Brak River**	• The site/point is located on a non-perennial drainage line flowing to the Brak River. • No water was encountered. • The site has more herb layer than the tree layer. • Species such as *Solanum mariantanum, Melinis repens, Momordica balsamina, and Acacia tortilis* were recorded.

Site	Site Description and observation
 **Picture 5: DL 3 – Drainage line of the Brak River**	• The site/point is located south-west of the Brak River and the flow is to the east. • The site is not different from DL 2, because it does not have water flowing as it is a non-perennial drainage line. • No signs of erosion were recorded • Terrestrial species such as *Ipomea spp., Sida cordofolia, Sporobolus spp.,* were recorded.
 **Picture 6: Point DL 4**	• No water was flowing during the survey • The site is charachterised by grasses • No sign of erosion was observed • The drainage line flows to the northern direction until it feeds to the Brak River
 **Picture 7: DL 5 point**	• The point is located on a non-perennial drainage line that feed the Brak River • The site is dominated by grasses such as *Eragrostis curvula, Melinis repens, Urochloa mosambicens* • No water flow was encountered

1.9.5.7 Groundwater

While several boreholes were drilled within and around the Berenice project area, several comprehensive regional hydrogeological investigations of the groundwater potential in the western parts of the project area were carried out by Department of Water and Sanitation (DWS) between 1982 and 1989 (Golder, 2012). The studies were aimed at identifying additional water resources for the Alldays area and the detailed report was compiled by Fayazi and Orpen in 1989.

The information published on the 1:500 000 hydrogeological map – 2127 Messina (2002), indicate that the regional Geohydrological attributes of the area are clearly a function of the geological host matrix distribution. The groundwater in the area primarily occurs within the fractured and weathered zones or in joints and fractures of the competent arenaceous rocks, related to tensional and compressional stresses and offloading. Groundwater also occurs along the sedimentary contacts. The borehole yield potential of the Ecca Group (Pe) and differential Ecca and Clarens Formation (Pe-Trc) is classified as b3 in the 1:500 000 hydrogeological map, indicating that an average borehole yield in the group ranges between 0.5 and 2.0 l/s.

1.9.5.7.1 Hydraulic testing

Hydraulic tests were undertaken to determine the in-situ hydraulic parameters of the hydrostratigraphic units underlying the area. The hydraulic test was comprised of the test pumping of existing boreholes and slug testing of the exploration core boreholes. These tests were undertaken by Golder in 2012.

1.9.5.7.2 Slug test in the exploration core boreholes

The slug test involved positive displacement of water by injecting a known volume of water into the identified exploration and using the rate at which the water levels return to its undisturbed state to determine the hydraulic conductivity. The hydraulic conductivity values were determined using the Bouwer and Rice (1976) method.

Slug tests were performed on open exploration core boreholes with a nominal inside diameter of 150 mm. A total 14 exploration core boreholes and one monitoring borehole (H18-1522) were tested and their details are presented in Table 1 together with the estimated hydraulic conductivity (k).

Table 12: Summary of the slug testing programme

Site ID	**GPS Coordinates WGS 84**		**Depth (mbgl)**	**Water level (mbgl)**	**Est. hydraulic Conductivity (m/d)**
	Latitude	**Longitude**			
BGAC-6	-22.72335	29.51875	106	45.1	0.0353

BGAC-7	-22.73469	29.49068	71	45.9	0.0109
BGAC-8	-22.73755	29.46358	60	33.4	0.00781
BGAC-9	-22.73761	29.46354	69.1	33.5	0.1100
BGAC-10	-22.72035	29.48618	66	44	0.1400
BGAC-11	-22.72082	29.46679	-	26.3	0.0583
BGAC-12	-22.72716	29.47307	-	29.4	0.0353
BGAC-13	-22.68617	29.51700	-	32.7	0.019
BGAC-14	-22.69107	29.53883	-	32.7	0.0136
BGAC-15	-22.67328	29.53076	-	18.8	0.0295
BGAC-16	-22.73403	29.45369	91.6	20.4	0.00478
BGAC-17	-22.72931	29.50428	-	24.1	0.0215
BGAC-19	-22.70953	29.54431	-	47.4	1.3800
BGAC-21	-22.71692	29.53894	-	39	0.00025
H18-1522	-22.72976	29.53827	-	55.9	0.0581

The hydraulic conductivity of the tested areas ranges between 0.00025 and 1.38 m/d indicating a low to very high permeability (Table above). Corehole BGAC-19 was drilled through a very high permeability zone with an estimated hydraulic conductivity of 1.38 m/d. Core boreholes, BGAC-9 and BGAC-10, were drilled through a moderate permeable zone with estimated hydraulic conductivities of 0.11 and 0.14 m/d, respectively. The moderate to high hydraulic conductivities in core boreholes, BGAC-19, BGAC-9 and BGAC-10, indicate the high permeability of the fractured bedrock aquifer system and the less permeable weathered aquifer system. The low to very low hydraulic conductivities reported in other tested core boreholes suggest that the bedrock matrix is absence or the fracturing is less or very tight.

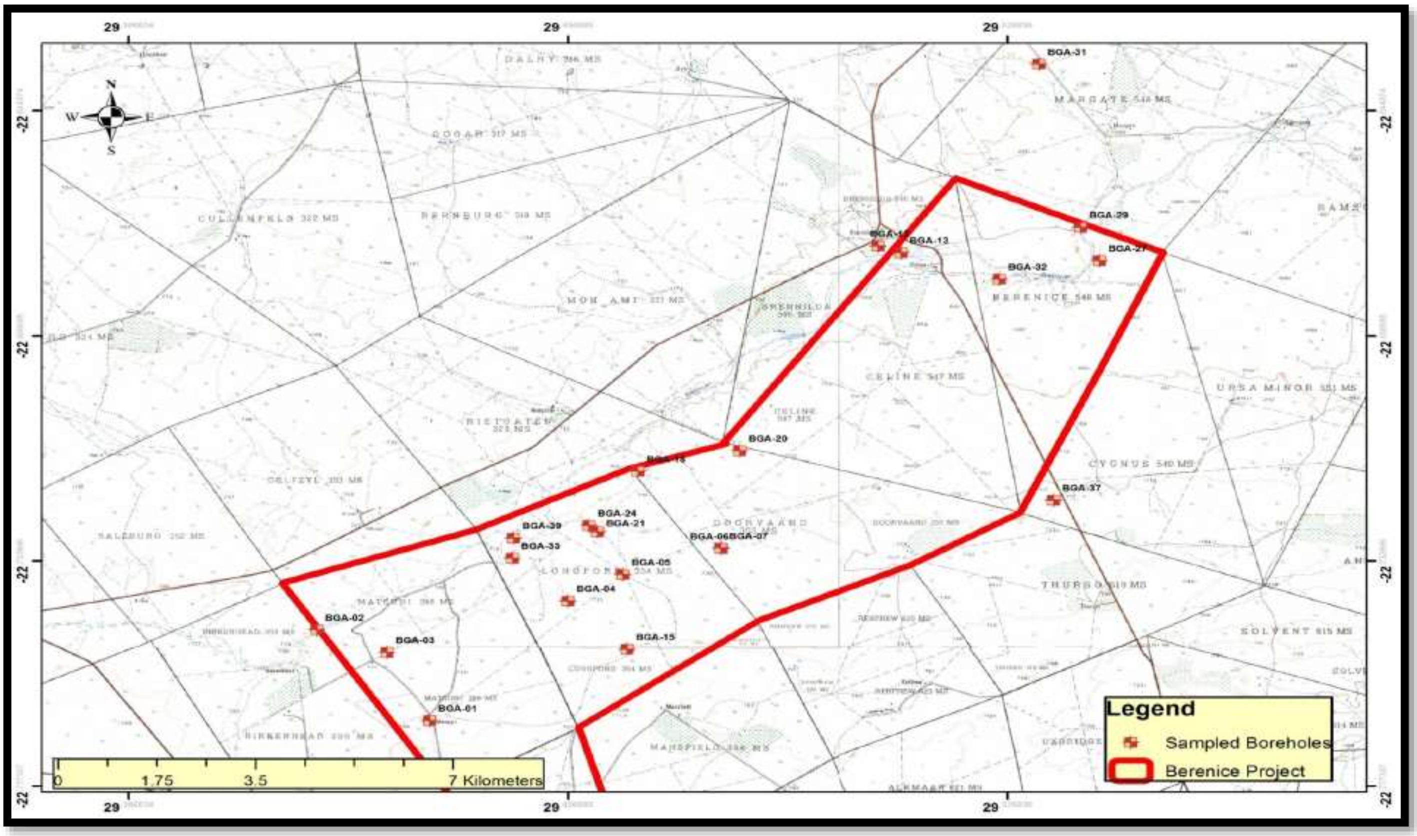


Figure 35: Sampled Boreholes

No consistent groundwater monitoring is being undertaken in the area, currently. No samples were collected and analysed in the area prior to the hydrogeological investigations by Golder in 2012. Therefore, the baseline groundwater quality is based on data obtained from water samples collected from the existing groundwater supply boreholes by Golder (2012) and Naledzi (2016). A total of 21 boreholes were sampled by Golder in 2012. Naledzi only sampled eight boreholes which were in use and pumping during the site visit. The samples were submitted to UIS Laboratories in Pretoria and Capricorn Veterinary Laboratories for analysis. The analytical results for the samples collected by Naledzi were still pending during the compilation of this report, therefore, only Golder water quality data was used to define the baseline groundwater quality in the area.

The groundwater quality information for the Berenice Coal Project was compiled to characterise the groundwater condition in the area before mining begins. The water quality gathered in this study will form part of the baseline water quality condition to be used as reference in assessing possible groundwater contamination emanating from mining activities in the future. Note the water quality presented here is a 'snap shot' and variability of the water quality should be established prior to mining.

1.9.5.7.3 Aquifers

Golder (2012) analysed the pump testing data and geological settings of the area to determine the occurrence of groundwater and to assess the types of aquifer systems that occur in the area. This analysis revealed that there are two dominant aquifer types that occur in the area, the secondary fractured aquifer system and secondary intergranular and fractured aquifer systems associated with the geological formations. The analysis of core logs revealed that the aquifer system in the area can be divided into three aquifer systems as follows.

1.9.5.7.4 Shallow weathered aquifer system

This is the predominant aquifer system present within the project area and is laterally extensive, occurring in the shallow weathered zone and weathering related fractured zone. This aquifer extends across the entire extent of the project area and ranges between 5 and 26 mbgl. This is a minor aquifer system and water drains through into the underlying aquifer systems. It is unconfined to semi-confined in nature and highly susceptible to surface induced activities and impacts.

1.9.5.7.5 Secondary intergranular and fractured aquifer system

This is the predominant and major aquifer system in the area. This aquifer system is laterally extensive occurring between the shallow weathered aquifer system and the underlying fractured aquifer system. The aquifer system is comprised of fractured zone overlain by varying thicknesses of weathered saturated materials. The groundwater storage and flow is controlled by the fractures that again act as conduits during abstraction and vertical recharge from intergranular zone.

1.9.5.7.6 Secondary fractured aquifer system

The localized fractured aquifers systems are restricted to the contact zones between the fault zone and contacts between the sedimentary sequences. Although these aquifer systems may be high yielding, they have limited storage capacity and recharge. Most of groundwater in the fractured aquifer system is drained laterally from the storage within the overlying shallow weathered and intergranular and fractured aquifer systems.

1.9.5.7.7 Groundwater levels and flow

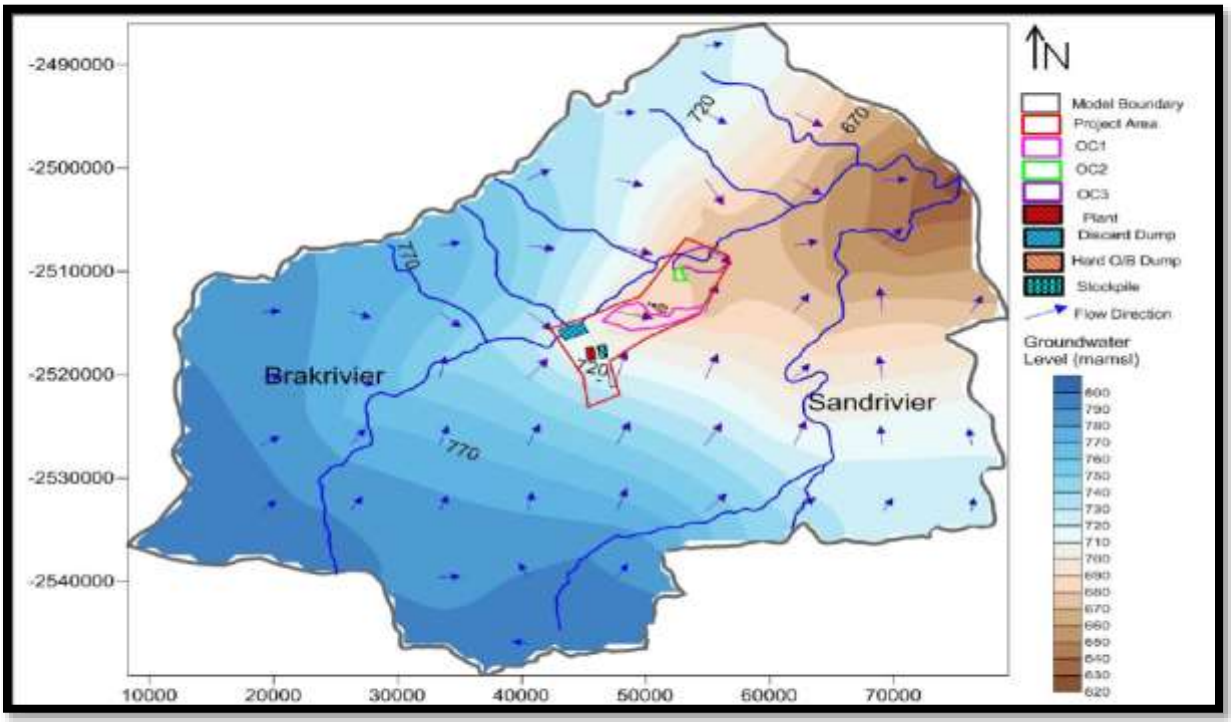
No consistent groundwater monitoring is being undertaken in the area and no water level data was available for the area until Golder conducted a hydrogeological investigation in 2012. The project baseline groundwater level is based on data obtained from:

- Water levels as measured in the existing boreholes and core boreholes by Golder 2012;
- Water levels as measured in the existing boreholes and core boreholes by Naledzi 2016.

The groundwater elevation in the Berenice Coal Project area ranges between 667 and 700 mamsl with an average of 680 mamsl. The depth to the groundwater level is generally increasing with an increase in distance from the Brak River, therefore, the groundwater flow directions is towards the River, suggesting that Brak is a gaining stream.

To assess the groundwater flow systems in the area, the water elevations were plotted against topography elevations. Two distinct sets of water elevations were identified from the collected data, the shallow weathered aquifer system characterised by water levels shallower than 26 mbgl and a ‘deeper system’ with water level deeper than 26 mbgl.

The figure below shows the correlation between groundwater and topography elevations in the shallow weathered system. There is a good correlation between topography and groundwater elevations in the shallow aquifer system, suggesting unconfined aquifer conditions and the groundwater mimics the topography.



*Please note the layout above was an alternative not the final layout

Figure 36: ***Piezometric surface map of the project area***

1.9.5.7.8 Groundwater supply potential

Universal Coal appointed Golder in 2012 and Naledzi in 2016 to undertake a preliminary hydrogeological investigation aimed at assessing the groundwater supply potential from the existing boreholes within the project area. Apart from the groundwater supply option, Universal coal also requested Golder to assess the surface water supply options. The indicated water demand for the planned mining operation was estimated at 3 to 5 Ml/day.

The groundwater potential, to supply the mine with its process water and domestic use, was evaluated from the pumping tests completed by Golder in 2012. The study concluded that the groundwater resources within the Brak River – Berenice Groundwater Management Unit should be considered as a viable water supply option for the planned mine operations. The study also indicated that an estimated volume of 1.1 Ml/day should be developed within the Berenice project area. To meet the estimated water demand for the mine operations, additional groundwater sources should be developed along the Waterpoort – Alldays road (referred as T2 by Golder).

Key aspects of the groundwater flow regime during and after mining are as follows:

- Impacts on groundwater levels are indicated by a 2m drawdown. The steady state groundwater levels are used as initial conditions to delineate further drawdown due to mining;

- The severity of groundwater drawdown on groundwater users will depend on the distance between the groundwater user and the pits. Higher drawdowns will be experienced by groundwater users closer to the pit.
- In the pits. the deeper the coal floor to the pre-mining groundwater level the higher the drawdown.
- A maximum drawdown of 10m is predicted in during mining Year 1.It should be mentioned that boreholes labelled BGAC are exploration boreholes and are not considered to represent groundwater users;
- Therefore only boreholes BGA-06. BGA-07 and BGA-09 are predicted to fall within the cone of dewatering during mining Y1 within OC1 pit.

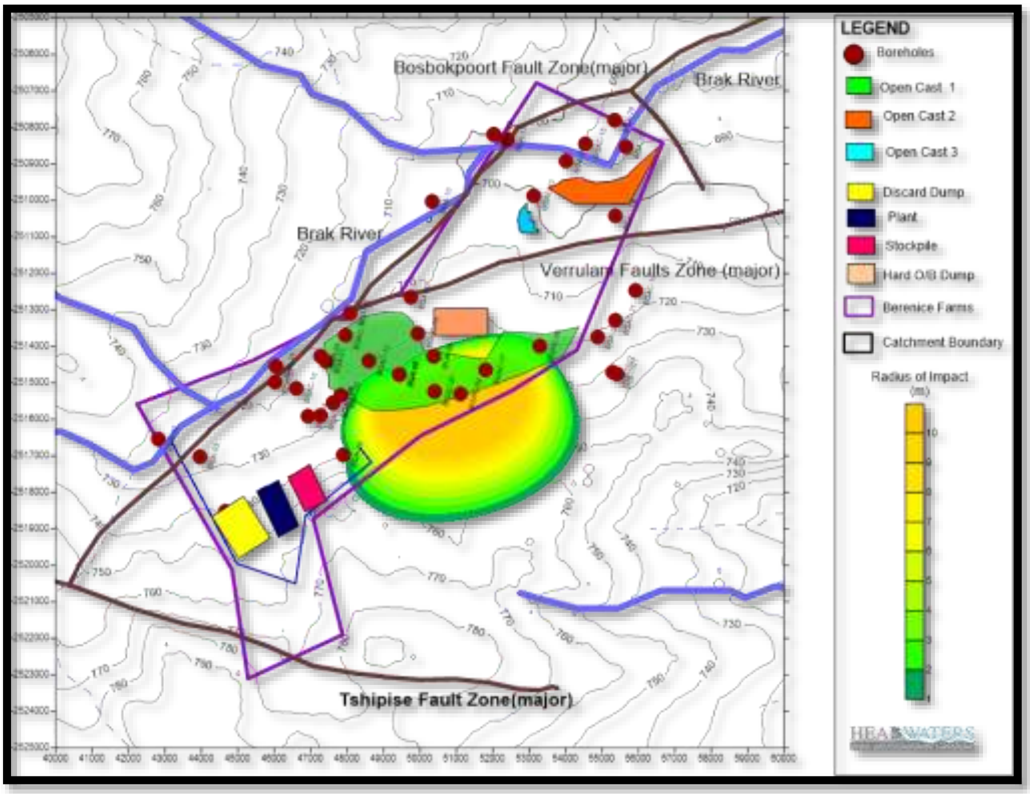


Figure 37: Year 1 transient simulated radius of impact due to mining Open Cast 1

A drawdown of 10-12m is predicted in BGA-06 and BGA-07 as shown above and mining will progress with concurrent rehabilitation. This was taken into consideration in the model. According to the mine plan Year 19 marks the last year for mining at OC1 only with a drawdown of 30m below. Then OC1 and OC2 will be mined in Year 20 which marks the final mining year in OC1.In Year 19; a maximum drawdown of 50 m is predicted in OC1.

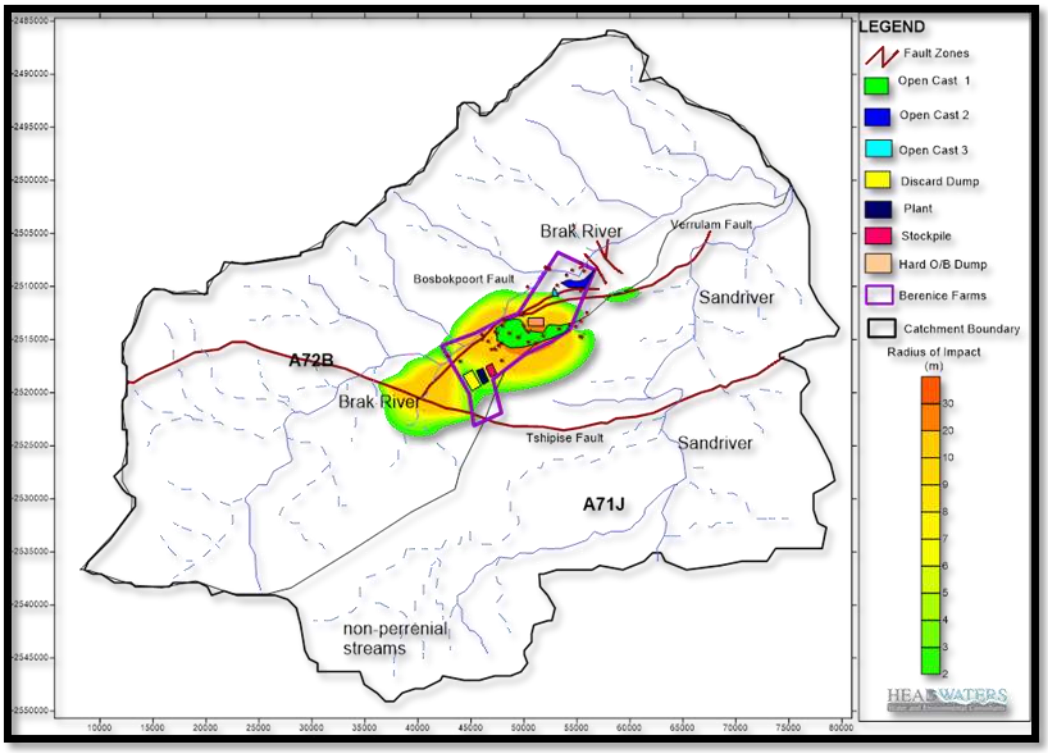


Figure 38: Year 19 transient simulated radius of impact due to mining Open Cast

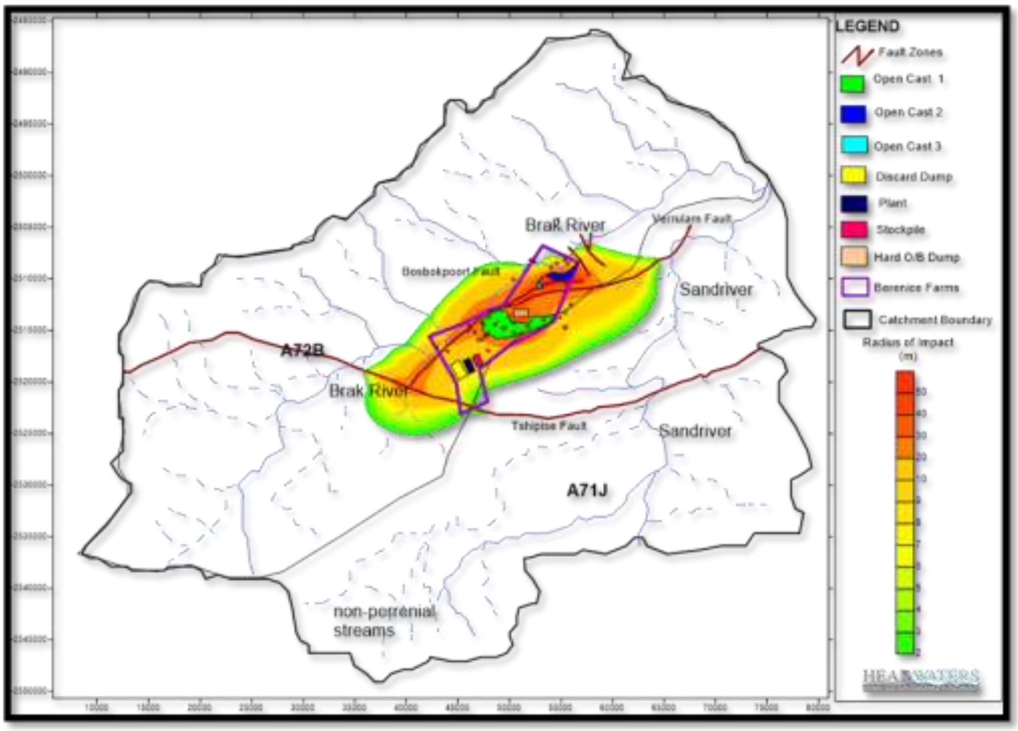


Figure 39: Year 20 transient simulated radius of impact due to mining Open Cast

With the introduction of OC2 in Year 20, the boreholes BGA-32 and BGA-27 are predicted to fall within the new drawdown cone. A drawdown of between 7m -10m is predicted for BGA 32 and BGA-27. A maximum drawdown of 50 m is predicted in OC 2 during this year.

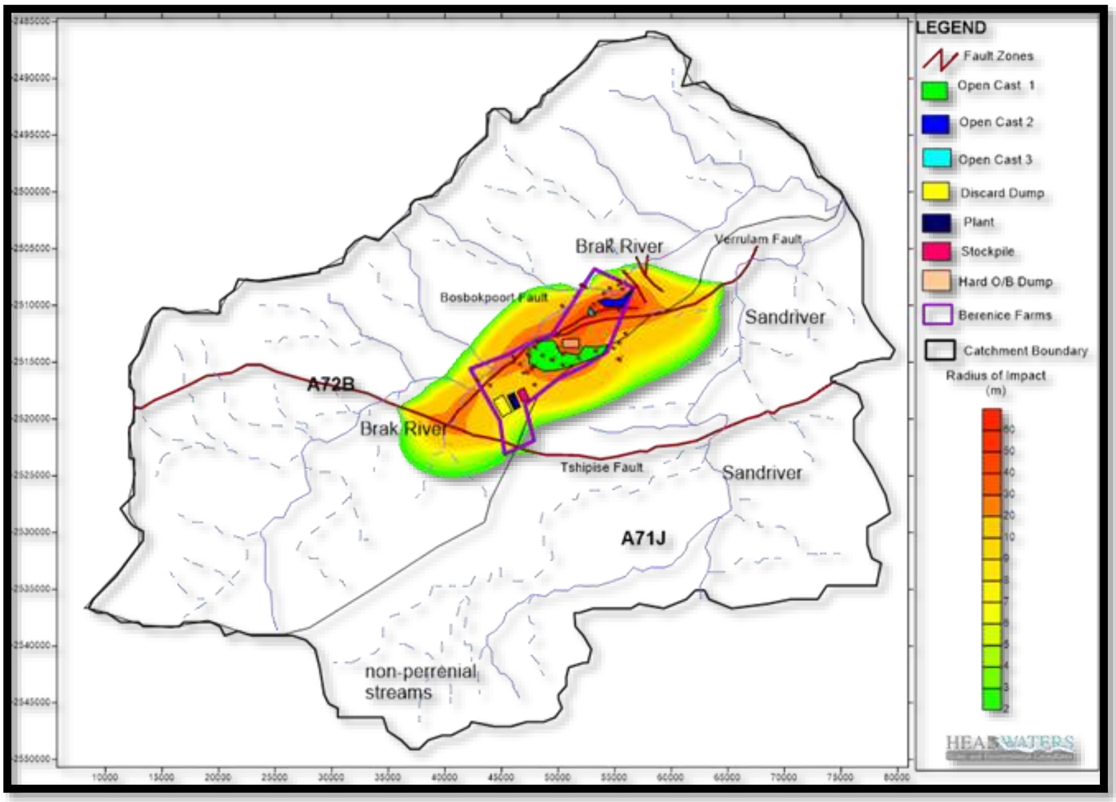


Figure 40: Year 25 radius of impact due to mining Open Cast 1 and Open Cast 2

In Year 25 groundwater levels in OC1 would have recovered for 5 years. The levels in OC1 are predicted to be at a minimum of 45m below pre-mining levels (a maximum recovery of 52m from Year 20 drawdowns). The maximum drawdown in OC2 during Year 25 is predicted to be also about 50 m. Boreholes BGA-12. BGA-17 and BGA-27 is predicted to add to the list of impacted boreholes. A 7 m drawdown is predicted in these boreholes;

The drawdown cone in the final 8 years of mining will be deepest in OC3 (58 m).The predicted drawdown cone extends to about 2km in maximum.

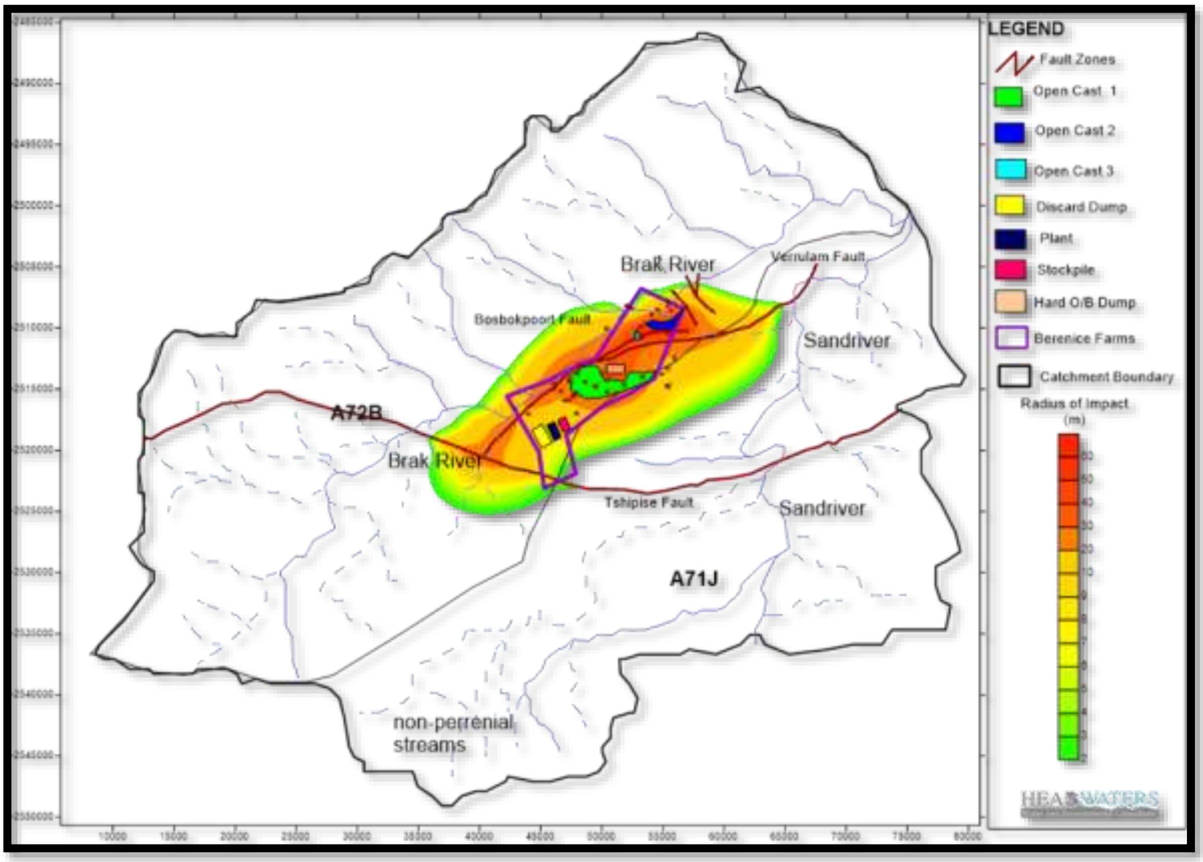


Figure 41: Year 26 to 33 radius of impact due to mining Open Cast 2 and Open Cast 3

1.9.5.7.9 Geochemical Assessment

Geochemical assessments on samples representative of the proposed Berenice Colliery residue deposits was undertaken by Naledzi Waterworks (Pty) Ltd. This section presents the baseline geochemistry for the proposed Berenice Coal mine project. The purpose of the geochemical study was to assess potential pollution impacts of the mining operations on land and water resources. These studies characterise the baseline chemical composition of the underlying geology and reactivity of the rock to be disturbed during mining. These data are used to evaluate potential environmental impacts from mining and the waste generated during mining (e.g. waste rock, run of mine and overburden) to the receiving environment.

To assess the potential for the mine waste and Run Of Mine (ROM) to act as sources of pollution the geochemical assessment and mine waste characterisation programme focused on the characterisation of the overburden, ore body (coal seams) and foot wall or formations below the coal seams. Due to the absence of existing cores from previous exploration programmes, three boreholes were drilled for sampling of the overburden, coal seams and foot wall required the geochemical assessment. The drilled boreholes were also used for groundwater baseline assessment.

The details of the drilled boreholes are presented in *Table 13*. Borehole Berenice 1 was drilled through the overburden, coal seams into the footwall. Borehole Berenice 2 and Matsuri 3 were drilled at the edge of the planned pits and never intercepted the coal seams.

A total of six samples, targeting the overburden, coal seams and foot wall were collected during the drilling of the boreholes. The details of the sampled intervals in the drilled boreholes are presented in the table below.

Table 13: Details of the sampled areas and intervals

Borehole ID	**Latitude**	**Longitude**	**Sampled intervals**	**Number of Samples**	**Target Zone**
Berenice 1	-22.678110	29.524820	8–16; 14-23; 44-67; 99-120	4	Overburden, Coal Seam, Foot wall
Berenice 2	-22.693770	29.525290	none	none	N/A
Matsuri 1	-22.751640	29.427510	0 – 3; 45 – 103	2	Overburden

The sample locations were also chosen to cover a first order reconnaissance screening of acid mine drainage (AMD) potential at the proposed Bernice Coal Mine. All samples were sent to WaterLab (Pty) Ltd in Pretoria, South Africa for analysis. The laboratory program included the following test work:

- X-ray Diffraction (XRD);
- X-ray Florescence (XRF);
- Acid-Base Accounting (ABA);
- Net- Acid Generation (NAG); and
- Synthetic Precipitation Leaching Procedure (SPLP)

The results for the whole rock analyses, ABA and leach tests are reported below.

1.9.5.7.9.1 Geochemical composition

1.9.5.7.9.1.1 XRF Results

XRF is an X-ray method used to determine the elemental composition of material that allows for the evaluation of materials chemical compound distribution, as well as the various trace element concentrations. The XRF results summarised in *Table 14* and *Table 15* indicate the oxide and trace element distributions, respectively, for various analysed samples. Major oxides present in the samples are SiO2, Al2O3, Fe2O3, CaO and MgO.

The sulphur content is low with a high lime content (CaO) indicating a low potential for acid generation with a high buffering capacity. On ignition of the test there was a high loss of material, especially in sample BH1 14/23 as the sample has never been subjected to such a high temperature procedure with a low moisture content.

Table 14: Major Element Concentration (wt %)

Major Elements	BH1 08/16	BH1 14/23	BH1 44/67	BH3 0/3	BH1 99/120	BH3 45/103
SiO_2	49,11	5,54	12,8	22,8	8,93	<0,43
TiO_2	438	342	251	222	319	10
AL_2O_3	1,81	1,93	1,86	1,06	2,65	1,36
Fe_2O_3	1,4	4,59	3,77	4,79	8,21	16,14
MnO	0,56	0,03	<0,01	<0,01	0,06	0,23
MgO	0,85	0,96	0,33	0,44	0,08	14,58
CaO	1,41	0,59	0,58	0,13	0,2	7,08
Na_2O	0,13	0,24	0	0,05	0,11	1,32
K_2O	0,69	2,07	1,15	1,57	0,5	0,61
P_2O_5	0,3	0,07	0,05	0,07	0,12	0,016
Cr_2O_3	<0,01	<0,01	<0,01	<0,01	<0,01	0,15
SO_3	<0,01	0,06	0,06	<0,01	<0,01	0,03
LOI	13,46	27,13	34,29	6,34	13,88	5,15
Total	99,29	100,5	99,49	99,97	99,9	100,18

H_2O	0,78	1,7	1,1	1,2	0,47	0,39

The trace elements distribution was compared to average crustal values and in most cases is higher than normal (*Table 15*). The trace elements with concentration values above the Upper Continental Crust values are highlighted below. The presence of these trace elements in concentration above Upper Continental Crust values is however no indication of any potential impacts or leachability. All heavy metals expected in the samples in small quantities are present with As, Cu and Mo mostly prone to dissolve and be removed from the solid system**.**

Table 15: Trace Element Concentration (ppm) [s]

Trace Elements	**Upper continental Crust**	**BH1 08/16**	**BH1 14/23**	**BH1 44/67**	**BH3 0/3**	**BH1 99/120**	**BH3 45/103**
As	1,5	6,43	5,54	12,8	22,8	8,93	<0,43
Ba	550	438	342	251	222	319	10
Bi	1,27	1,81	1,93	1,86	1,06	2,65	1,36
Cd	98	<3,04	<3,04	<3,04	9,1	<3,04	13,4
Ce	64	59,3	32,8	60,2	64,4	95,3	25,2
Co	17	<0,56	<0,56	<0,56	<0,56	<0,56	<0,56
Cs	4,8	1,36	1,12	1,23	1,24	1,26	1,15
Cu	25	26,3	<4,19	5,11	7,45	35,7	12,6
Ga	17	26,7	18,4	19,8	21,9	7	25,7
Ge	1,6	<0,50	<0,50	<0,50	<0,50	<0,50	<0,50
Hf	5,8	6,28	6,27	6,35	6,23	6,2	6,1
Hg	9	<1,00	<1,00	<1,00	<1,00	<1,00	<1,00
La	30	90,6	74,7	74,5	78,1	61,1	22,3
Lu	0,32	1,71	2,26	2,07	2,47	3,3	4,87
Mo	1,5	2,32	2,25	1,96	1,82	2,25	2,37
Nb	12,5	29,8	7,28	6,57	8,08	22,5	2,15

Trace Elements	Upper continental Crust	BH1 08/16	BH1 14/23	BH1 44/67	BH3 0/3	BH1 99/120	BH3 45/103
Nd	26	56,6	25,1	49,7	33,7	26,8	<2,39
Ni	50	36,1	22,6	20,8	30	77,7	433
Pb	16	<2,03	<2,03	<2,03	<2,03	<2,03	128
Rb	112	48,6	101	59,8	78	33,7	19,6
Sb	0,2	1,71	<1,48	<1,48	3,18	<1,48	<1,48
Sc	13	17,6	17	17,2	16,1	15,5	35,4
Se	50	0,71	0,73	1,23	2,08	0,59	<0,36
Sm	4,5	12,1	12,5	13,2	12,8	15	16,4
Sn	5,5	2,52	4,62	4,55	4,42	5,87	10,9
Sr	350	152	104	60,2	82,3	84,1	50,5
Ta	1,1	0,81	0,58	0,62	1,07	0,56	1,2
Th	10,7	23,4	10,6	12,4	15,6	15,9	1,58
Tl	0,75	2,37	2,23	2,18	1,98	1,7	1,74
U	2,8	4,05	4,07	5,21	28,9	2,75	<0,74
V	110	180	124	134	145	192	183
W	2	0,6	0,86	0,85	1,01	1,15	1,79
Y	22	38,7	27,7	30,4	44,6	41,2	24,6
Yb	2,2	<1,05	2,27	2,21	3,34	3,92	9,22
Zn	71	20,8	65,5	17,5	79,5	86,9	35,3
Zr	190	313	161	180	258	289	89,8

1.9.5.7.9.1.2 XRD

The X-Ray Diffraction (XRD) tests allows for the measurement of the crystal structures within a sample to determine the mineralogical composition of the material. The XRD test is an X-ray method used to determine the elemental composition of a material. The XRD results for the proposed Berenice Coal Mine project are summarised in *Table 16*. The results show that minerals were formed through the combination of the trace elements and oxides as discussed in the previous section

Table 16: Mineralogy

Mineral	Formula	BH1 08/16	BH1 14/23	BH1 44/76	BH3 0/3	BH1 99/120	BH3 45/103
Actinolite	$Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$	-	-	-	-	-	39.63
Anatase	TiO_2	1.4	0.67	0.97	0.59	1.07	-
Calcite	$CaCO_3$	0.38	0	1.12	0.26	0.29	-
Chlorite	(Mg,Fe, I)6(Al,Si)4O10(OH)8	-	-	-	-	-	9.53
Hematite	Fe_2O_3	0.03	0.23	0	0.03	0.05	-
Kaolinite	$Al_2Si_2O_5\ (OH)_4$	69.69	25.09	43.72	36.52	57.28	3.91
Lizardite	$Mg_3Si_2O_5(OH)_4$	-	-	-	-	-	2.83
Microcline	$KAlSi_3O_8$	3.12	7.27	5.61	2.1	2.85	4.4
Muscovite	$KAl_2(AlSi_3O_{10})(OH)_2$	3.58	16.49	7.85	10.73	4.11	5.27
Plagioclase	(Na,Ca)(Si,Al)4O8	1.46	3.12	1.44	0.54	1.24	16.03
Pyrite	FeS_2	0.26	1.79	1.98	0.17	0.27	-
Quartz	SiO_2	18.63	44.37	34.78	49.05	25.8	8,44
Siderite	$FeCO_3$	1.47	0.97	2.53	0	7.04	-
Talc	$Mg_3Si_4O_{10}(OH)_2$	-	-	-	-	-	9.95

In general the samples from BH1 have a similar mineralogy, dominated by silicates and alumino-silicates. Alumino-silicate minerals like Kaolinite and Muscovite, which are present in significant wt% (Table above), can buffer at low pH. Siderite seems to be the most dominant carbonate mineral. Calcite is also present but in smaller wt %. No dolomite was found in the samples. This indicates that calcite will act as a first line of defence in AMD neutralisation before buffering with siderite kicks in. The pyrite content from BH1 varies between 0.26 and 1.98 wt %.

The presence of pyrite in each of the samples indicates a potential for the materials to generate acid. The oxidation of pyrite, with subsequent oxidation and hydrolysis of the released iron at pH above 3 to 3.5 produces goethite, sulphate and sulphide-S. Sample BH1 44/76 has the highest amount of pyrite (1.98 %) followed by BH14/23 (1.79 %). What is interesting is the absence of calcite and presence of siderite in BH 14/23.

The absence of calcite in BH1 14/23 indicates that more Fe than Ca will be present in solution after the initial acid production at neutral pH. Sample BH3 45/103 shows a difference in its elemental composition, with a complete absence of pyrite and calcite.

1.9.5.7.9.2 ABA and NAG

Acid-Base Accounting (ABA) is a first order classification procedure whereby the acid neutralising potential (NP) and acid-generating potential (AP) of rock samples are determined, and the difference is calculated as the Net Neutralising Potential (NNP). It is a static procedure and provides no information on the rate with which acid generation or neutralisation will proceed, which is usually determined by kinetic weathering or leaching tests.

The ABA procedure includes a NAG test that evaluates the Net Acid Generation or Neutralising Potential of the material, to evaluate the potential of the material to counter acid production.

Acid drainage is assessed by:

- Net neutralising potential (NNP) = Neutralisation Potential (NP) – Acid Potential (AP);
- Neutralising Potential Ratio (NPR) = NP/AP;
- NNP <0, potential to generate acid;
- NNP>0, non-acid generating;
- NPR> 2, non-acid generating;
- 1>NPR<2, inconclusive or uncertain with regard to acid generation; and
- NPR <1, potential acid generating.

Paste pH, also included in the ABA procedure, is a rapid measure of the current geochemical condition of the sample due to the presence of weathering products on the surfaces, and ion exchange (Usher et al., 2003). Statistically, samples with a paste pH smaller than 4 are considered potentially acid forming and contain significant acidic sulphate salts (up to 30.1 kg H2SO4/t equivalent) that will immediately produce acid upon exposure to water. Samples with a paste pH of

4 to 5 are considered potentially acid forming as well but have a lower stored acidic salt content (up to 9.0 kg H2SO4/t equivalent) (Weber et al, 2006).

Key findings of the results presented in *Table 17*, below and are summarised as follows:

- All samples have a neutral pH of 7.5 and above. This indicates that the samples have sufficient base material to prevent immediate acidification during oxidation. The high values indicate the presence of significant alkaline phases;
- The total sulphur concentrations in samples BH1 08/16, BH3 0/3 and BH3 45/103 are below the recommended 0.3%. The samples with sulphur above the 0.3% value material have an acid generating potential; and
- Based on the NNP results, the BH1 14/23 and BH1 44/67 samples can be classified as potential acid generators. Sample BH 1 99/120 can generate acid under certain system conditions.
- Samples BH1 08/16, BH3 0/3, and BH3 45/103 are non-acid generating.

Table 17: **ABA results**

Sample ID	**BH1 08/16**	**BH1 14/23**	**BH1 44/67**	**BH3 0/3**	**BH1 99/120**	**BH3 45/103**
Paste pH	7.6	8.2	7.9	7.6	7.5	9.5
Total Sulphur (%) LECO	0	2,36	1,68	0	0,37	0
Acid Potential (AP) (Kg/t)	0.031	74	53	0.031	12	0.031
Neutralization Potential (NP)	5	15	12	3,25	4	42
Net Neutralization Potential (NNP)	4.97	-59	-41	3,22	-7,56	42
Neutralising Potential Ratio (NPR)	160	0.197	0.224	104	0.346	1352
Verdict	**Non-Acid Generating**	**Potentially Acid Generating**	**Potentially Acid Generating**	**Non-Acid Generating**	**Acid under certain condition**	**Non-Acid Generating**

Note: NNP< -20: Negative NP means that the sample has no neutralising potential

1.9.5.7.10 Leachate Tests and Total Element Analysis

Distilled Water (DW) leachate tests were done to simulate the heavy metal leachate potential of the samples under normal conditions, with only neutral water allowing leaching to occur.

This test was used to simulate and evaluate the potential of any heavy metal or ion contamination from the waste materials to the groundwater environment. Although the leach test can determine the leachability of determinants, the liquid-to-solid ratio may not represent actual field conditions; therefore, resultant concentrations may not be representative of seepage that could emanate from site. The tests are commonly used as a preliminary screening process to identify potential constituents of concern (CoC) based on a comparison against relevant water quality and effluent standards. The leachability test results are presented in the table below, and interpreted as follows:

- The leachate results indicate that the interaction of BH1 material with clean water releases high concentration of aluminium. All other heavy metals will be below guideline limits under such neutral conditions; and Leachate from BH3 will not pose any risk to the groundwater system

Table 18: Leachate results

Parameters (mg/L)	Sample Name					
	BH1 08/16	**BH1 14/23**	**BH1 44/67**	**BH3 0/3**	**BH1 99/120**	**BH3 45/103**
As	<0.010	<0.010	<<0.010	<0.010	<0.010	<0.010
Al	2.01	0.494	0.39	3.82	0.442	0.11
B	<0.010	0.021	0.015	0.02	<0.010	<0.010
Ba	0.019	0.017	0.055	0.016	<0.010	<0.010
Ca	<1	2	6	<1	<1	2
Cd	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Co	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cr	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cu	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Fe	0.126	0.087	0.087	0.031	1.35	0.123
Hg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
K	0.9	2.3	1.7	2	<0.5	0.6
Mg	<1	2	2	<1	<1	1
Mn	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

Parameters (mg/L)	Sample Name					
	BH1 08/16	BH1 14/23	BH1 44/67	BH3 0/3	BH1 99/120	BH3 45/103
Mo	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Na	7	12	7	9	6	3
Ni	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Pb	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Sb	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Se	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
V	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Zn	<0.010	<0.010	<0.010	0.02	<0.010	<0.010

1.9.5.7.11 Waste Classification

Table 19 and Table 20 present the analysis of the samples in accordance to the NEM: WA Regulation (2013). The samples have been compared with the Total Concentration Threshold (TCT) and Leachable Concentration Threshold (LCT).

Key findings are:

- The TCT0 threshold for arsenic is exceeded in sample BH1 08/16, BH1 44/67, BH3 0/3 and BH1 99/120;
- The TCT0 threshold for barium is exceeded in all samples;
- The TCT0 threshold for copper is exceeded in sample BH 1 99/120;
- The TCT0 threshold for nickel and lead are exceeded in sample BH3 45/103;
- The TCT0 threshold for vanadium is exceeded in sample BH1 08/16, BH1 99/120 and BH3 45/200; and
- All samples fall below the LCT1 and TCT2 limits.

Based on the findings, the materials from the proposed pits have a TC classification of TCT0 < TC ≤ TCT1, and an LC classification of LC ≤ LCT0. All samples are therefore classified as Type 3 waste.

Table 19: Total concentration classification

Parameters (mg/L)	NEM:WA Total Concentration Thresholds			BH1 08/16	BH1 14/23	BH1 44/67	BH3 0/3	BH1 99/120	BH3 45/103
	TCT0	TCT1	TCT2						

units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
As, Arsenic	5,8	500	2000	6,43	5,54	12,8	22,6	8,93	<0,43
Ba, Barium	62,5	6250	25000	348	342	251	222	319	104
Cd, Cadmium	7,5	260	1040	<3,04	<3,04	<3,04	9,1	<3,04	13,4
Co, Cobalt	50	5000	20000	<0,56	<0,56	<0,56	<0,56	<0,56	<0,56
Cu, Copper	16	19500	78000	26,3	<4.19	5,11	7,45	35,7	12,6
Hg, Mercury	0,93	160	640	<1,00	<1,00	<1,00	7,45	<1,00	<1,00
Mo, Molybdenum	40	1000	4000	2,34	2,25	1,96	7,45	2,26	2,37
Ni, Nickel	91	10600	42400	36,1	22,6	20,8	7,45	77,7	433
Pb, Lead	20	1900	7600	<2,03	<2,03	<2,03	7,45	<2,03	128
Sb, Antimony	10	75	300	1,71	<1,48	<1,48	7,45	<1,48	<1,48
Se, Selenium	10	50	200	0,71	0,73	1,23	7,45	0,59	<0,36
V, Vanadium	150	2680	10720	180	124	134	7,45	192	183
Zn, Zinc	240	160000	640000	20,8	65,5	17,5	7,45	86,9	35,3

Table 20: Leachable concentration classification

Parameters (mg/L)	**NEM:WA Total Concentration Thresholds**				**Distilled water test samples**					
	TCT0	**TCT1**	**TCT3**	**TCT2**	**BH1 08/16**	**BH1 14/23**	**BH1 44/67**	**BH3 0/3**	**BH1 99/120**	**BH1 99/120**
units	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
As, Arsenic	0,01	0,5	1	4	<0,010	<0,010	<0,010	<0,010	<0,010	<0,010
Ba, Barium	0,5	25	50	200	<0,010	0,021	0,015	0,02	<0,010	<0,010
Cd, Cadmium	0,003	0,15	0,3	1,2	<0,010	<0,010	<0,010	<0,010	<0,010	<0,010
Co, Cobalt	0,5	25	50	200	<0,010	<0,010	<0,010	<0,010	<0,010	<0,010
Cr Total, Chromium Total	0,1	5	10	40	<0,010	<0,010	<0,010	<0,010	<0,010	<0,010
Cu, Copper	2	100	200	800	<0,010	<0,010	<0,010	<0,010	<0,010	<0,010

Parameters (mg/L)	NEM:WA Total Concentration Thresholds				Distilled water test samples					
	TCT0	**TCT1**	**TCT3**	**TCT2**	**BH1 08/16**	**BH1 14/23**	**BH1 44/67**	**BH3 0/3**	**BH1 99/120**	**BH1 99/120**
Hg, Mercury	0,006	0,3	0,6	2,4	<0,010	<0,010	<0,010	<0,010	<0,010	<0,010
Mn, Manganese	0,5	25	50	200	<0,025	<0,025	<0,025	<0,025	<0,025	<0,025
Mo, Molybdenum	0,07	3,5	7	28	<0,010	<0,010	<0,010	<0,010	<0,010	<0,010
Ni, Nickel	0,07	3,5	7	28	<0,010	<0,010	<0,010	<0,010	<0,010	<0,010
Pb, Lead	0,01	0,5	1	4	<0,010	<0,010	<0,010	<0,010	<0,010	<0,010
Sb, Antimony	0,02	1	2	8	<0,010	<0,010	<0,010	<0,010	<0,010	<0,010
Se, Selenium	0,01	0,5	1	4	<0,010	<0,010	<0,010	<0,010	<0,010	<0,010
V, Vanadium	0,2	10	20	80	<0,010	<0,010	<0,010	<0,010	<0,010	<0,010
Zn, Zinc	5	250	500	2000	<0,010	<0,010	<0,010	<0,010	<0,010	<0,010

1.9.5.8 Air Quality

1.9.5.8.1 Sampling points

The sampling layout was established to ensure that a regional overview could be obtained for the entire area, and although limited to only one of the applicable properties, due to the homogenous nature of the area and no other influencing activities in close proximity to the site, the layout as illustrated here is sufficient to obtain a baseline for the entire area. Sampling receivers have been established in close proximity to activities which might result in increased dust deposition and atmospheric dust pollution such as open exposed soil surfaces, agricultural fields, gravel and main roads.

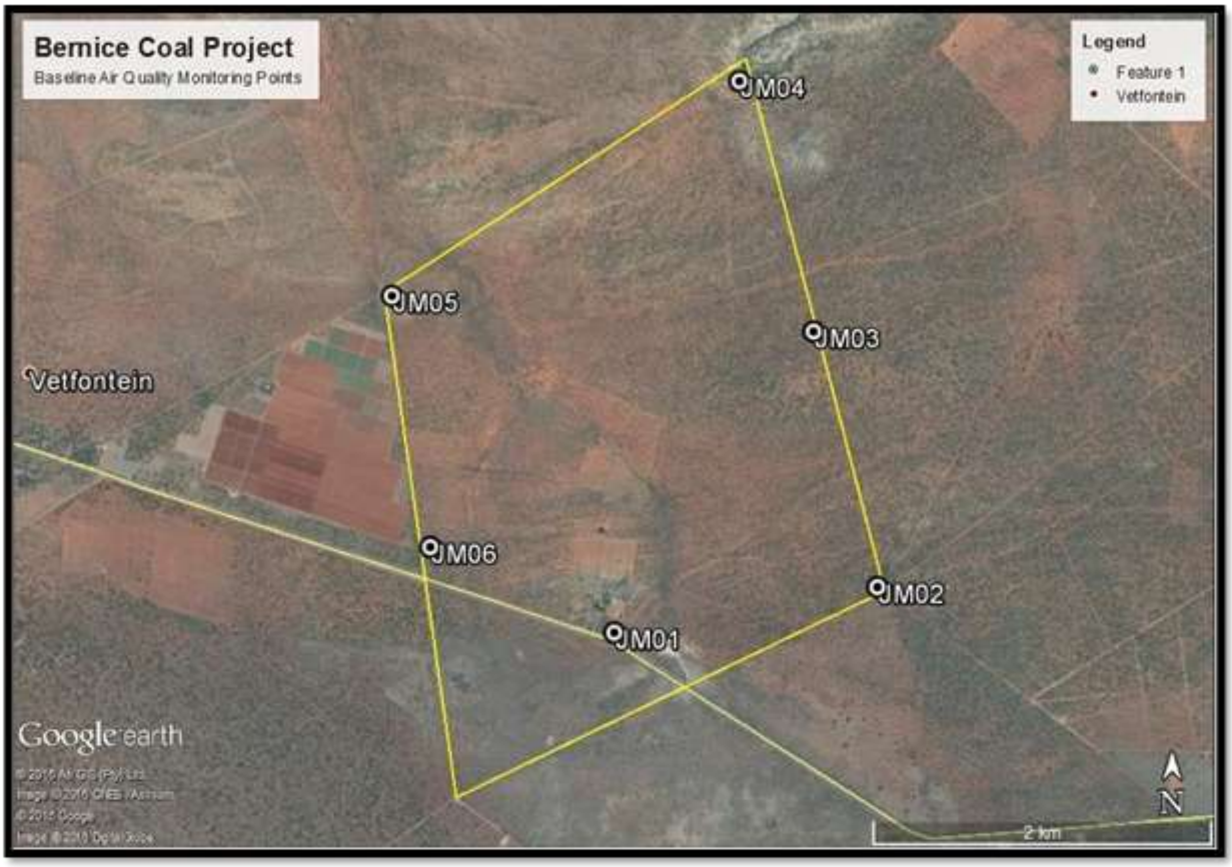


Figure 42: Air quality measurement locations during field visit

1.9.5.8.2 Gravimetric Dust Fallout

Proposed baseline air quality samples for gravimetric dust fallout were taken for 30day exposure period. This serves as an emission inventory and reference whilst mining activities commence. It should however be noted that the onsite measurements during the field visit is only applicable to the time period when sampling took place (May to June 2016) and does not take into account seasonal and other local variables that might occur during other months. However, it is still a good general overview of the existing air quality climate.

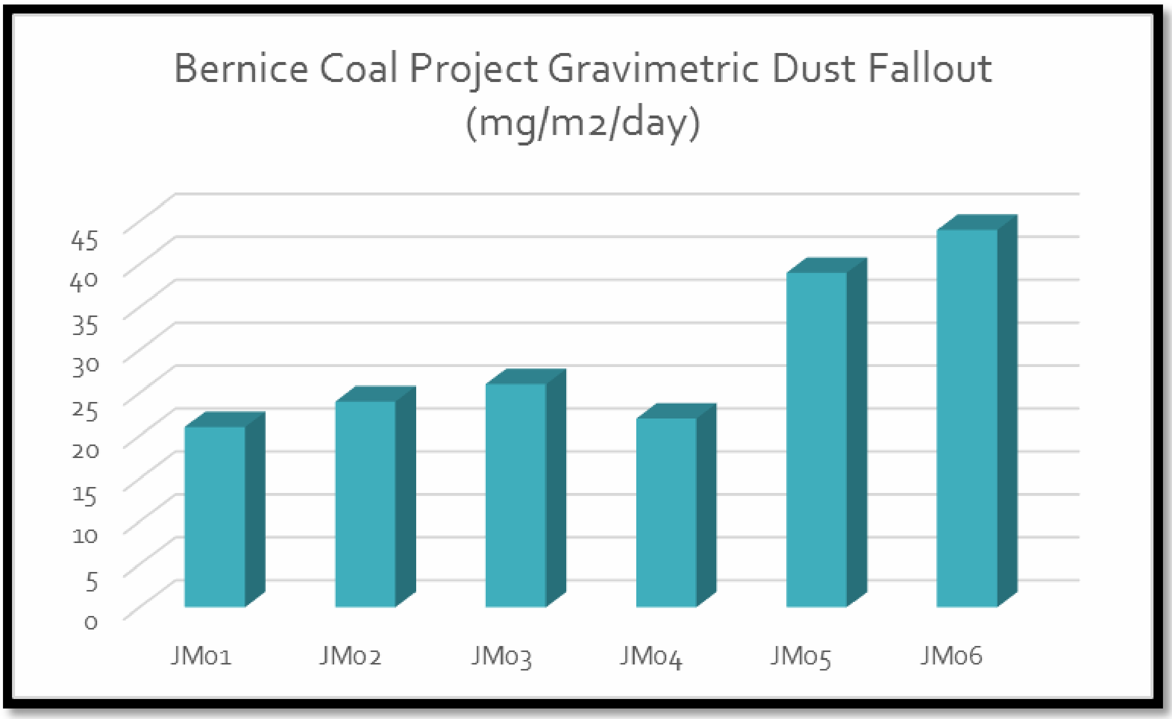
Table 21: Gravimetric Dust Fallout in mg/m2/day analytical results

Analyses	Method Identification	Sample Identification: Jomela Consulting Makhado			
		JM 01		JM 02	
Sample Number		10682		10683	
Units		mg	mg/m²/day	mg	mg/m²/day
Dust Fallout	WLAB057	14	21	16	24

Analyses	Method Identification	Sample Identification: Jomela Consulting Makhado			
		JM 03		JM 04	
Sample Number		10684		10685	
Units		mg	mg/m²/day	mg	mg/m²/day
Dust Fallout	WLAB057	18	26	15	22

Analyses	Method Identification	Sample Identification: Jomela Consulting Makhado			
		JM 05		JM 06	
Sample Number		10686		10687	
Units		mg	mg/m²/day	mg	mg/m²/day
Dust Fallout	WLAB057	27	39	30	44

A graphic presentation of the results is show below:



Graph 1: Gravimetric Dust Fallout in mg/m2/day

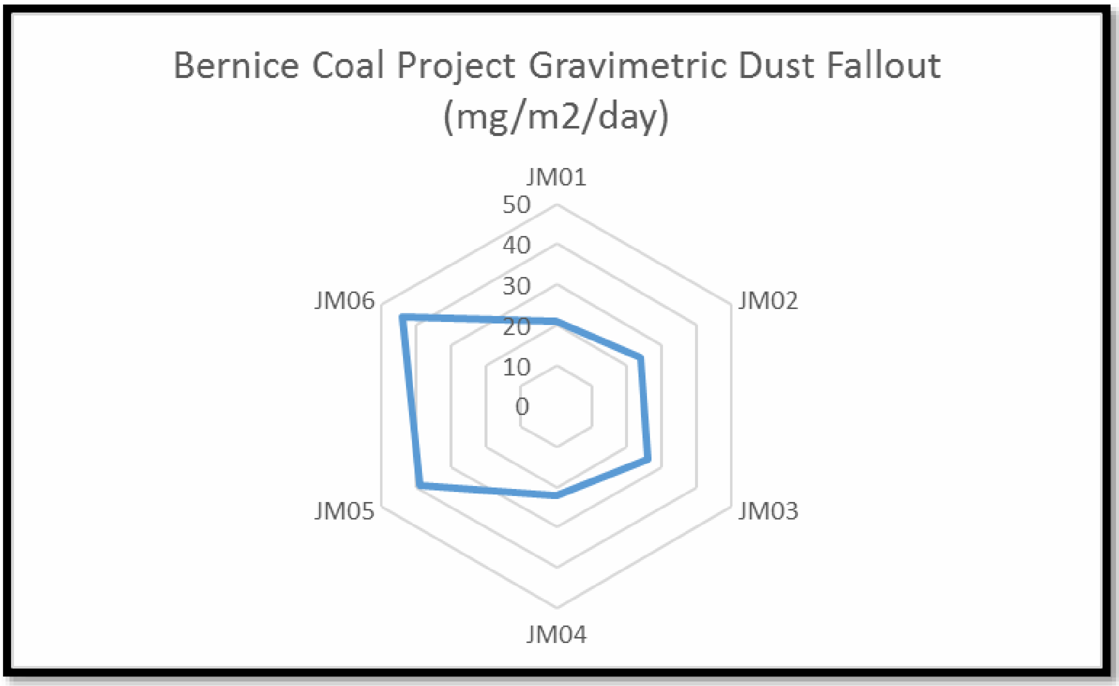
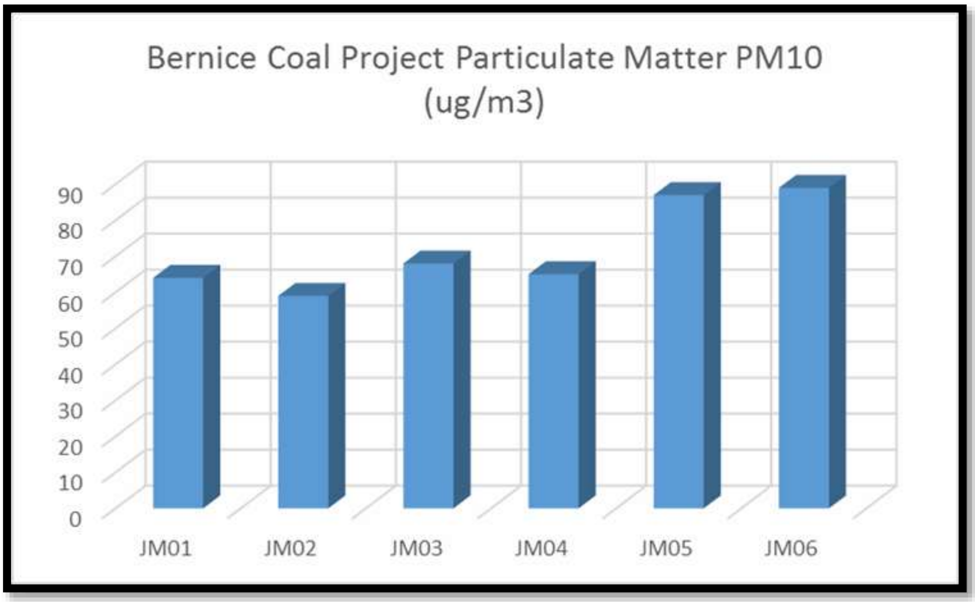


Figure 43: Gravimetric Dust Fallout in mg/m2/day

Table 7: Particulate Matter PM10 in ug/m3

Sampling	PM10 in ug/m3
JM01	64
JM02	59
JM03	68
JM04	65
JM05	87
JM06	89



Graph 2 Particulate Matter PM10 in ug/m3

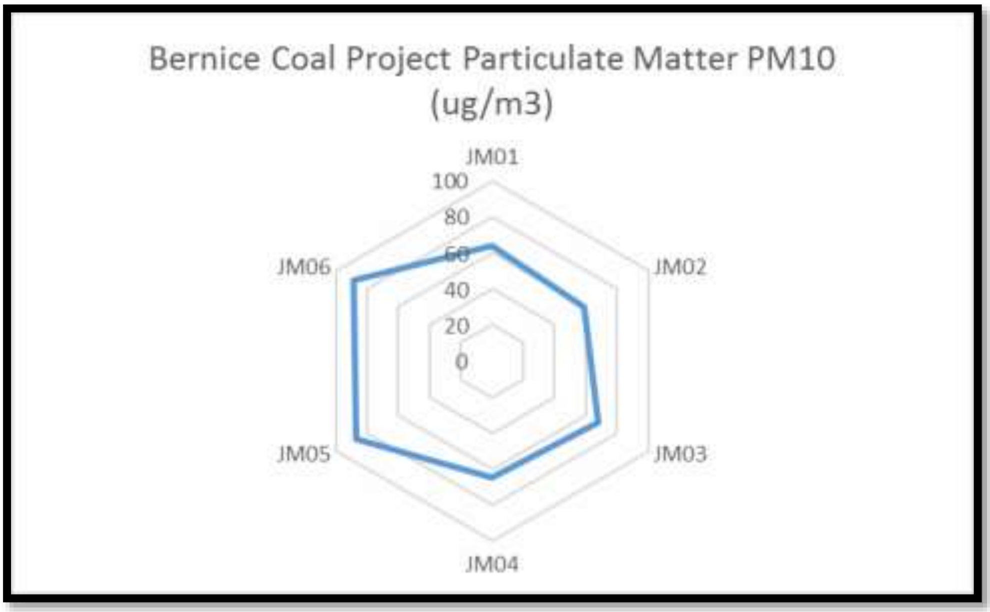


Figure 44: *Particulate Matter PM10 in ug/m3*

1.9.5.8.3 Sensitive Receptors

Sensitive receptors which have been identified in the immediate vicinity of the study area and proposed project area have been listed below;

- Community homesteads
- Farming homesteads on immediate and surrounding farms
- Agricultural cultivated and grazing lands
- Game farming activities in the immediate vicinity
- Wetland habitat and surface water bodies

1.9.5.8.4 Baseline Air Pollution Sources

From the site visits and the desktop study, the following sources been identified as potential pollution causes;

1.9.5.8.4.1 Vehicle exhaust gases

Vehicle exhausts contain a number of pollutants including carbon dioxide (CO_2), carbon monoxide (CO), hydrocarbons, oxides of nitrogen (NO_x), sulphur and PM10. Tiny amounts of poisonous trace elements such as lead, cadmium and nickel are also present. The quantity of each pollutant emitted depends upon the type and quantity of fuel used, engine size, speed of the vehicle and abatement equipment fitted. Once emitted, the pollutants are diluted and dispersed in the ambient air. Pollutant concentrations in the air can be measured or modelled and then compared with ambient air quality criteria.

1.9.5.8.4.2 Veld fires

Veld fires are widespread across the world, occurring in autumn, winter and early spring. In addition to controlled burning for fire-breaks and veld management, many fires are set deliberately for mischievous reasons. Some are accidental, notably those started by motorists throwing cigarettes out of car windows. Emissions from veld fires are similar to those generated by coal and wood combustion. Whilst veld fire smoke primarily impacts visibility and landscape aesthetic quality, it also contributes to the degradation of regional scale air quality. Dry combustible material is consumed first when a fire starts. Surrounding live, green material is dried by the large amount of heat that is released when there are veld fires, sometimes this material can also burn. The major pollutants from veld burning are particulate matter, carbon monoxide, and volatile organics. Nitrogen oxides are emitted at rates from 1 to 4 g/kg burned, depending on combustion temperatures. Emissions of sulphur oxides are negligible (USEPA, 1996).

1.9.5.8.4.3 Agricultural activities

Little information is available with respect to the emissions generated due to the growing of crops. The activities responsible for the release of particulates and gasses to atmosphere would however include:

- Particulate emissions generated due to wind erosion from exposed areas;
- Particulate emissions generated due to the mechanical action of equipment used for tilling and harvesting operations; and
- Vehicle entrained dust on paved and unpaved road surfaces.

1.9.5.8.4.4 Mining activities in the region of the project area

Mining operations like drilling, blasting, hauling, collection, and transportation are the major sources of emissions and air pollution. The use of explosives releases carbon monoxide (CO). Dust and coal particles stirred up during the mining process, as well as soot released during aggregate transport, contributes to emissions and respiratory problems.

- **Trucks passing on the gravel road, loading and offloading raw materials**

Dust emissions occur when soil is being crushed by a vehicle, as a result of the soil moisture level being low. Vehicles used on the roads will generate PM-10 emissions throughout the area and they carry soils onto the paved roads which would increase entrainment PM-10 emissions. The quantity of dust emissions from unpaved roads varies linearly with the volume of traffic.

1.9.5.8.5 Summary of baseline air quality

Current results measured and obtained during the May to June 2016 sampling period were extremely low for both the Gravimetric Dust Fallout and Particulate Matter PM10 results obtained. The highest gravimetric dust fallout results were obtained at the sampling receivers JM05 and JM06, although these values were still so low that no conclusive statement could be made about reasons for this slight elevation in dust fallout. In normal circumstances values with variations of between 50mg/m2/day and 100mg/m2/day would indicate definitive fugitive dust sources in close proximity to the sampling receivers.

In this instance the sampling receivers were located in close proximity to exposed surfaces and gravel roads, but even given this information the results were still very low as these roads are seldom used. The thick bush and tree cover also aids in preventing wind flow close to the surface and therefore in turn eliminates the dust becoming airborne. All the samples taken were well below the residential limit of 600mg/m$^{2/}$day and it can be concluded that the air quality in the region as it was measured during the sampling period is pristine and of a very high quality. Results reflect a baseline ambient air quality situation were very little to no air quality impacts are being experienced currently.

Similar to the Gravimetric Dust Fallout results were the Particulate Matter PM10 measurements also extremely low. All the values obtained were well below the threshold value of 120ug/m^3 and it can be stated that the particulate matter in the atmosphere in the vicinity of the proposed operations are also currently pristine and of a very high standard with little to no impacts currently resulting in additional PM10 emissions being experienced. The highest value obtained was 89ug/m^3 which is 31ug/m^3 below the upper limit.

1.9.5.9 Baseline Ambient Noise

1.9.5.9.1 Sampling Locations

Sampling locations were chosen in such a manner to enable the researchers to achieve a holistic representation of the study site. The purpose of a baseline study is to determine the existing ambient noise in the area of future influence. For a baseline study it is necessary to not only take samples on the borders of the property but all across the site since there is not a point/source of pollution/impact on the ambient environmental climate to determine buffering sample distances. Therefore, it is imperative to understand the initial cumulative impacts and later compare the change when the proposed mine starts to operate.

The human ear is more accurate with auditory observations but the margin for human error is too large to include physical olfactory observations in a scientific study of this nature. During sampling there was no visible activity in the study area which could have influenced the data as this has a bigger influence on the ambient noise than the ambient air quality.
The samples were taken at midday with minimal wind present making sampling conditions very favourable to achieve the best possible representation of the site.

Figure 45: Map showing location of all 14 measured points

1.9.5.9.2 Study Area Sensitivity Analysis

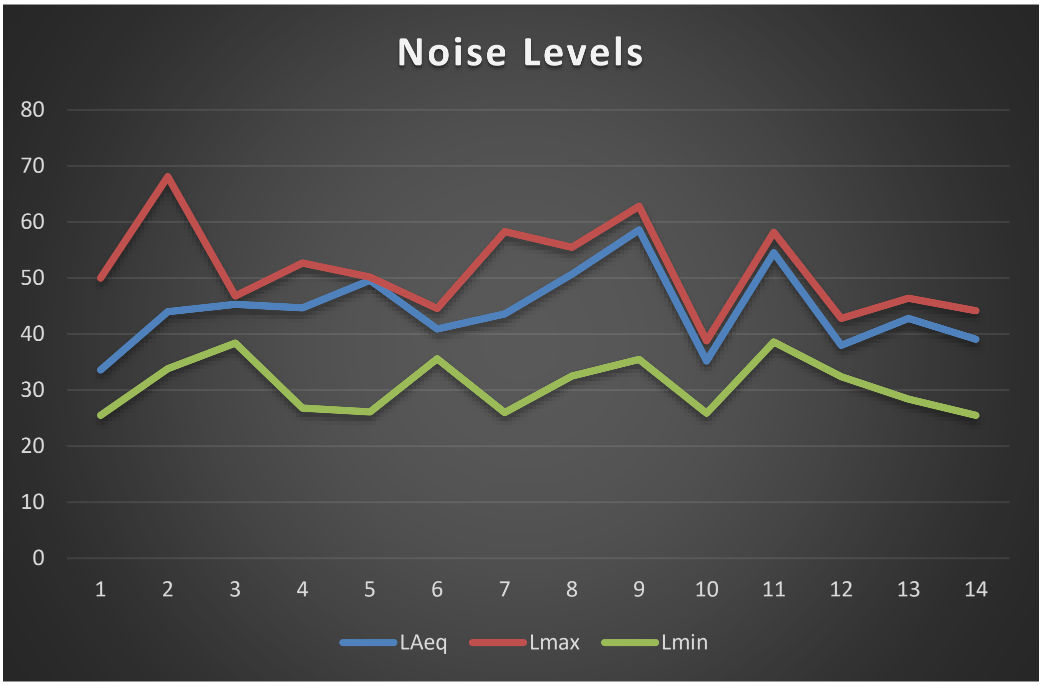
The proposed project is located North East of an existing road (R584), and there are noise sensitive areas (farm houses and/or game resorts) scattered along the vicinity of the area. This area is already a disturbed area as there is an access road which will also be used by traffic to the proposed Site. The prevailing ambient noise levels for the study area are made up from the existing farming and hunting activities, the existing road network, seasonal farming activities and fauna activities prevalent on the directly affected farms. The people living in the vicinity of the project area exposed to rural noise levels.

The noise from the hunting activities, the R584, agricultural activities, animals and insects, wind blowing through crops and plants, as well as, through traffic along the roads (R584, R521, R523 and gravel road to Musina) make up the prevailing ambient noise level of the study area. The proposed open pit coal mine will have an impact on the noise levels of the project area and surrounding. The first step in opencast mining process is to remove the topsoil then store it elsewhere away from the operations as it will be used later on for rehabilitating the mined out areas. The overburden is first broken up by drilling and blasting then removed by the shovel and trucks. Once the coal seam is exposed it is drilled, fractured by blasting and steadily mined, the coal is then loaded on to the dump trucks and transported to the tipping area whereby it will be crushed to a predetermined size then conveyed to the beneficiation plant for washing. Mining operations generate noise that can be heard in the surrounding community.

The proposed project area is located in a rural-type area characterised by cattle and game farming with no existing mining activities. Accordingly, the ambient noise levels can be described as "very quiet". In this regard, day-time noise levels of below 40dBA and night-time levels of below 35dBA can be expected, which is consistent with a rural noise environment as defined in South African national Standards (SANS) 10103.

Ambient sound levels were measured at 14 locations during a site visit from the 25^{th} of May to the 27^{th} of May. The prevailing ambient noise levels at the proposed site are between 33.6 dBA and 58.6 dBA. The higher noise levels are due to vehicles and faunal activity with higher faunal noise at night. In terms of the South African National Standards, residential daytime ambient noise levels should not exceed 55 dBA; and night-time ambient noise levels should not exceed 45dBA. Therefore, the proposed mine and associated activities will have an impact as noise levels will increase significantly.

Graphic interpretation of baseline noise level results for study site:



Graph 3: Noise Levels

1.9.5.10 Visual characteristics and sense of place

1.9.5.10.1 Visual Character

The Project area is located in an area which is relatively flat lying (see **Photo plate 1**) with the incision of the Brak River Valley towards the north of the area, at a surface elevation of 690 metres (m) to 735 metres (m) above sea level. No settlements are situated within the planned opencast mining area. The land is currently mainly used for game farming. It is located 55km west of Coal of Africa's Makhado Coking Coal Project and 20km from the Musina-Maputo railway line.

Photo plate 1: Depicting landscape with a flat low lying visual character

The topography of the greater Makhado area is characterised by a mountainous makeup but the proposed site is relatively flat. It should also be noted that although settlements are mostly located on slopes less than 9% (1:10), many of the urbanized areas (settlements) are located between the mountainous areas with slopes between 9%-25%, in other words slopes between 1:10 to 1:4. This means that settlements located within valleys or behind mountains will experience limited visual impacts from visually intrusive activities due to shielding factor. The topography of the areas is described in Part A 1.9.5.3 Topography.

The areas surrounding the proposed mine are used by the local residents for game farming, agriculture, livestock grazing and subsistence farming.

1.9.5.10.2 Sense of Place

Our sense of a place depends not only on spatial form and quality but also on culture, temperament, status, experience and the current purpose of the observer (Lynch, 1992). Central to the idea of 'sense of place' or Genus Loci is identity. The concept of "a Sense of Place "does not equate simply to the creation of picturesque landscapes or pretty buildings but to recognise the importance of a sense of belonging. Embracing uniqueness as opposed to standardization attains quality of place. In terms of natural environment, it requires the identification, a response to and the emphasis of distinguishing features and characteristics of landscapes.

An area will have a stronger sense of place if it can easily be identified, that is to say if it is unique and distinct from other places. Photo plate 2 shows various landscapes within the proposed mining area and these reflect that the area does not have any unique features which would visually set it apart from other areas where similar land uses like game farming are taking place this is despite the presence of two ecological important ridges which are located on the property. Lynch defines 'sense of place' as "the extent to which a person can recognise or recall a place as being distinct from other places – as having a vivid or unique, or at least a particular, character of its own" (Lynch, 1992:131).

Photo plate 2: Landscapes within the proposed site area

Using the above photo plate, it is clear that the natural landscape provides an aesthetically pleasing character. However bearing in mind that sense of place centres around distinctiveness and uniqueness there are no specific visually unique (that cannot be found in any other place with a similar land use)landforms on the property despite the presence of 2 ecologically sensitive ridges .

1.9.5.11 Heritage

In terms of section 38 of the National Heritage Resources Act, 1999 (Act no. 25 of 1999), a comprehensive heritage impact assessment (HIA) investigation in accordance with the provisions of Sections 38(1) and 38(3) of the *said act* and focuses on the survey results from a cultural heritage survey. The HIA study was undertaken in order to establish if any localities of heritage significane were present on the property.

1.9.5.11.1 Baseline heritage

Generally very little is known about the archaeological sites in the specific region of the study area. Although several hill-top Venda settlements are known further to the east, no such sites were recorded during the survey. In addition, although several surface scatters of Later Stone Age (LSA) and Middle

Stone Age (MSA) artefacts were noted no substantial manufacturing/knapping sites with at least a low density concentration, were recorded in the survey area.

During the survey a Late Iron Age cattle kraal outpost was recorded (Site 9) which is probably associated with other Venda settlements in the region. A total of 4 historical farm workers house complexes were noted (Sites 1, 8, 12 and 15). Site 3 is a water furrow that was used to irrigate the agricultural lands. Also note that a total of three farmhouse complexes were recorded (Sites 5, 10 and 11) but they are probably not older than 60 years and/or do not have any cultural significance (also see Site 4, which is associated infrastructure). The trading outpost is one of the more significant sites recorded during the survey (Site 13), moreover there is also the possibility that at least another four graves may be associated with the site. A total of four grave sites were also recorded (Sites 2, 6, 7and 14) (for more details see the HIA specialist report).

Please note that no Stone Age settlements, structures, features, assemblages or artefacts concentrations were recorded during the survey. Also, due to the nature of the topography and openness of the region no rock art sites were recorded.

1.9.5.11.2 Observations

A total of 15 sites were recorded ranging from a Late Iron Age cattle outpost (Site 9), several farm worker house complexes (Sites 1, 8, 12 and 15), four individual grave and graveyard sites (Sites 2, 6, 7 and 14), a historic trade store (Site 13) situated along an existing ox wagon trade route and to the more recent farmhouse complexes and associated infrastructure (Sites 4, 10 and 11).

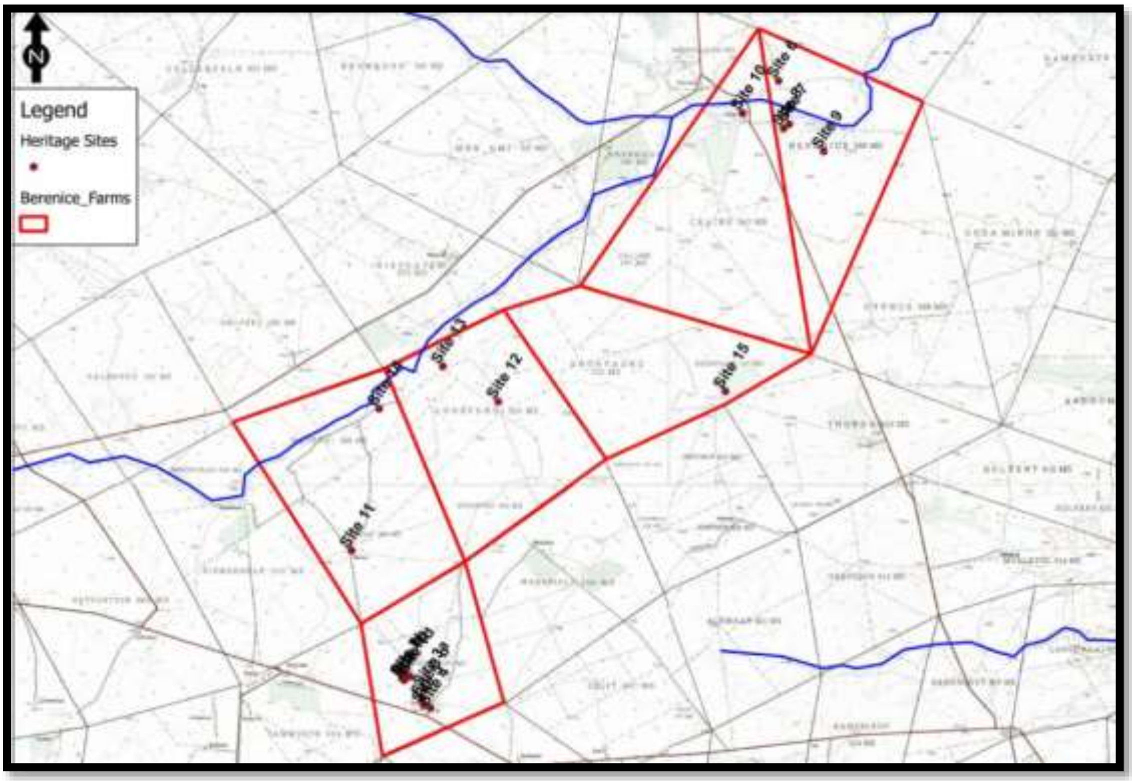


Figure 46: location of the recorded cultural heritage sites within the survey area

Figure 47: Detail of the location of heritage sites in the southern section of the survey area

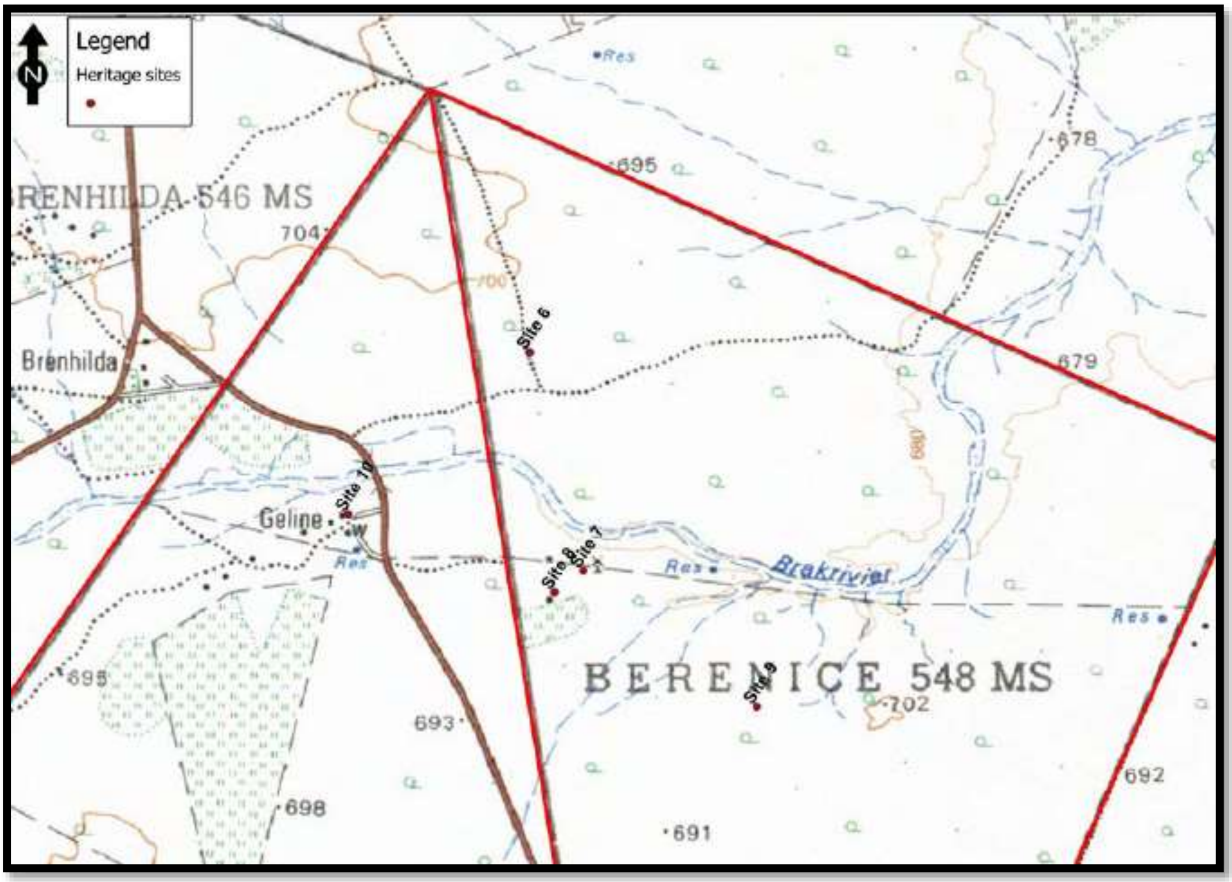


Figure 48: Detail of the location of heritage sites in the northern section of the survey area

As a result please note the following recommendations:

• A destruction permit will have to be applied for from SAHRA for the farm worker house complexes (Sites 1, 8, 12 and 15);

• The site of the historic trade store (Site 13) and Late Iron Age cattle kraal settlement (Site 9) will have to be surveyed and mapped (Phase 2); then an application submitted for a destruction permit from SAHRA;

• The individual graves and graveyards (Sites 2, 6, 7and 14) will require a Phase 2 investigation (exhumation and reburial).

Overall, the site was given a Grade III (B) field rating, and as such it is recommended that the burial must be fenced off and that a site management plan is to be implemented. From the heritage point should the right be granted a go ahead ,the aforementioned recommendations are adhered to by the developer during the construction phase of the project.

1.9.5.12 Baseline Traffic

1.9.5.12.1 Conditions of the Local Road Network

The study area for the proposed establishment of an open cast coal mine development is around Waterpoort around 29 km from Waterpoort police station on the intersection of road R523 (N1) Louis Trichardt and R523 (R521) Alldays along the Waterpoort area under Musina local municipality. The traffic assessment report considered the following intersections and roads:

- The intersection of the R523 (N1) Louis Trichardt and R523 (R521) All days Road as its 29 km from the proposed site for open cast mine coal development.
- The intersection of Mopane, All Days at the D3243 East Road.
- The intersection of the D3256 North Road and the Main Site Access Road of the mine development Site (off the R584 North west Road).

The distance of D3256 North road to the nearest farm portion is Berenice 548 MS mine development in Waterpoort is at a range of 30-40km. The distance from intersection of D3256 East road to Waterpoort is about 14 km to farm Berenice and North of road R584. The intersection of road D3256 West to farm Berenice towards farm Matsuri side is almost 24 km of gravel (22°48'22.09"S and 29°26'33.35"E)

Figure 49: Access roads (R523 Gezelschap access and D3256 Berenice and Celine access)

A physical site inspection was carried out on May 6th 2016 by Masala Makhathulela of Shivhugwana Environmental Solutions to record existing site conditions on site and adjacent road with Zenkcon

Engineers team. The conditions were further assessed from 06-08 May 2016 with support from desktop data records and fluctuations to understand local road network of the area.

1.9.5.12.2 D3256 North Road

The D3256 North Road is a local gravel road that is used as a one lane 2 way divided corridor. There is no current sealed pavement along the carriageway and an estimate that can be done when installing tar is approximately 3.5m to 4m wide.

The posted speed limit on the D3256 North Road is 40 km/hr. Approximately 0.5m from the intersection with Mopane D3256 North Road, the speed limit is still taken to 40km/hr up to the intersection of the Berenice 548 MS link Road and Waterpoort D3256 East Road. There is no pavement and area is generally in good condition and during the site inspection there were no visible signs of road failure. The condition of the road would be mostly attributable to low traffic volumes and high traffic volumes.

The existing carriageway is unmarked with the only form of delineation guide posts on the side of the road. The location of these guide posts, however, is variable with some guide posts missing.

1.9.5.12.3 D3256 East Road towards Waterpoort – D3256 North Road towards All Days Intersection

The intersection of the R584 East Road and D3256 North Road is a "T" intersection. The width of sealed carriageway on Celine Farm varies at different locations but is approximately 7m with a 1m to 2m gravel shoulder on both sides of the road. The width of sealed carriageway on the D3256 East Road near the intersection is approximately 6m.

1.9.5.12.4 Access to the project site

The D3256 access road is a single carriageway road, 8000m long, which will be constructed by an appointed contractor. Initially the road is gravel and later to be upgraded to a paved road once the mine is fully operational. Currently the road is gravel and is the only available access road to the proposed site for the Project.

1.9.5.12.5 Influence area

As mentioned in 3.1 above, the following external link roads will be directly affected by the mine traffic:

- R523
- D3256
- Existing Farm Berenice gravel to Musina

- Existing farm Matsuri gravel to Musina
- Vetfotein road to All-days from Waterpoort

In addition the following intersections have been investigated:

- N1/R523 to Waterpoort
- R523/ Vetfontein road to the mine
- D3256 to Musina gravel
- Link Road

1.9.5.12.6 Status quo traffic volumes

Site visits were conducted on the 6th to the 8th and the 10th of May 2016 as part of the assessment and scoping process. Traffic counts were carried out for 12 hours (05:30 AM – 05:30 PM) on the 10th of May 2016 at all intersections mentioned above. The light vehicles, heavy vehicles (2-4 axels) and very heavy vehicles (>5), were all counted during the scoping process.

The AM ad PM peak hour was further determined based on the highest traffic volumes registered during the morning and afternoon period respectively. The AM peak was recorded from 06:30 to 08:30 and the PM peak hour was recorded at 15:30 to 17:30.

Based on the existing traffic counts it can be concluded that the AM peak is the most critical period given that during the said period, the highest peak in number of vehicles on the road was registered. For that reason, the analysis scenarios refer to the AM peak hour which is the most critical hour. The vehicle speeds and driver behaviour within the study area are generally good based on observation during the site visit, with the occasional vehicle exceeding the speed limit. There is signage displaying the maximum permissible speed on the R523. From observation, pedestrian activity did not pose a road safety threat on any of the roads surrounding the project area.

1.9.5.13 Socio economic

The total population of Makhado has increased by about from 495 261 to 516 031 in 2011 (Based on the 2011 census outcome). The number of households have increased from 108 978 to 134 889 households (Census 2011) with about 225 059 registered voters. Females constitute 54% (279,326) of the population compared to males who constitute 46% (236,759) of Makhado population. In terms of the population groups, Black Africans comprises the majority of the population with 97.30% followed by Whites at 2%, Asians/Indians 0.35% and Coloured 0.21%. Makhado has a population growth of 0.43 per annum.

The population growth statistics for the local municipality are presented in the graph below.

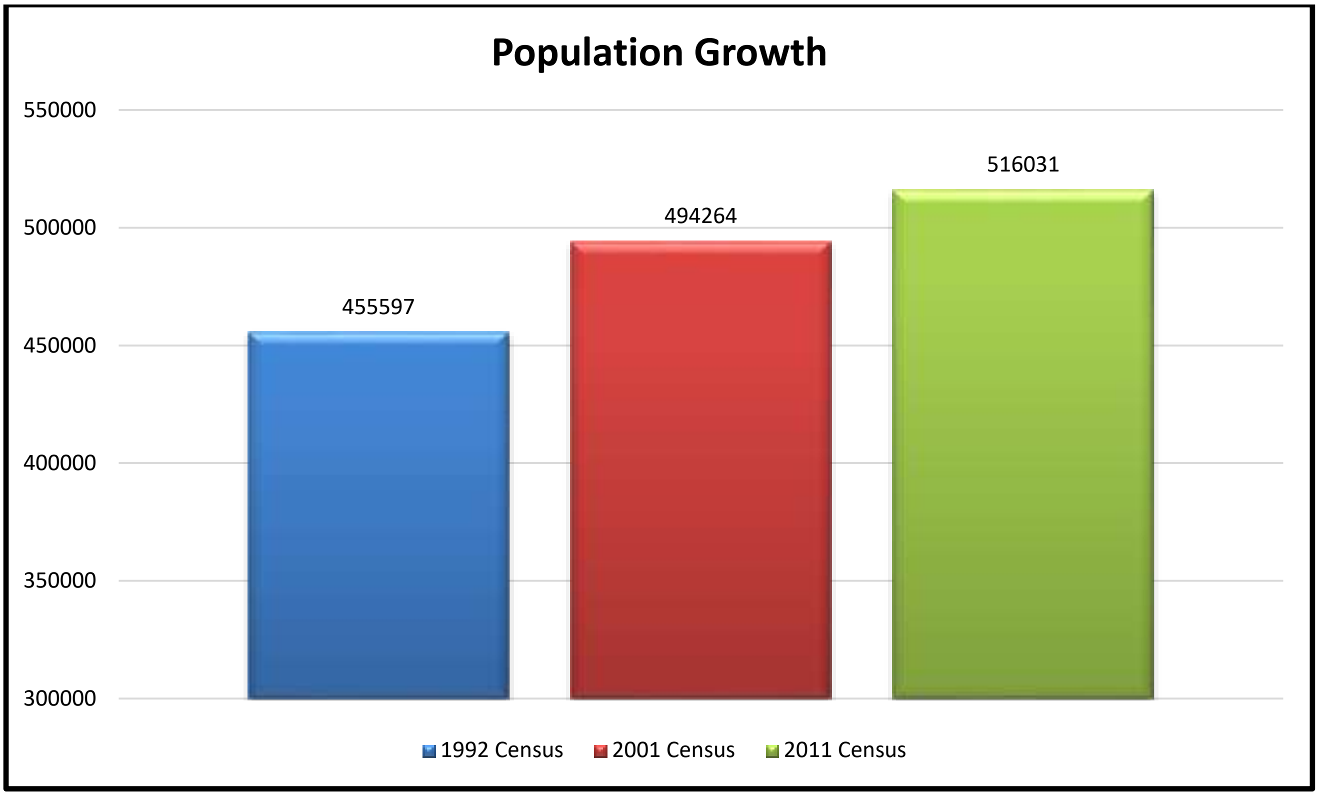


Chart 1: Population Growth

The population has a youthful age structure and the immediate significance of this young age structure is that the population will grow rapidly in future and this implies a future high growth rate in the labour force. At present, the local economy is unable to provide sufficient employment opportunities to meet the needs of the economically active population. A youthful population structure also implies a relatively higher dependency ratio.

1.9.5.13.1 Education

In 2011, approximately 11% of the population over 20 years of age had attained some form of primary education. At least 19% of people have had no schooling, 22% people have a Grade 12 education, and 9% people have attained a higher education. This analysis reveals that the population in Makhado is most heavily weighted towards high school education.

1.9.5.13.2 Economic Profile

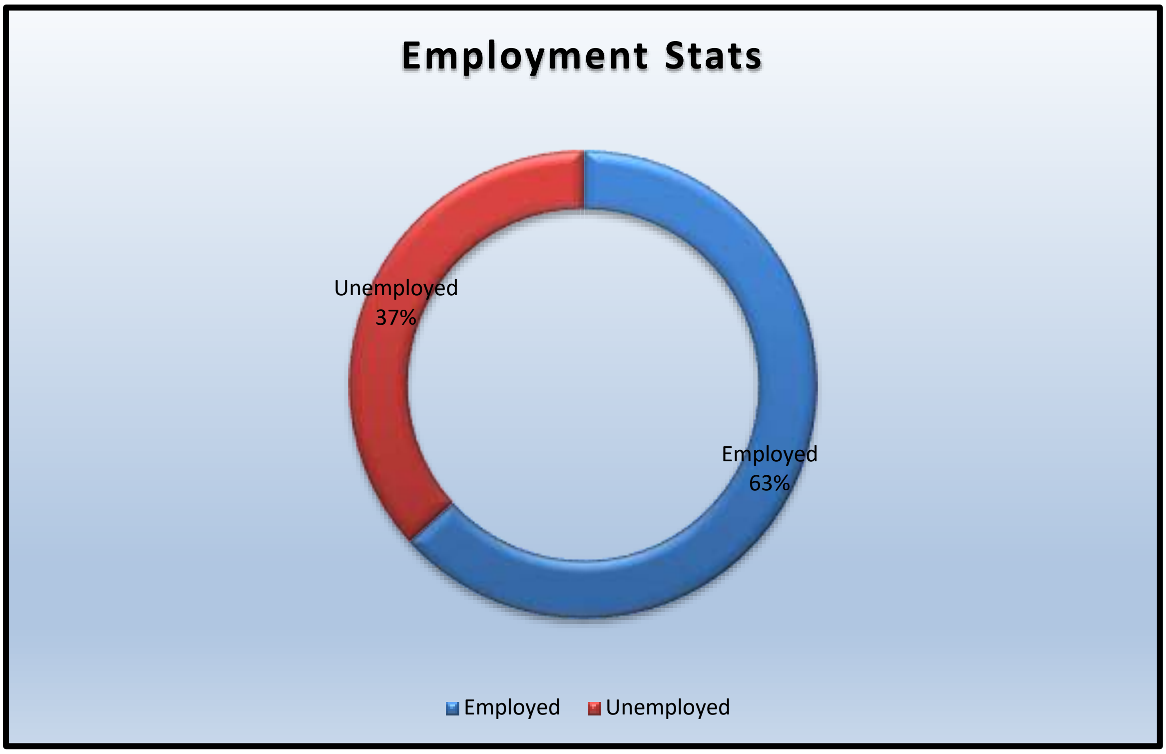
Makhado has the second biggest economy in Vhembe District. The sector, which contributed the most to the GVA in Makhado Municipality, is the Community Services (33%) followed by the Finance Sector

(26%) and Trade Sector (15%). This shows the same trend as in the Limpopo Province where Mining is by far the largest contributor to the GVA. The contribution of Agriculture to the GVA has grown more on Provincial and District level than on National level. The mining sector has grown on National level as well as on District level while the manufacturing sector has grown slightly less on regional level. Community service and trade sectors are the predominant employers within the study area, responsible for just over 27% and 19% of the active work force respectively. Agriculture is the third largest employer absorbing around 17% followed by the construction sector (8%), finance (5%), transport (5%), manufacturing (5%), and mining (1%).

1.9.5.13.3 Employment Status

The Municipality has an Economically Active Population (EAP) of 124,473 which represent about 24.12% of the entire population of Makhado. In recent years, in common with the provincial and district economies, the Municipality has experienced an increase in overall employment levels. The total number of employed people is 78,768 (63%) of the EAP and the total number of unemployed persons is 45,705 (36.7%) of the EAP. The unemployment rate in Makhado has decreased by 8.2% in recent years (from 44.9% in 1996 to 36.70% in 2011). The unemployment rate for Limpopo as a whole has also decreased by 6.1% in the same period (from 45.1% to 39%).

The unemployment rate amongst the youths (15-34years) has also declined from 62.30% in 2001 to 49.60% in 2011, but it remains very high.



*Source: Census 2011, Statistics South Africa (2012)

Chart 2: Employment Levels

1.9.6 Description of the current land uses.

Land use within the surrounding project area is dominated by rural and agriculture activity. Surrounding land uses are:

- Tomato farming with irrigation;
- Game farming;
- Waterpoort rail line; and
- Wilderness and grazing.

The six farms that form part of the applications are all used for eco-tourism game farming and hunting with small scale farming on the Berenice farm. Part of the proposed project area is disturbed. with roads from the existing hunting activities on the farms.

1.9.7 Description of specific environmental features and infrastructure on and around the site.

Historically the farms were utilised for raising cattle with indications of small sections of agricultural fields. Infrastructure consists mostly of fences, power lines, dirt tracks providing access and a few farm houses built during the mid to late 20th century.

The site specific features are explained in detail under Section Part A- Heading 1.9, describing in details the environmental sensitivities of the areas. In summary the following features are also observed on site:

i. Farm houses
ii. Diverse species of Game animals
iii. Brak river which feeds into the Sand river which in turn feeds the Limpopo river
iv. Longford and Berenice high ecological sensitivity Hill
v. Indigenous flora species
vi. Heritage and cultural features
vii. Eco-tourism -, bird watching camps, chalets, hunting infrastructure
viii. Seasonal pans
ix. Small scale farming on Berenice

1.9.8 Environmental and current land use map.

(Show all environmental, and current land use features)

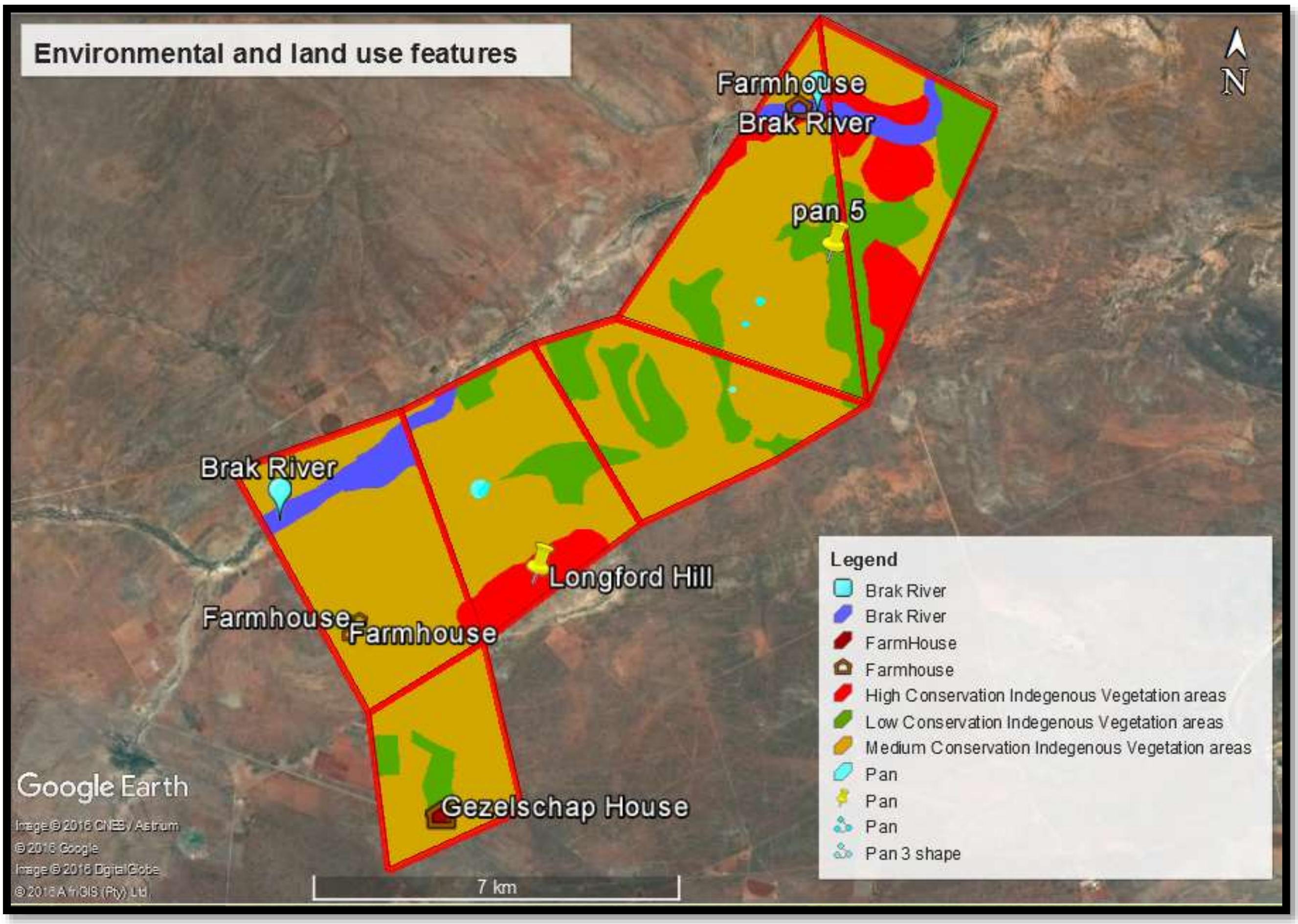


Figure 50: Current Land use Map

1.10 Impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts

(Provide a list of the potential impacts identified of the activities described in the initial site layout that will be undertaken, as informed by both the typical known impacts of such activities, and as informed by the consultations with affected parties together with the significance, probability, and duration of the impacts. Please indicate the extent to which they can be reversed, the extent to which they may cause irreplaceable loss of resources, and can be avoided, managed or mitigated).

The table below describes the potential impacts for the proposed UCDII Berenice Project. The following phases are applicable for the Berenice Project:

- The Construction Phase: This phase entails soil stripping of the Open Cast pits, construction of new infrastructure (PCDs, associated water and waste management infrastructure, as well as the processing plant).

- The Operational Phase: relates to the operation of the PCDs, Water Treatment Plant, Sewage Treatment Plant and Processing Plant. This phase also includes concurrent backfilling of mined out areas.
- The Decommissioning Phase. The decommissioning of the mining area and mining-associated infrastructure (such as the plant and workshop area).
- The Post-closure Phase will commence once the mine has obtained Closure under the applicable legislation.

Potential impacts identified for the project include but not limited to:

- sterilization of mineral resources
- hazardous excavations/structures/surface subsidence
- loss of soil resources and land capabilities through contamination
- loss of soil resources and land capabilities through physical disturbance
- physical destruction of biodiversity
- general disturbance of biodiversity
- Poaching and killing of biodiversity
- pollution of surface water resources
- alteration of drainage patterns
- contamination of groundwater
- dewatering
- air pollution
- disturbing noise levels
- visual impacts
- impacts on heritage, cultural and paleontological resources
- land use impacts
- blasting impacts
- project-related road use and traffic safety
- economic impacts
- inward migration

This section provides a list of potential impacts on environmental aspects separately in respect of each of the main project actions / activities and processes. The potential impacts are presented for each of the project phases in tabular format.

Table 22: List of Potential Impacts and significance

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	Significance without mitigation	Significance with mitigation

				intensity	extent	duration	probability	Weighing factor	significance rating	intensity	extent	duration	probability	Weighing factor	significance rating after mitigation
Site clearing, removal of topsoil and vegetation	Air Quality	Variable Dust generation from as land clearing, topsoil removal, loading of material, hauling, grading, stockpiling, bulldozing and compaction	Construction	1	1	1	4	2	14	1	1	1	4	0.4	6
Construction of surface infrastructure (e.g. access roads, pipes, storm water diversion berms, change houses, admin blocks, drilling, blasting and development of adits for mining, etc)	Air Quality	Activities of vehicles on access roads, levelling and compacting of surfaces, as well localised drilling and blasting will have implications on ambient air quality.	Construction	3	2	2	4	3	33	3	2	2	4	0.2	7
General transportation, hauling and vehicle movement on site	Air Quality	Transportation of the workers and materials in and out of mine site will be a constant feature during the construction phase. This will however result in the production of fugitive dust (containing TSP, as well as PM10 and PM2.5) due to suspension of friable materials from earth roads. dust emissions from haul track,	Construction	3	2	2	5	3	36	3	2	2	5	0.4	14.1

Removal of overburden, mineral extraction and backfilling when possible (including drilling/blasting hard overburden & stockpiling)	Air Quality	Drilling is an intermittent exercise that emits fugitive dust. There will be fumes from diesel trucks transporting ore to the stockpiles and conveyor belts at crushing and screening	Operational phase	3	1	4	5	4	52	3	1	4	5	0.6	31.2
Use and maintenance of haul roads (incl. transportation of minerals to plant	Air Quality	Transportation of the workers and materials in and out of mine site will be a constant feature during the operational phase and result in the production of fugitive dust	Operational phase	3	3	4	4	3	42	3	3	4	4	0.4	17
Generation of stockpiles and associated mining waste	Air Quality	dust generated from waste rock, evaporation of hydrocarbon fuels from storage tanks and spillages, waste oils chemicals plus hazardous waste	Operational phase	3	2	4	4	4	52	3	2	4	4	0.6	31.2
Beneficiation by means of crushing and screening	Air Quality	The crushing process releases fugitive dust, especially if there are no enclosure and water sprays. Dust contained within the RoM ore can be released into the atmosphere during this process i.e. fugitive dust (containing TSP, as well as PM10 and PM2.5). Wind erosion from	Operational phase	5	1	4	5	5	75	5	1	4	5	0.4	30

		stockpiles can be a perennial source of dust if not properly managed during and post mining operations.													
Demolition & Removal of all infrastructure (incl. transportation off site)	Air Quality	The process includes dismantling and demolition of existing infrastructure, transporting and handling of topsoil on unpaved roads in order to bring the site to its initial/rehabilitated state. Demolition and removal of all infrastructures will cause fugitive dust emissions.	Closure and Decommissioning Phase	5	2	2	4	3	39	5	2	2	4	0.6	23.4
Rehabilitation (spreading of soil, revegetation & profiling/contouring)	Air Quality	Topsoil can be imported to reconstruct the soil structure. There is less transfer of soil from one area to other therefore negligible chances of dust through wind erosion. Profiling of dumps and waste rock dump to enhance vegetation cover and reduce wind erosion from such surfaces post mining.	Closure and Decommissioning Phase	1	2	2	4	2	18	1	2	2	4	0.2	7.2
Site construction and grading	Groundwater quantity	changes in runoff and infiltration that could reduce groundwater recharge	Construction	3	2	4	1	3	28	3	2	4	1	2.0	18

Fuel storage and Vehicular Movement Use and maintenance of haul roads (incl. transportation of minerals to plant	Groundwater quality	Fuel and hydrocarbon leakages and spillages from the transporting vehicles may cause groundwater contamination	Construction and operation	2	2	4	1	3	28	2	2	4	1	2.0	18
Open cast mining	Groundwater	Open cast mining below the water table will result in pit inflows	Operational phase	2	2	4	4	4	64	2	2	4	4	4.0	64
Open cast mining	Groundwater quantity	Baseflow reduction caused by mining	Operational phase	1	1	1	1	1	6	1	1	1	1	1.0	6
Open cast mining	Groundwater quantity	Mine dewatering and groundwater abstraction for water supply purposed could reduce groundwater levels in the area	Operational phase	3	3	4	4	4	80	3	3	4	4	4.0	56
Open cast mining	Groundwater quality	increased potential for groundwater contamination due to seepages from the overburden stockpiles	Operational phase	1	1	2	2	2	16	1	1	2	2	2.0	16
Open cast mining	Groundwater quality	Water contained in dirty water dams may impact on groundwater quality	Operational phase	2	1	4	4	4	56	2	1	4	4	2.0	6
Rehabilitation of open pits and removal of infrastructure	Groundwater quality	salt load contribution towards the Brak river	Closure and Decommissioning Phase	1	1	2	2	2	16	1	1	2	2	6.0	6
Open pit backfill	Groundwater	aquifer contamination caused by backfill	Closure and Decommi	4	3	5	5	4	108	4	3	5	5	4.0	99

			ssioning Phase												
Open pit backfill	Groundwater	rebound water levels within backfill material may cause decant	Closure and Decommissioning Phase	1	2	1	1	2	12	1	2	1	1	2.0	6
Construction trenches and excavations on wetland and associated river	Wetlands	Water quality deterioration (Pollution from suspended material)	Construction Phase	4	2	5	3		33	4	2	5	3		
Construction for site establishment and mining infrastructure	Wetlands	Negative impact on flora and fauna from human interference on site	Construction Phase	4	1	4	2		18	4	1	4	2		
Land clearing	Wetlands	Biodiversity loss	Construction Phase	6	2	5	5		60	6	2	5	5		
Land clearing	Wetlands	Soil loss	Construction Phase	6	1	4	3		33	6	1	4	3		
Oil spillages	Wetlands	Water quality contamination	Construction Phase	6	2	4	4		48	6	2	4	4		
Human dispersal of alien seeds/sapling by construction vehicles, shoes, clothes	Wetlands	Alien invasion of native species habitat	Construction Phase	6	2	3	4		44	6	2	3	4		
Increased excavation processes that may lead to more sediment being deposited into the wetlands	Wetlands	Gully formations	Construction and operation	4	2	4	2		20	4	2	4	2		
Continued mining activities	Wetlands	Water quality may be reduced by increased sedimentation and erosion	Operational phase	4	1	3	3		24	4	1	3	3		

Continued mining activities	Wetlands	Interruption of wetland habitat with potential decrease in species numbers and local biodiversity	Operational phase	6	2	3	4		44	6	2	3	4		
Toxic chemicals from vehicles and mining machinery (oil, petrol, brake fluid etc.)	Wetlands	Pollution of wetland and habitat which could ultimately lead to underground water contamination	Operational phase	6	2	4	3		36	6	2	4	3		
Human dispersal of alien seeds/sapling by vehicles, shoes, clothes	Wetlands	Alien invasion of native species habitat	Operational phase	6	2	4	3		36	6	2	4	3		
Site clearing, removal of topsoil and vegetation	Surface Water	Increased sediment loads from vegetation clearance and soil compaction	Construction, operational and decommissioning Phase	1	1	2	4	2	16	1	1	2	4	2.0	10
Fuel storage and Vehicular Movement Use and maintenance of haul roads (incl. transportation of minerals to plant	Surface Water	Water resources pollution due to spillage of oils, fuel and chemicals	Construction Phase	2	1	2	4	2	18	2	1	2	4	2.0	10
Stockpiles and general waste	Surface Water	Pollution of watercourses from general waste and sewage effluent	Operational phase	2	2	2	3	3	27	2	2	2	3	2.0	14
Vehicular movement of haulage vehicles and	Surface Water	Increased runoff due to soil compaction and	Operational phase	3	3	3	3	4	48	3	3	3	3	2.0	14

passenger vehicles as well as conveyor belts		increased paved surfaces													
Vehicular movement of haulage vehicles ,passenger vehicles, workshops	Surface Water	Contamination from leakage and spillage of chemicals, oils and grease	Closure and Decommissioning Phase	3	3	3	3	4	48	3	3	3	3	2.0	16
Rehabilitation of stockpile areas, PCD's and discard dump	Surface Water	Acid mine drainage problems and problems associated with general waste disposal	Closure and Decommissioning Phase	3	3	3	4	4	52	3	3	3	4	4.0	44
Stripping, handling and placement of soil associated with pre construction land clearing and rehabilitation	Soil	Loss of topsoil	construction and decommissioning	4	2	3	4	4	52	4	2	1	4	4.0	44
Stockpiling of topsoil	Soil	Loss of topsoil through erosion. Mixing of deep and surface soils during handling, stockpiling and subsequent placement. Change to soil's physical, chemical and biological properties due to operational contamination of oils and coal dust	Construction Phase and operation	4	2	4	4	4	56	4	2	4	4	4.0	56
Backfilling and profiling	Soil	Change in natural surface topography due to re-profiling of	Decommissioning	4	2	4	4	3	52	4	2	4	4	4.0	52

		surface after stripping													
vegetation clearing for open pit excavation, clearing for construction of buildings, roads and other infrastructure, waste dumps etc.	Vegetation	The area for the proposed development will be cleared of vegetation. This will result in the loss of indigenous species, disturbance of species of conservation concern and the fragmentation of plant communities. The removal of vegetation will also expose soil increasing the risk of erosion	Construction phase	10	5	5	5		100	6	5	5	5		80
Alien Invasive plant species on cleared areas(Construction)	Vegetation	Alien invasive plant species will encroach into disturbed areas. It is expected that extensive area will be disturbed, natural vegetation totally destroyed.	Construction phase	10	5	5	5		100	6	5	5	5		80
Open Pit mining	Vegetation	Clearing of vegetation within the site will result in the loss of indigenous species, disturbance of species of conservation concern and the fragmentation of plant communities. The removal of vegetation will also expose soil increasing the risk of erosion	Operational phase	10	5	5	5		100	6	5	5	4		64

Alien Invasive plant species on cleared areas (Haulage vehicles and human activities)	Vegetation	Alien invasive plant species will encroach into disturbed areas. It is expected that extensive area will be disturbed, natural vegetation totally destroyed.	Operational phase	10	5	5	5		100	6	5	5	5		80
Change in land use (site clearing)	mammal and herpetofaunal	Total or near-total irreplaceable loss of mammal and herpetofaunal species is anticipated	Construction Phase	10	4	2	5		80						n.a
Change in land use (site clearing)	mammal and herpetofaunal Habitat	The mining operation will replace the current land-use practice which relies on prime natural resources and will thus be destructive to natural habitats through vegetation clearing .Opencast mining is responsible for continued loss of faunal habitat. This has widespread impact on ecological function and health of sensitive ecosystems...Dis placement of extraordinary high vertebrate species richness	Construction Phase	10	4	2	5		80						n.a

Change in land use (site clearing)	Loss of avian habitats.	Avian habitats, including mopane woodland, scrub and open areas will be destroyed by the proposed mine. It is proposed that over 5000ha of land will be cleared	Construction Phase	10	3	2	5		75	8	3	2	5		65
Change in land use (open cast mining areas)	Loss of avian habitats.	Avian habitats, including mopane woodland, scrub and open areas will be destroyed by the proposed mine. It is proposed that over 5000ha of land will be cleared	Operational phase	10	3	4	5		85	8	3	4	5		n.a
Change in land use (open cast mining areas)	mammal and herpetofaunal	Total or near-total irreplaceable loss of mammal and herpetofaunal species is anticipated	Operational phase	10	5	4	5		95						n.a
Human activities	Fauna	The disturbance of birds and other vertebrate fauna species in the surrounding areas will increase through poaching pressure and disturbance of nests) and indirectly changes in prey availability, nesting material, etc.). Given the limited background information available, the impact assessment here pertains to the	Construction Phase	6	3	2	4		44	6	3	2	3		33

		worst case scenario.													
Human activities	Fauna	In addition to direct habitat loss, the disturbance of birds and other vertebrate fauna species in the surrounding areas will increase. through poaching pressure and disturbance of nests) and indirectly changes in prey availability, nesting material, etc.). Given the limited background information available, the impact assessment here pertains to the worst-case scenario.	Operational phase	6	3	4	4		52	6	3	4	3		39
Mining processing activities	Ground and surface water pollution.	Pollution generated by the mine (e.g., acid mine drainage, accidental fuel spillages, as well as pollutants such as mercury and lead) has the potential to severely affect avian habitats and therefore bird species along the Brak River downstream of the mine, including potentially the entire Limpopo	construction phase	8	5	2	4		60	8	5	2	3		45

		River downstream of Musina.													
Mining processing activities	Ground and surface water pollution.	Pollution generated by the mine (e.g., acid mine drainage, accidental fuel spillages, as well as pollutants such as mercury and lead) has the potential to severely affect avian habitats and therefore bird species along the Brak River downstream of the mine, including potentially the entire Limpopo River downstream of Musina.	Operational phase	8	5	4	4		68	8	5	4	3		51
Air pollution from blasting, wind erosions and vehicle movement	Vegetation	The anticipated increase in haul traffic and opencast mining operations will lead to an increased settling of dust on adjacent vegetation. Continued increased levels of dust in the air has an effect on faunal species, particularly birds, but also on fauna species feeding on the vegetation.	Construction Phase	8	4	2	5		70	6	4	4	3		36
Air pollution excavations and construction	Vegetation	The anticipated increase in haul traffic and opencast mining operations will lead to an increased settling of dust on	Operational phase	8	4	4	5		80	6	4	4	3		42

		adjacent vegetation. Continued increased levels of dust in the air has an effect on faunal species, particularly birds, but also on fauna species feeding on the vegetation.													
Powerline	Birds	The impact of such lines on birds will depend on the route the new line will follow, the size and configuration of the towers and lines, and the impacts cannot be evaluated without this information.	Construction Phase	6	4	2	3		36	6	3	2	2		22
Powerline	Birds	The impact of such lines on birds will depend on the route the new line will follow, the size and configuration of the towers and lines, and the impacts cannot be evaluated without this information hence the impact assessment here pertains to the worst case scenario, where the lines generate high collision and electrocution risks.	Operational phase	6	4	4	4		56	6	4	4	2		28

Clearing of vegetation and earthworks	Visual	Visual impacts are expected to result from the stripping of vegetation and earthworks associated with the pre-construction and construction phases of the proposed Berenice coal mine. The stripping of vegetation will result in the bare soil being exposed, creating a visual scar within the area, and a contrasting colours in the landscape	Construction Phase	4	2	2	4	4	48	3	2	2	3	2	20
Construction of offices, plant infrastructure ,workshops and other associated mine infrastructure	Visual Resource	The process of construction equipment and related works in the construction of the plant and associated mining areas (e.g. storage areas, access roads) will introduce visually intrusive elements into the landscape and locally result in increased traffic.	Construction Phase	3	2	2	4	3	33	3	2	2	4	2	33
Earthworks and construction of plant infrastructure	Visual	Night-time lighting will be required during construction. Due to the level of screening provided by the existing vegetation cover the impact of light pollution is expected to be	Construction Phase	3	2	2	4	2	22	3	2	2	4	2	22

		limited, but may increase as construction progresses and more cranes and large plant are housed on site.													
Fugitive dust from construction and vehicle movement	Visual Resource	Fugitive dust	Construction Phase	3	2	2	4	3	33	1	2	2	4	2	18
Fugitive dust from construction and vehicle movement	Visual Resource	Fugitive dust	Construction Phase	3	2	2	4	4	44	1	2	2	4	2	44
presence of topsoil, Run of Mine, product and ,overburden stockpiles and discard dumps;	Visual impact of fugitive dust	Operational Phase Reduction in visual resource value due to Fugitive dust	Operational phase	4	3	3	4	4	56	1	3	3	4	4	44
mining infrastructure	Visual Impact of night time Illumination	Operational Phase Reduction in visual resource value due to Night-time illumination	Operational phase	3	3	4	4	4	56	1	3	4	4	2	24
Demolition & Removal of all infrastructure	Visual Significance rating post closure	Reinstatement of visual resource value due to dismantling of infrastructure and subsequent rehabilitation of footprint areas. Permanent alteration of site topographical and	Closure and Decommissioning Phase	3	3	3	4	4	52	1	3	3	4	3	33

		visual character ofmined areas													
Site development and mining	Demographic change process	Influx of workers	Construction and operation	3	3	3	3	2	24	1	3	3	3	2.0	20
Mine development	Socio-cultural change process	Noise pollution	Construction and operation	3	2	2	2	3	27	3	2	2	2	2.0	18
Mine development	Socio-cultural change process	Crime, Safety and Security	Construction and operation	3	2	2	4	3	48	3	2	2	4	3.0	20
Mine development	Socio-cultural change process	Integration with local community	Construction and operation	3	3	3	3	4	48	3	3	3	3	2.0	24
Mine development	Socio-cultural change process	Quality of life and sense of place	Construction and operation	3	3	3	3	4	56	1	3	3	3	4.0	24
Mine development	Institutional and Empowerment Changes Processes	Attitude formation against project	Construction and operation	3	3	2	2	3	30	3	3	2	2	3.0	30
Mine development	Institutional and Empowerment Changes Processes	Negotiation process	Construction and operation	3	2	3	3	3	33	1	2	3	3	3.0	27

Mine development	Economic Change process	Direct formal employment opportunities to local individuals	Construction, operation and closure	3	3	4	4	4	56	3	3	4	5	4.0	60
Mine development	Economic Change process	Indirect formal and /or informal employment opportunities to local individuals	Construction, operation and closure	3	3	4	3	4	52	3	3	4	5	4.0	60
Mine development	Economic Change process	Impact on existing businesses in surrounding areas	Construction, operation and closure	3	3	4	3	5	65	3	3	4	3	3.0	39
Preparation of the foot print area	Baseline Noise Levels	Increased noise levels on the proposed site	Construction Phase	1	2	1	5	3	27	1	2	1	5	3.0	27
Preparation of the foot print area	Baseline Noise Levels	Increased noise levels off the proposed Site	Construction Phase	1	2	1	3	1	7	1	2	1	3	1.0	7
Civil construction	Baseline Noise Levels	Increased noise levels along the boundary of the proposed Site	Construction Phase	1	2	1	5	3	27	1	2	1	5	2.0	18
Civil construction	Baseline Noise Levels	Increased noise levels at the proposed open pit area	Construction Phase	1	2	1	3	1	7	1	2	1	3	1.0	7
Grading and building of new roads	Baseline Noise Levels	Increased noise levels along the boundary of the proposed Site	Construction Phase	1	2	1	5	3	27	1	2	1	5	2.0	18
Grading and building of new roads	Baseline Noise Levels	Increased noise levels at mine area	Construction Phase	3	2	1	3	5	45	3	2	1	3	3.0	27
Construction of buildings and/or plant	Baseline Noise Levels	Increased noise levels along the boundary of the proposed Site	Construction Phase	1	2	1	5	1	9	1	2	1	5	1.0	9
Construction of buildings and/or plant	Baseline Noise Levels	Increased noise levels at open pit and plant	Construction Phase	1	2	1	3	3	21	1	2	1	3	3.0	21

Mining activities area	Baseline Noise Levels	Increased noise levels on the proposed site	Operational phase	5	2	4	5	5	80	5	2	4	3	3.0	52
Mining activities area	Baseline Noise Levels	Increased noise levels off the proposed Site	Operational phase	1	2	4	4	1	11	1	2	4	1	1.0	11
Hauling of ore to siding or via road	Baseline Noise Levels	Increased noise levels along the feeder roads	Operational phase	5	3	4	5	4	68	3	3	4	3	3.0	39
Rehabilitation: Covering of open pit with capping layer and top soil	Baseline Noise Levels	Increased noise levels on the proposed Site	Closure and Decommissioning Phase	1	2	2	5	5	50	5	3	3	1	1.0	15
Rehabilitation: Covering of open pit with capping layer and top soil	Baseline Noise Levels	Increased noise levels off the proposed Site	Closure and Decommissioning Phase	1	2	2	3	5	40	1	2	2	3	1.0	8
Removal of buildings and infra- structure	Baseline Noise Levels	Increased noise levels along the feeder roads	Closure and Decommissioning Phase	1	2	2	1	5	35	1	3	2	1	1.0	7
Vehicle movement and Transportation of coal via road	Roads and Traffic	Heavy vehicle impact at the Intersections (congestion), increase in daily traffic	Construction, operation and closure	2	2	2	1	4	28	1	2	2	1	4.0	24
Transportation of coal via road	Roads and Traffic	Delay at Intersections	Construction, operation and closure	2	2	2	1	4	28	1	2	2	1	4.0	24
Transportation of coal via road	Roads and Traffic	Social Impact (unsafe pedestrian and drivers conditions)	Construction, operation and closure	2	2	2	3	3	27	1	2	2	3	3.0	24

1.10.1 Methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;

(Describe how the significance, probability, and duration of the aforesaid identified impacts that were identified through the consultation process was determined in order to decide the extent to which the initial site layout needs revision).

Assessment Criteria

The assessment of the impacts will be conducted according to a synthesis of criteria required by the integrated environmental management procedure.

Extent

The physical and spatial scale of the impact is classified as:

a) Footprint

The impacted area extends only as far as the activity, such as footprint occurring within the total site area.

b) Site

The impact could affect the whole, or a significant portion of the site.

c) Regional

The impact could affect the area including the neighbouring properties, the transport routes and the adjoining towns.

d) National

The impact could have an effect that expands throughout the country (South Africa).

e) International

Where the impact has international ramifications that extent beyond the boundaries of South Africa.

Duration

The lifetime of the impact, that is measured in relation to the lifetime of the proposed development.

a) Short term

The impact would either disappear with mitigation or will be mitigated through natural processes in a period shorter than that of the construction phase.

b) Short to Medium term

The impact will be relevant through to the end of the construction phase.

c) Medium term

The impact will last up to the end of the development phases, where after it will be entirely negated.

d) Long term

The impact will continue or last for the entire operational lifetime of the development, but will be mitigated by direct human action or by natural processes thereafter.

e) Permanent

This is the only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient,

Intensity

The intensity of the impact is considered by examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning, or slightly alters the environment itself. The intensity is rated as:

a) Low

The impact alters the affected environment in such a way that the natural processes or functions are not affected.

b) Medium

The affected environment is altered, but functions and processes continue, albeit in a modified way.

c) High

Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.

Probability

This describes the likelihood of the impacts actually occurring. The impact may occur for any length during the life cycle of the activity, and not at any given time. The classes are rated as follows:

a) Impossible

The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0%).

b) Possible

The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chances of this impact occurring is defined as 25%.

c) Likely

There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined as 50%.

d) Highly likely

It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined as 75%.

e) Definite

The impacts will take place regardless of any provisional plans, and or mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined as 100%.

Mitigation

The impacts that are generated by the development can be minimised if measures are implemented in order to reduce the impacts. The mitigation measures ensure that the development considers the environment and the predicted impacts in order to minimise impacts and achieve sustainable development.

Determination of significance – Without Mitigation

Significance is determined through a synthesis of impacts as described in the above paragraphs. It provides an indication of the importance of the impact in terms of both tangible and intangible characteristics. The significance of the impact "without mitigation" is the prime determinant of the nature and degree of mitigation required. Where the impact is positive, significance is noted as "positive". Significance is rated on the following scale:

a) No significance

The impact is not substantial and does not require any mitigation action.

b) Low

The impact is of little importance, but may require limited mitigation.

c) Medium

The impact is of importance and is therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels.

d) High

The impact is of major importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential.

Determination of significance – With Mitigation

Determination of significance refers to the foreseeable significance of the impact after the successful implementation of the necessary mitigation measures. Significance with mitigation is rated on the following scale:

a) No significance

The impact will be mitigated to the point where it is regarded as insubstantial.

b) Low

The impact will be mitigated to the point where it is of limited importance.

c) Low to Medium

The impact is of importance however, through the implementation of the correct mitigation measures such potential impacts can be reduced to acceptable levels.

d) Medium

Notwithstanding the successful implementation of the mitigation measures, to reduce the negative impacts to acceptable levels, the negative impact will remain of significance. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw.

e) Medium to High

The impact is of major importance but through the implementation of the correct mitigation measures, the negative impacts will be reduced to acceptable levels.

f) High

The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact is regarded as high importance and taken within the overall context of the project, is regarded as a fatal flaw. An impact regarded as high significance, after mitigation could render the entire development option or entire project proposal unacceptable.

Assessment weighting

Each aspect within the impact description was assigned a series of quantitative criteria. Such criteria are likely to differ during the different stages of the project's life cycle. In order to establish a defined base upon which it becomes feasible to make an informed decision, it is necessary to weigh and rank all criteria.

Ranking, Weighting and Scaling

For each impact under scrutiny, a scale weighting Factor is attached to each respective impact (refer to Figure 51: Description of biophysical assessment parameters with its respective weighting), The purpose of assigning such weight serve to highlight those aspects considered most critical to the various stakeholders and ensure that each specialist's element of bias is taken into account. The weighting factor also provides a means whereby the impact assessor can successfully deal with the complexities that exist between the different impacts and associated aspects criteria.

Simply, such a weighting factor is indicative of the importance of the impact in terms of the potential effect that it could have on the surrounding environment. Therefore, the aspects considered to have a relatively high value will score a relatively higher weighting than that which is of lower importance.

Extent	Duration	Intensity	Probability	Weighting Factor (WF)	Significance Rating (SR)	Mitigation Efficiency (ME)	Significance Following Mitigation (SFM)
Footprint 1	Short term 1	Low 1	Probable 1	Low 1	Low 0-19	High 0,2	Low 0-19
Site 2	Short to medium 2		Possible 2	Low to medium 2	Low to medium 20-39	Medium to high 0,4	Low to medium 20-39
Regional 3	Medium term 3	Medium 3	Likely 3	Medium 3	Medium 40-59	Medium 0,6	Medium 40-59
National 4	Long term 4		Highly Likely 4	Medium to high 4	Medium to high 60-79	Low to medium 0,8	Medium to high 60-79
International 5	Permanent 5	High 5	Definite 5	High 5	High 80-100	Low 1,0	High 80-100

Figure 51: Description of biophysical assessment parameters with its respective weighting

Identifying the Potential Impacts without Mitigation (WOM)

Following the assignment of the necessary weights to the respective aspects, criteria are summed and multiplied by their assigned weightings, resulting in a value for each impact (prior to the implementation of mitigation measures).

Equation 1:

Significance Rating (WOM) = (Extent + Intensity + Duration + Probability) x Weighting Factor

Identifying the Potential Impacts with Measures (WM)

In order to gain a comprehensive understanding of the overall significance of the impact, after implementation of the mitigation measures, it was necessary to re-evaluate the impact.

a) Mitigation Efficiency (ME)

The most effective means of deriving a quantitative value of mitigated impacts is to assign each significance rating value (WOM) a mitigation effectiveness (ME) rating. The allocation of such a rating is a measure of the efficiency and effectiveness, as identified through professional experience and empirical evidence of how effectively the proposed mitigation measures will manage the impact.

Thus, the lower the assigned value the greater the effectiveness of the proposed mitigation measures and subsequently, the lower the impacts with mitigation.

Equation 2:

Significance Rating (WM) = Significance Rating (WOM) x Mitigation Efficiency

Or WM = WOM x ME

b) Significance Following Mitigation (SFM)

METHODOLOGY FOR ASSESSING ENVIRONMENTAL ISSUES AND ALTERNATIVES

According to National Environmental Management Act (107/1998): Environmental Impact Assessment Regulations, 2014), the environment is described as the surrounding within which human exist and that are made up of:

(i) the land, water and atmosphere of the earth;

(ii) micro-organisms, plant and animal life;

(iii) any part or combination of (i) and (ii) and the interrelationships among and between them; and

(iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Impact Assessment Methodology

(a) Nature of the impact

The NATURE of an impact can be defined as: "a *brief description of the impact being assessed, in terms of the proposed activity or project, including the socio-economic or environmental aspect affected by this impact*".

(b) Extent of the impact

The EXTENT of an impact can be defined as: "*a brief description of the spatial influence of the impact or the area that will be affected by the impact*".

EXTENT Extent or spatial influence of impact	**Footprint**	Only as far as the activity, such as footprint occurring within the total site area
	Site	Only the site and/or 500m radius from the site will be affected
	Local	Local area / district (neighbouring properties, transport routes and adjacent towns) is affected
	Region	Entire region / province is affected
	National	Country is affected

(a) Magnitude of the impact

The MAGNITUDE of an impact can be defined as: "*a brief description of the intensity or amplitude of the impact on socio-economic or environmental aspects".*

MAGNITUDE Magnitude / intensity of impact (at the specified scale)	**Zero**	Natural and/or social functions and/or processes remain *unaltered*
	Very low	Natural and/or social functions and/or processes are *negligibly* altered
	Low	Natural and/or social functions and/or processes are *slightly* altered
	Medium	Natural and/or social functions and/or processes are *notably* altered
	High	Natural and/or social functions and/or processes *severely* altered

(b) Duration of the impact

The DURATION of an impact can be defined as: "*a short description of the period of time the impact will have an effect on aspects*".

DURATION Duration of the impact	**Short term**	Construction phase up to 3 years after construction
	Medium term	Up to 6 years after construction
	Long term	More than 6 years after construction

(c) Probability of the impact occurring

The PROBABILITY of an impact can be defined as: "the *estimated chance of the impact happening*".

PROBABILITY	**Unlikely**	*Unlikely* to occur (0 – 25% probability of occurring)
	Possible	*May* occur (26 – 50% chance of occurring)
	Probable	*Likely* to occur (51 – 75% chance of occurring)
	Definite	Will *certainly* occur (76-100% chance of occurring)

(d) Degree to which impact can be reversed

The REVERSABILITY of an impact can be defined as: *"the ability of an impact to be changed from a state of affecting aspects to a state of not affecting aspects*".

REVERSABILITY	**Reversible**	Impacts can be reversed through the implementation of mitigation measures
	Irreversible	Impacts are permanent and can't be reversed by the implementation of mitigation measures

(e) Degree to which impact may cause irreplaceable loss of resources

The IRREPLACEABILITY of an impact can be defined as:" the amount of resources that can (not) be replaced".

IRREPLACEABILITY Irreplaceable loss of resources	**No loss**	*No* loss of any resources
	Low	*Marginal* loss of resources
	Medium	*Significant* loss of resources
	High	*Complete* loss of resources

(f) Degree to which the impact can be mitigated

The degree to which an impact can be MITIGATED can be defined as: "the effect of mitigation measures on the impact and its degree of effectiveness".

MITIGATION RATING	**MITIGATED** Degree impact can be mitigated	**High**	*Impact 100% mitigated*
		Medium	*Impact >50% mitigated*
		Low	*Impact <50% mitigated*

(g) Confidence rating

CONFIDENCE in the assessment of an impact can be defined as the:" *level of certainty of the impact occurring*".

CONFIDENCE RATING	**CONFIDENCE**	**Unsure**	Amount of information on and/or understanding of the environmental factors the potentially influence the impact is *limited*.
		Sure	Amount of information on and/or understanding of the environmental factors the potentially influence the impact is *reasonable and relatively sound.*
		Certain	Amount of information on and/or understanding of the environmental factors the potentially influence the impact is *unlimited and sound*.

(h) Cumulative impacts

The effect of CUMULATIVE impacts can be described as:" the effect the combination of past, present and "reasonably foreseeable" future actions have on aspects".

CUMULATIVE RATING	**CUMULATIVE EFFECTS**	**Low**	*Minor* cumulative effects
		Medium	*Moderate* cumulative effects
		High	*Significant* cumulative effects

The significance of the impact after the mitigation measures are taken into consideration. The efficiency of the mitigation measure determines the significance of the impact. The level of impact is therefore seen in its entirety with all considerations taken into account. The significance of the impact assessment was taken into consideration by assessing areas of high conservation value. These areas will either be excluded from any disturbances including buffer zones being implemented. In cases where the areas cannot be exempted relevant applications will be applied for.

1.10.2 The positive and negative impacts that the proposed activity (In terms of the initial site layout) and alternatives will have on the environment and the community that may be affected.

(Provide a discussion in terms of advantages and disadvantages of the initial site layout compared to alternative layout options to accommodate concerns raised by affected parties)

This section focuses specifically on the alternatives relating directly to the proposed coal mining project, further impacts are detailed in the section below, and therefore not repeated here. The alternatives discussed are:

- Proposed open Cast Mining
- Pollution Control Dam
- Storm water management infrastructure
- Processing Plant
- Water Treatment Plant and sewage treatment plant
- Infrastructure and Roads (workshops, discard dumps, temporary storage of ROM stockpiles, powelines and substations etc.)
- No Go Option

Table 23: Positive and negative impacts considering the alternatives described for the proposed Berenice Project

Activity	Alternative	Aspect	Positive and negative impacts
Open Cast Mining	Type of mining and areas mineable	Geology	(-) Due to the shallow nature of the coal seams it is only feasible to mine opencast (-) Including the areas within 1:100 floodline will increase areas impacted by the coal mining and increases the extent to which the geology is altered
		Groundwater	(-) The excavation of the open pit will lead to dewatering and decanting. This will have a drawdown effect of 5m on boreholes in the area (-) groundwater quality will also be affected by polluting elements
		Surface water	(-) Minimal impacts are expected on the Brak river, salination through groundwater quality change (seepage of polluted groundwater into the Brak River?) and sedimentation is expected (+) Not mining within the floodlines and riparian areas will preserve the pristine environment and not alter the drainage patterns on those particular areas (-) Increased sedimentation due to erosion
		Wetlands and Pans	(-) One of the Pans on the farm Longford will be completely lost to the mining activity (-) Increased sedimentation due to erosion
		Topography	(-) The topography or the area is relatively flat and the open pits will leave a depression even after rehabilitation (-) temporary storage of stockpiles, discard dumps and topsoil will temporarily distort the topography
		Soil	(-) Excluding floodline and riparian areas from the open pit mining will reduce the footprint of the mining area. (-) Soil will be lost during excavations and erosion even if mitigation measures are implemented
		Land Capability	(-) The land capability will be lost in areas where excavation and open pits will be located. (-) the chemical properties of the soil will be altered due to pollution from hydrocarbons, oils, coal dust, overspills from PCDs
		Land Use	(-) the land use will be lost from that of a conservation value, however with proper mitigation the land can be rehabilitated to an acceptable level

Activity	Alternative	Aspect	Positive and negative impacts
		Flora	(-) Not mining in the riparian areas minimises impacts on flora (-) the vegetation clearing of around 5000heactres will lead to significant loss of indigenous species (-) increased encroachment of alien invasive species on cleared land
		Fauna	(-) the loss of these vegetation leads to loss of habitats for birds, mammals and herpetofauna (-)displacement of fauna due to increased human activity like noise, blasting, vehicles, human behaviour and poaching
		Air	(-) Increased air pollution from the blasting activities, site clearing, vehicle movement and fumes and fugitive dust
		Noise	(-) Increased noise polluting from earthmoving equipment, heavy vehicles and machinery, processing plant, conveyor belts and blasting
		Heritage	(-) Graves on OC2 will need a relocation permit or a buffer zone if they are excluded from the mining area. (-) Artefacts unearthed during construction and operations can be lost if no proper heritage induction is undertaken and proper mitigation measures are not put in place
		Climate change	(-) Due to vegetation cleaning , particulate matter from vehicles and machinery, increased fugitive dust it is expected that the climate will be locally affected by the increase in aerosols in the atmosphere as well as increased reflective surfaces
		Socio- Economic	(-) excluding areas within floodlines reduces the total amount of ore to be mined (-) I&AP's concerned over the pollution plume of the mining activity, Acid mine drainage, reduction in groundwater levels to scarcity in a water strained area (-) I&AP's concerned about the proximity of the mining area to the biosphere buffer, this listing activity under Activity 3 has been included as part of this application (+) the proposed mine will employ a total of 511 employees(skilled and unskilled during construction) (+)There will be infrastructure development as part of the SLP for a Tshwikaradi Primary school and a library. (+) Through local hiring and promoting of local SME’s the project will have a positive impact on the local economy (this has been noted but I&AP”s requesting to supply fuel for the mine)
Pollution control dam	Location and size	Geology	(-) The excavations will remove certain bedrock which will be discarded or used to rehabilitate the open pits but will be lost to the original stratigraphy
		Groundwater	(-) The excavation of the area will change drainage patterns as well as infiltration and runoff
		Surface water	(-) The PCD with a 110% capacity will be located at least 500m from the Brak river with a dirty water containment system in place in case of spillage
		Wetlands and Pans	(-) The PCD with a 110% capacity will be located at least 500m from the pans with a dirty water containment system in place in case of spillage
		Topography	(-) The PCD will be constructed in a low lying flat area and will not alter the topography
		Soil	(-) Soil loss through clearing of land for the pollution control dam
		Land Capability	(-) Land capability lost for the pollution control dam
		Land Use	(-) Current land use lost as land capability is directly affected by the reduction in area due to infrastructure as well as loss in visual appearance land for infrastructure and roads

Activity	Alternative	Aspect	Positive and negative impacts
		Flora	(-) Vegetation will be lost during site clearing and construction. However it is recommended that the plant be constructed on already existing clearances to minimise vegetation loss
		Fauna	(-) The clearance of vegetation will lead to a loss in habitat for birds, mammals and herpetofauna (-) displacement of fauna due to increased activity and noise
		Air	(-) increased dust levels, PM10, fumes during the construction phase
		Heritage	(-) The PCD will be located at least a 100m from heritage buffer zones. (-)loss of archaeological artefacts might be lost due to poor environmental management during the construction phase
		Noise	(-)Increased noise levels are expected during construction
		Social	(-) Increased visual disturbance to the residents on the site from the PCD (-) I&AP concerns for overspills and spillages contaminating the groundwater (-) I&AP's raising concern about waste license management application. As part of an integration application a waste license was applied for during the EA application phase. The inputs of the IWWMP which is part of the IWULA also running concurrently with this process feeds into the waste licence application authorisation (+) Potential local economy growth through hiring of architectural and engineering companies in the areas to provide the services (+) Skilled and unskilled labour creations
Storm Water Management features (Clean and dirty water separation)		Geology	(0) the stormwater management features will have negligible effect on the geology as there will be no alterations to the bedrock
		Groundwater	(+) The stormwater management features will contain contaminated water separating it from clean water which is released to the Brak River. This contains contaminated water in a localised area
		Surface water	(+) The stormwater management features will contain contaminated water separating it from clean water which is released to the Brak River. This stops the Brak River being contaminated as it feeds into the Sand River which feed into the Limpopo. (-) the construction of the stormwater management features will alter drainage patterns
		Wetlands and Pans	(0) the stormwater management features will not impact the pans
		Topography	(+) The stormwater management features will be constructed around the hill with the possibility of using berms to redirect runoff around the site straight into the Brak river
		Soil	(-) Soils will be lost albeit in minimal quantities where the features will be built
		Land Capability	(-)There will be minimal land use lost due to the infrastructure
		Land Use	(-)There will be minimal land capability lost due to the infrastructure
		Flora	(-)Where possible the features will be constructed around vegetation of high conservation value. In cases where this is not possible there will be loss in flora
		Fauna	(-) the construction of the features will cause a loss in vegetation therefore habitats are lost (-)changes in animal routine might be affected by the features
		Air	(-) Aside from temporary fugitive dust and PM10 emissions during construction no residual air quality impacts are anticipated

Activity	Alternative	Aspect	Positive and negative impacts
		Heritage	(0) Storm water features will be designed around heritage features
		Noise	(-) There will be temporary noise pollution during construction but this will subside once complete
		Social	(+) Potential local economic growth through hiring of architectural and engineering companies in the areas to provide the services (+) Skilled and unskilled labour creations
Processing plant		Geology	(+) The processing plant will not affect the geology
		Groundwater	(-) Construction of the processing plant will lead the clearance of vegetation altering infiltration and runoff patterns. There are open areas on the project site and it is proposed by the EAP that UCDII choose one of those areas as an alternative (+) The technology of the plant is considered to be one of the best in coal beneficiation
		Surface water	(-) the vegetation clearing, compaction and infrastructure will change drainage patterns and rates of infiltration
		Wetlands and Pans	(0) The plant will not be constructed within a 500 meter buffer of the pans on site
		Topography	(0) The plant will be constructed on relatively low flat land which has already been disturbed and this will not impact the topography
		Soil	(-)There will be soil loss during construction of the plant
		Land Capability	(-) The land capability of the plant foot print will be altered and lost
		Land Use	(-) The current land use is not compatible with mining, a rezoning certificate will need to be applied for prior to commencement of the activity. The eco-tourism land use will be lost as the land capability is directly altered
		Flora	(-) Vegetation will be lost during site clearing and construction. However it is recommended that the plant be constructed on already existing clearances to minimise vegetation loss
		Fauna	(-) The clearance of vegetation will lead to a loss in habitat for birds, mammals and herpetofauna (-) displacement of fauna due to increased activity and noise
		Heritage	(0) The wash processing plant will be located at least a 100m away from any areas of cultural significance
		Air	(-) Air emissions from the use of chemicals and generators
		Noise	(-) Increased noise levels from the processing plant
		Social	(-) Increased visual disturbance to the communities from the plant (-) Increase noise levels in the area might disturb the community (+) Potential local economy growth through hiring of architectural and engineering companies in the areas to provide the services (+) Skilled and unskilled labour creations
Water treatment plant and sewage treatment Plant	Phase of construction and implementation	Geology	(+) The water treatment plant will not affect the geology
		Groundwater	(-) Construction of the water plus the sewage treatment plant will lead the clearance of vegetation. There are open areas on the project site and it is proposed by the EAP that UCDII choose one of those areas as an alternative (+) Construction of the water treatment plant is advantageous in reuse of water reducing the mine's reliance on external water resources (+) Earlier commissioning of the plant can increase chances of early mitigation of acid mine drained as water from the pits will be treated before it is discharged to curb Acid Mine Drainage (AMD) (-) the sewage treatment plant should be designed as a bio-filtration process instead of chemicals, possibility of effluent spillages affecting the groundwater quality

Activity	Alternative	Aspect	Positive and negative impacts
		Surface water	(-) the vegetation clearing, compaction and infrastructure will change drainage patterns and rates of infiltration
		Wetlands and Pans	(+) The plants will not be constructed within a 500 meter buffer of the pans on site
		Topography	(0) The plant will be constructed on relatively low flat land which has already been disturbed and this will not impact the topography
		Soil	(-)There will be soil loss during construction of the plant
		Land Capability	(-) The land capability of the plant foot print will be altered and lost
		Land Use	(-) The current land use is not compatible with mining, a rezoning certificate will need to be applied for prior to commencement of the activity. The eco-tourism land use will be lost as the land capability is directly altered
		Flora	(-) Vegetation will be lost during site clearing and construction. However it is recommended that the plants be constructed on already existing clearances to minimise vegetation loss
		Fauna	(-) The clearance of vegetation will lead to a loss in habitat for birds, mammals and herpetofauna (-) displacement of fauna due to increased activity and noise
		Heritage	(+) The water plus sewage treatment plant will be located at least a 100m away from any areas of cultural significance
		Air	(-) Air emissions from the use of chemicals and generators (-) Increased "bad smell" from the sewage treatment plant
		Noise	(-) Increased noise levels from the water and waste treatment plant due to increased activity and at the plants.
		Social	(+) Increased potential to supply water to the communities treated from the plant (-) Increased noise levels in the area might disturb the community (+) Potential local economy growth through hiring of architectural and engineering companies in the areas to provide the services (+) Skilled and unskilled labour creations
Mine related Infrastructure including Roads, Workshops, powerlines, substation, workshops etc.	Location on site and route options	Geology	(+) The construction of infrastructure and roads will not affect the geology
		Groundwater	(-) increased compaction will negatively impact runoff and infiltration which impacts the groundwater recharge. (-) Oils spillages during construction and use of roads will negatively impact the groundwater quality (-) Increased water pollution and risk of AMD at the discard dump (to minimise impact the proposed discard dump area must be HDPE lined
		Surface water	(+) All of the infrastructure and roads will not be constructed within 500m of the river (-) Possible spillages into the Brak river can occur when trucks cross the bridge north east of Celine towards Berenice
		Wetlands and Pans	(+) All of the infrastructure and roads will not be constructed within a 500m buffer zone of the pans
		Topography	(+) The infrastructure will be constructed on relatively low flat land which has already been disturbed and this will not impact the topography (+) To minimise vegetation clearance it is proposed that UCDII make use of the vast rod networks on and off the site
		Soil	(-) Soil loss through clearing of land for infrastructure and roads
		Land Capability	(-) Land capability lost for infrastructure and roads
		Land Use	(-) Current land use lost as land capability is directly affected by the reduction in area due to infrastructure as well as loss in visual appearance land for infrastructure and roads

Activity	Alternative	Aspect	Positive and negative impacts
		Flora	(-) Loss of vegetation through site clearing for infrastructure (+) To minimise vegetation clearance it is proposed that UCDII make use of the vast rod networks on and off the site
		Fauna	(-) The clearance of vegetation will lead to a loss in habitat for birds, mammals and herpetofauna (-) displacement of fauna due to increased activity and noise (-) Electrocution of birds by power lines and at substations
		Heritage	(+) The infrastructures will be located at least a 100m away from any areas of cultural significance
		Air	(-) Increased air pollution during construction activities, site clearing and during the operation phase from vehicle movement and fumes and fugitive dust
		Noise	(-) Temporary increase in levels during construction (-) Noise level increases from haul trucks on and off the site as well as conveyer belts on site
		Social	(-) The I&AP's see the infrastructure as a disturbance to the visual character of the area. (+) Potential local economy growth through hiring of architectural and engineering companies in the areas to provide the services (+) Skilled and unskilled labour creations
No-go project option (Not implementing the mining activity)	Not implementing the mining activity	Air	(0) Air quality would not be compromised during the construction, operations and rehabilitation through the proposed mining activities by the generation of dust from exposed surfaces as well as the generation of exhaust fumes from machinery.
		Noise	(+) Noise would not be generated during the construction, operations and rehabilitation through the mining related activities.
		Topography, groundwater and surface water	(+) Sensitive landscapes will not be compromised including groundwater or surface water quality or quantity
			(+) The landscape will not be altered by the depressions which will be caused by the open pits mining and removal of coal however successfully rehabilitated.
		Flora and Fauna	(+) No Loss of indigenous vegetation and habitats
		Soil and Land Capability	(+)The arable and wildlife land capability will not be changed and no soil losses through the construction, operations and rehabilitation through the mining related activities
		Visual aspects	(+) The visual landscape and sense of place attributes would not be compromised.
		Land Use	(+) The current land use is quite profitable and ecologically sustainable and would continue generating income from eco-tourism
		Heritage	(+) The sites of historical and cultural importance would not be affected by the construction, operations and rehabilitation through the mining related activities
		Social and Economic Impacts	(-)Loss of potential investment opportunities in the project area and income generated from the sale of the product
			(-) Loss of potential employment creation and opportunities for local service providers
			(-) Loss of infrastructure development for the proposed SLP programs for the surrounding community (Tshwikiradi Primary school and Library)
			(-)Loss of income already invested in the prospecting activities as well as related regulatory applications
			(-) Loss of training programs for HDSA including bursaries, mentorship programs and career development plans

Activity	Alternative	Aspect	Positive and negative impacts
			(-) There would be direct losses to government through a loss in revenue from the mine (through taxes).
			(-) There would be direct losses to government through a loss in revenue from the mine (through taxes).
			(-) The land claimants will also stand to lose out on the BEE partnership to be gained from the project.
		I&APs	(-) / (+) I&APs may be positively or negatively affected by the various impacts described above

1.10.2.1 The possible mitigation measures that could be applied and the level of risk.

(With regard to the issues and concerns raised by affected parties provide a list of the issues raised and an assessment/ discussion of the mitigations or site layout alternatives available to accommodate or address their concerns, together with an assessment of the impacts or risks associated with the mitigation or alternatives considered).

The impacts of the proposed project have been detailed in **Table 24: Assessment of each identified potentially significant impact and risk**

1.10.2.1.1 Motivation where no alternative sites were considered.

The applicant in joint partnership with their BEE partner Bono Lithihi hold a prospecting right over the area project and the project cannot be implement at alternative sites (away from the existing mine boundary area).

Alternative locations of various developments and infrastructure within the application area have, where possible, been considered, and are described in **Table 23: Positive and negative impacts considering the alternatives described for the proposed Berenice Project** above.

1.10.2.1.2 Statement motivating the alternative development location within the overall site.

(Provide a statement motivating the final site layout that is proposed)

The proposed locations of pits and related infrastructure were influenced by the following factors:

- Open Cast Areas
    - The quantifiable availability and location of the resources and appropriate mining method
    - The location of open cast areas in relation to environmentally sensitives features
- Water management Infrastructure
    - Pollution control dams- to be located on already disturbed areas, low lying flat areas, at least 500m from the Brak River, outside the 1:100 year floodline, away from

riparian areas and 500m buffer from wetlands. 110% containment capacity and to be located within the dirty water bunded areas.
    - Storm water management infrastructure- Location of drains in relation to hills and areas of high conservation value
- Processing Plant
    - Design- the processing plant has been designed according to the standards required for the beneficiation process.
    - Location- The location of the plant will be finalised based on finding a location on site which is low lying and flat to minimise visual impact as well as already cleared areas to reduce the destruction of indigenous vegetation
- Water Treatment Plant and the sewage treatment plant
    - Commissioning- It is proposed that the water treatment plant be commissioned at the onset of operations to treat pit decant water to reduce impacts on ground water quality.
    - Location- The location of the plant will be finalised based on finding a location on site which is low lying and flat to minimise visual impact as well as already cleared areas to reduce the destruction of indigenous vegetation.
- Infrastructure and road (offices, buildings, sub stations, discard dump, workshops, road, powerlines)
    - Existing road network- on and off site there is a good network of road that can be utilised for the project to minimise additional disturbances
    - Areas of high visual view shed- Infrastructure to be constructed in low lying areas to minimise the view shed. Screening with indigenous vegetation is also crucial which can be reached by reducing the tree removal around the boundary of the project site to limit the visual impact to the site (I.e. workshops to be on Matsuri instead of Gezelschap as the latter has a higher view shed).
    - High ecology sensitivity areas- Construct on already disturbed areas to limit destruction of indigenous vegetation.
    - Existing power lines on and around the project site
    - The use of road vs construction of a railway line linking the project directly to the Waterpoort Station
    - The tailing dump will be located in an area with low potential for AMD and HDPE lining of the discard dump to minimise leaching of minerals into the ground.

1.10.3 Full description of the process undertaken to identify, assess and rank the impacts and risks the activity will impose on the preferred site (In respect of the final site layout plan) through the life of the activity.

(Including (i) a description of all environmental issues and risks that where identified during the environmental impact assessment process and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.)

The methodology used to determine and rank the nature, significance, consequences, extent, duration and probability of each of the potential impacts and risks that have been identified was described in detail in 1.10.1: Methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks; of this report. Impacts are assessed below in terms of the following summarised criteria (for details refer to 1.10.1: Methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;):

- Nature of impact –proposed listed activity or project.
- Extent – Spatial Influence of the impact (site only, local, regional, national, international).
- Magnitude- Intensity of the impact (zero, very low, lo, medium, high)
- Duration – Period of time the impact will affect an aspect (immediate, short term, medium term, long term, permanent).
- Probability of occurrence- The estimated chance of the impact happening (improbable, low, medium, high, definite).
- Significance = (Magnitude + Duration + Extent) x Probability. (Low, medium, high).
- Reversibility of the impact – the ability of an impact to be changed from affecting an aspect to not affecting an aspect (reversible, partially reversible, irreversible).
- Irreplaceability loss of resources- The amount of resource that can or cannot be replaced (replaceable, partially replaceable, irreplaceable).

Other aspects considered is the degree to which the impact can be mitigated and the confidence rating which is the level of certainty of an impact occurring.

The significance of each identified impact described in **Table 23: Positive and negative impacts considering the alternatives described for the proposed Berenice Project**has been assessed based on the criteria and is tabulated in **Table 24: Assessment of each identified potentially significant impact and risk**.

1.10.4 Assessment of each identified potentially significant impact and risk (as rated by the specialist reports)

(This section of the report must consider all the known typical impacts of each of the activities (including those that could or should have been identified by knowledgeable persons) and not only those that were raised by registered interested and affected parties).

Table 24: Assessment of each identified potentially significant impact and risk

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
Site clearing, removal of topsoil and vegetation	Air Quality	Variable Dust generation from as land clearing, topsoil removal, loading of material, hauling, grading, stockpiling, bulldozing and compaction	Construction	14	• Topsoil should not be removed during windy months (August, September and October) due to associated wind erosion heightening dust levels in the atmosphere. • The area of disturbance must be kept to a minimum and no unnecessary clearing of vegetation must occur. • Topsoil should be re-vegetated to reduce the exposure areas. • During the loading of topsoil onto trucks or stockpiles, the dropping heights should be minimised. • Water or other binding agents such as (petroleum emulsions, polymers and adhesives) can be used for dust suppression on earth roads. • When using bulldozers and graders, there is need to minimise travel speed and distance and volume of traffic on the roads. • Stockpiles should not be left for prolonged periods as wind energy generates erosion and causes more dust to form. • It should be noted that emissions generated by wind are also dependent on the frequency of disturbance of the erodible surface and therefore covering the stockpiles with vegetation would reduce the negative erosion effect. • Any crusting of the surface binds the erodible material. • All stockpiles should be damped down, especially during dry weather or re-vegetated (hydro seeding is a good option for slope revegetation).	5.6

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					• Successful trialling of temporary rehabilitation of unshaped overburden emplacement areas by aerial sowing of a cover crop, providing an established vegetative stabilisation to minimise the potential for windblown dust generation • Constricting the areas and time of exposure of pre-strip clearing in advance of mining development In cases where the mitigation measures cannot be implemented dust suppression will be used.	
Construction of surface infrastructure (e.g. access roads, pipes, storm water diversion berms, change houses, admin blocks, drilling, blasting and development of adits for mining, etc)	Air Quality	. Activities of vehicles on access roads, levelling and compacting of surfaces, as well localised drilling and blasting will have implications on ambient air quality. The above mentioned activities will result in fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust)Bulldozing, excavation, drilling and blasting operations will result in the emission of dust to atmosphere	Construction	33	• Dust emitted during bulldozing activities can be reduced by increasing soil dampness by watering the material being removed thus increasing the moisture content. • Another option would be to time the blasting with wind to ensure the dust will not be blown to the sensitive receptors or especially the community. • Blasting should also not take place when poor atmospheric dispersion is expected i.e. early morning and late evening. • Materials need to be removed to dedicated stockpiles to be used during rehabilitation. • The hauling of materials should take place on roads which are being watered and/or sprayed with dust suppressant. • To reduce the amount of dust being blown from the load bin in the haul roads, the material being transported can be watered or the back of the vehicles can be covered with plastic tarpaulin covers. • Constricting the areas and time of exposure of pre-strip clearing in advance of construction to limit exposed soil surfaces	6.6

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
General transportation, hauling and vehicle movement on site	Air Quality	Transportation of the workers and materials in and out of mine site will be a constant feature during the construction phase. This will however result in the production of fugitive dust (containing TSP, as well as PM10 and PM2.5) due to suspension of friable materials from earth roads. dust emissions from haul track,	Construction	36	• Hauling of materials and transportation of people should take place on roads which is being watered and/or sprayed with dust suppressant. • To reduce the amount of dust being blown from the load bin in the haul roads, the material being transported can be watered or the back of the vehicles can be covered with plastic tarpaulin covers. • In order to mitigate the impacts of the activity, the speed limit should be kept to the low as more dust will be generated at higher wind speeds. • Speed limits need to be observed and adhered to. • Management should fit roads with speed humps to ensure adherence. • Application of wetting agents or application of dust suppressant to bind soil surfaces to avoid soil erosion. • The drop heights should be minimised when depositing materials to the ground. • Encourage car-pool and bulk delivery of materials in order to reduce the number of trips generated daily.	14.1
Removal of overburden, mineral extraction and backfilling when possible (including drilling/blasting hard overburden & stockpiling)	Air Quality	Drilling is an intermittent exercise that emits fugitive dust. There will be fumes from diesel trucks transporting ore to the stockpiles and conveyor belts at crushing and screening facilities. The conveyor belts deposit the minerals into the crusher, the crushing process releases fugitive dust. Activities by machinery in the mining process will lead to exhaust fumes from vehicles and dust from drilling and blasting	Operational phase	52	• Drilling by the nature of the action required to drill holes can produce a lot of dust. Drilling rigs for hole diameters over 50 mm generally have their own dust collectors which suck the drill cuttings to a large cyclone separator on board, which dumps the larger cuttings (over 2-3 mm); the finer dust is collected on filter elements and dumped by intermittent reverse air pulses through the elements. Cyclones can be used in many other applications and present a very good method of capturing dust. • Use of pre-blast environmental checklists, real-time weather monitoring data and stringent controls on blasts carried out in sensitive areas • A no-blast arc is automatically calculated for the nearest private residence based on the latest relevant weather	31.2

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
		processes. Fugitive dust (containing TSP, as well as PM10 and PM2.5) occurs as a result of the aforementioned processes.			conditions, including wind speed and direction, temperature inversions and amount of atmospheric turbulence (i.e. stability category) before the blast can be fired • Respiratory protection should only be used to control the dust exposures where other dust collection or suppression systems have not been able to reduce the dust to acceptable levels. • When using hand held rock drills efforts should be made to control dust at source e.g. water injection or extraction. If control of dust at source is not practicable then respiratory protection should be used. • Low or in-pit dumping of overburden during high wind conditions • There is need to have water sprays. • Filtration systems can be utilised to remove the pollutants from the underground air prior to their release to the surface via the vent. • Use of efficient diesel fuel for heavy underground machinery. • Successful trialling of broad acre temporary rehabilitation of unshaped overburden emplacement areas by aerial sowing of a cover crop, providing an established vegetative stabilisation to minimise the potential for windblown dust generation • Constricting the areas and time of exposure of pre-strip clearing in advance of mining development	
Use and maintenance of haul roads (incl. transportation of minerals to plant	Air Quality	Transportation of the workers and materials in and out of mine site will be a constant feature during the operational phase and result in the production of fugitive dust	Operational phase	42	• Formulation and implementation of sound management plans for all operations likely to create dust • Planting plenty of trees or hedges as shelterbelts to eliminate or minimise wind disturbance • Planning operations to maximise the benefit of wind breaks	16.8

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
		(containing TSP, as well as PM10 and PM2.5) due to suspension of friable materials from earth roads. Substantial secondary emissions may be emitted from material moved out from the site during grading and deposited adjacent to roads			• Disturbed areas such as those caused by stripping off grass and topsoil should be kept to a minimum • Haul roads and standing areas should be sealed or concreted where possible • Use water sprays or water carts to settle dust. Care must be taken to ensure that the water used is free from pollution by noxious matter. There are additives available that reduce the volume of water used, and increase its effectiveness, but approval to use them should be obtained from the local territorial authority. • Use of a global positioning system as a tool to track the locations of mining and dust suppression equipment (e.g. water carts) and cross-referencing this information with real- time weather monitoring to assist with dust control • Use of water sprays at each contact or transfer point along the conveyance system which have adjustable rates of application (low, medium and high) depending on dust levels • Automatic water sprays installed at the ROM hopper bin that produce a fine mist to suppress dust generated with the triggering of sensors when a truck enters the dump zone and automatic sprays activated until a set time following the departure of the truck • Use of a reclaim tunnel at the product stockpile and an enclosed conveyor to transfer minerals to the loader, both of which minimise dust generation • Use of a retractable telescopic chute with curtains to load minerals into transport trucks • Speed restrictions should be imposed and enforced • Cabs of machines should be swept or vacuumed regularly to remove accumulated dust • Exhaust pipes of vehicles should be directed so that they do not raise dust	

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					• Engine cooling fans of vehicles should be shrouded so that they do not raise dust • Hard surfaced haul roads or standing areas should be washed down and swept to remove accumulated dust	
Generation of stockpiles and associated mining waste	Air Quality	dust generated from waste rock, evaporation of hydrocarbon fuels from storage tanks and spillages, waste oils chemicals plus hazardous waste	Operational phase	52	• Automatic sprays installed around the perimeter of the ROM stockpile activated when the wind speed is >6 m/sec (averaged over 15 minutes) • Finished product stockpiles formed on an as-needs basis with stockpiled minerals loaded out by truck as soon as possible • A tree windbreak located downwind of the prevailing wind direction to minimise dust from the finished product stockpiles • Topsoil handling and storage procedures including stockpile inventory, vegetative cover and signage to optimise rehabilitation and minimise wind erosion • Successful trialling of a chemical dust suppressant on haul roads resulting in a considerable reduction in the amount of water used for dust suppression on haul roads • Dust from stockpile sources can be contained in an enclosure, the use of plastic or other material cover, compaction of the surface and the use of water or sprays, trees and careful citing of stockpiles • In summary, care and planning of sites for plant, haul roads and stockpiles will help in reducing problems with nuisance dust. For existing plants, care must be taken to ensure the dust suppression system used fits in with the products produced and is easily used and maintained • There is a need to develop a waste management plan. • This will identify anticipated liquid and solid waste streams and will ensure thorough inspection and waste minimisation procedures, storage locations, and waste-	31.2

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					specific management and disposal requirements. • Optimum material handling and recycling strategy should be enforced by management and strict adherence on the part of workers during the operation phase. • There is need to understand the process that generates waste and monitoring constantly to observe if there are changes in the waste or the waste characteristics in order to minimize stockpiles. • Successful trialling of broadacre temporary rehabilitation of unshaped overburden emplacement areas by aerial sowing of a cover crop, providing an established vegetative stabilisation to minimise the potential for windblown dust generation. • Constricting the areas and time of exposure of pre-strip clearing in advance of mining development in turn limiting stockpile requirements.	
Beneficiation by means of crushing and screening	Air Quality	. The crushing process releases fugitive dust, especially if there are no enclosure and water sprays. Dust contained within the RoM ore can be released into the atmosphere during this process i.e. fugitive dust (containing TSP, as well as PM10 and PM2.5). Wind erosion from stockpiles can be a perennial source of dust if not properly managed during and post mining operations.	Operational phase	75	Plant • Fog Suppression System • Dust extraction hoods and cyclones and/or bag filters • Conventional water sprays, whose performance can be enhanced with the addition of wetting agents that assist in water to dust particle contact, lessening the amount of water required • Locating plant so that it is sheltered from the prevailing wind and the introduction of plant shelterbelts Crushing • Dust can be reduced by providing a controlled fine water spray system that directs water onto the input material before it enters the crusher (be careful not to over water as this can cause further problems down the production process) • Dust extractor hoods and cyclone collectors and/or bag	30

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					filters. This is particularly suitable for use on the output chute or stone box under the crusher • Where practicable, stone boxes on process plants can direct and slow the fall of material onto conveyor belts, and thus the amount of dust generated at transfer points • Crushing often requires constant supervision; therefore, some extra operator protection at this typically dusty process is almost always required • In order to reduce dust contamination in crusher control rooms and operator's positions, these areas should be completely enclosed and ventilated with uncontaminated air to create a positive air pressure • Thus it may be necessary to provide air conditioning so the operator has no need to open doors or windows • Protection of the control room will, in addition to creating a healthier environment, protect the electrical equipment from dust contamination that may lead to malfunctioning. • Fog Suppression System is another method Screening • In order to control dust in dry screening, the conventional method is to place a hood over the total screen area with rubber curtains sealing to the screen sides • To be effective the screens and discharge chutes should be sealed to the bins to prevent currents of air carrying fine dust away into the surrounding area, and the screen house building must be well sealed or dust will escape • Desirable elements for effective control are enclosed screens; enclosed transfer points, covered conveyors and chutes, and sealed bins. In theory it is then only necessary to deal with dust-laden air in the controlled area. As an aid to creating these conditions, extensive use can be made of specially developed rubber sheet covering that can be	

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					removed for maintenance and the inevitable blockage • A careful summary of what permanent sealing and what removable sealing can be done should be carried out before determining the degree of further dust control, which may need to be applied • Ducting from each plant item and transfer point may be connected to a filter system. Each item can either have its own filter or be ducted through to a central collector, usually a cyclone or bag filter system, or an electrostatic precipitator. The electrostatic precipitator is very efficient, but is an expensive item to buy. They are usually used where there is a large amount of dust produced • Metal sheeting or rubber panels normally achieve the enclosure of equipment, plus rubber seals at the joints. The use of rubber sheeting panels has grown recently, as it is easily removed and replaced for maintenance purposes • An important factor in the enclosure of a screen or the enclosing of any machinery is that adequate clearance must be allowed for moving parts, and account should be taken of potential temperature build-up in bearings and gearboxes. Further limitation on the discharge of dust can be achieved by the complete housing of the plant	

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
Demolition & Removal of all infrastructure (incl. transportation off site)	Air Quality	The process includes dismantling and demolition of existing infrastructure, transporting and handling of topsoil on unpaved roads in order to bring the site to its initial/rehabilitated state. Demolition and removal of all infrastructures will cause fugitive dust emissions.	Closure and Decommissioning Phase	39	• Demolition should not be performed during windy periods (August, September and October), as dust levels and the area affected by dust fallout will increase. • The area of disturbance must be kept to a minimum, as demolition should be done judiciously avoid the exposure of larger areas to wind erosion. • Speed restrictions should be imposed and enforced. • Cabs of machines should be swept or vacuumed regularly to remove accumulated dust. • Exhaust pipes of vehicles should be directed so that they do not raise dust. • Engine cooling fans of vehicles should be shrouded so that they do not raise dust. • Hard surfaced haul roads or standing areas should be washed down and swept to remove accumulated dust. • Dust suppression of roads being used during rehabilitation should be enforced.	23.4
Rehabilitation (spreading of soil, revegetation & profiling/contouring)	Air Quality	. Topsoil can be imported to reconstruct the soil structure. There is less transfer of soil from one area to other therefore negligible chances of dust through wind erosion. Profiling of dumps and waste rock dump to enhance vegetation cover and reduce wind erosion from such surfaces post mining.	Closure and Decommissioning Phase	18	• Revegetation of exposed areas for long-term dust and water erosion control is commonly used and is the most cost-effective option. • Plants with roots that bind the soil, and vegetation cover should be used that breaks the impact of falling raindrops, thus preventing wind and water erosion. • Plants used for revegetation should be indigenous to the area, hardy, fast-growing, nitrogen-fixing, provide high plant cover, be adapted to growing on exposed and disturbed soil (pioneer plants) and should easily be propagated by seed or cuttings. • The area of disturbance must be kept to a minimum, as demolition should be done judiciously avoid the exposure of larger areas to wind erosion. • Spreading of soil must be performed on less windy days. • The bare soil will be prone to erosion and therefore there	7.2

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					is need to reduce the velocity near the surface of the soil by re-vegetation. • Leaving the surface of the soil in a coarse condition reduces wind erosion and ultimately reduces the dust levels. • Additional mitigation measures include keeping the soil moist using sprays or water tanks, using wind breaks. • The best time to re-vegetate the area must be linked to the distribution and reliability of the rainfall. • Speed restrictions should be imposed and enforced. • Cabs of machines should be swept or vacuumed regularly to remove accumulated dust. • Exhaust pipes of vehicles should be directed so that they do not raise dust. • Engine cooling fans of vehicles should be shrouded so that they do not raise dust. • Hard surfaced haul roads or standing areas should be washed down and swept to remove accumulated dust. • Dust suppression of roads being used during rehabilitation should be enforced. • It is recommended that the rehabilitation by vegetating should begin during the operational phase already as the objective is to minimise the erosion. • These measures should be aimed to reduce the potential for fugitive dust generation and render the impacts on ambient air quality negligible.	
Site construction and grading	Groundwater quantity	changes in runoff and infiltration that could reduce groundwater recharge	Construction	28	the construction phase will be planned to minimise the removal of vegetation and opportunities for revegetation will be maximised	18

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
Fuel storage and Vehicular Movement Use and maintenance of haul roads (incl. transportation of minerals to plant	Groundwater quality	Fuel and hydrocarbon leakages and spillages from the transporting vehicles may cause groundwater contamination	Construction and operation	28	All storage areas containing hazardous material will have secondary containments of containers the volumes of the largest tank or container plus 10%. Resort to immediate clean up after accidental spillage. Divert runoff from haul roads that may contain hydrocarbons into lined pollution control dams	18
Open cast mining	Groundwater	Open cast mining below the water table will result in pit inflows	Operational phase	64	Pit inflows cannot be mitigated. Provision needs to be made within the mine water balance for the reuse or treatment of pit inflows. In case the water should be discharged, treatment will be required before discharge	64
Open cast mining	Groundwater quantity	Baseflow reduction caused by mining	Operational phase	6	Brak river and other streams in the project area are non-perennial and there are no base flow in them. The baseflow into the streams and Brak river will not be affected by the mining activities	6
Open cast mining	Groundwater quantity	Mine dewatering and groundwater abstraction for water supply purposed could reduce groundwater levels in the area	Operational phase	80	Pit dewatering will cause a cone of drawdown which will affect the neighbouring farms in the Norths, east and south of the project site. The extent of the zone of influence will not extend beyond 2000m and the maximum drawdown in the affect areas will range between from 5m in the first year to 58m in year 20. Possible mitigation against such an impact is temporary water supply by the mine	56

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
Open cast mining	Groundwater quality	increased potential for groundwater contamination due to seepages from the overburden stockpiles	Operational phase	16	Compact footprint area of the overburden stockpiles to minimise ground water infiltration. Stormwater run-off from the overburden stockpiles will be diverted into dirty water dams. A groundwater resource monitoring program will be implemented during to detect the groundwater contamination	16
Open cast mining	Groundwater quality	Water contained in dirty water dams may impact on groundwater quality	Operational phase	56	Pollution control dams need to be and designed to comply with NEMA and NWA requirements (At 36 of 1998). Manage any leakages and spill to prevent ground water contamination. Implement groundwater monitoring to detect groundwater contamination	6
Rehabilitation of open pits and removal of infrastructure	Groundwater quality	salt load contribution towards the Brak river	Closure and Decommissioning Phase	16	The dominant direction of migration of contaminants from the surface facilities will be towards the pits and the Brak River or nearby streams won't be affected	6
Open pit backfill	Groundwater	aquifer contamination caused by backfill	Closure and Decommissioning Phase	108	Pollution plume migration will be towards the mine pits around the stockpiles areas and the plume will not affect the nearby farms. The final backfilled open cast topography should be engineered in such that runoff is diverted away from the open cast area. (Amended). It has been noted that the pollution plume from the discard dump if not properly lined and mitigated will affect adjacent farmers but according to the Waste Act the discard dump legally needs to be lined.	99

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
Open pit backfill	Groundwater	rebound water levels within backfill material may cause decant	Closure and Decommissioning Phase	12	Decant positions are located within the mining area. In case there is decant an impermeable layer can be applied below the topsoil cover which will need to be compacted to prevent the ingress of water. Install water monitoring boreholes closer to the decant points to monitor the water level and quality	6
Construction trenches and excavations on wetland and associated river	Wetlands	Water quality deterioration (Pollution from suspended material)	Construction Phase	33	An appropriate water management system should be used during the construction period, including, for example, efficient land drainage and the use of constructed ponds for receiving site runoff to reduce the impact of runoff on nearby watercourses. The creation of artificial pan wetland on a different location within the farm is encouraged. This should be considered since the water in the pan wetlands are used for animal feeding	
Construction for site establishment and mining infrastructure	Wetlands	Negative impact on flora and fauna from human interference on site	Construction Phase	18	Use of techniques to minimise any form of noise pollution during construction should be exercised. Machinery used during the construction phase should be one such that it does not emit a high amount of chemicals that may deteriorate the wetlands.	
Land clearing	Wetlands	Biodiversity loss	Construction Phase	60	Avoid stockpiling of removed soils on wetlands. The creation of artificial pan wetland on a different location within the farm is encouraged. The creation of artificial will promote habitat life within the farm instead of total destruction.	

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
Land clearing	Wetlands	Soil loss	Construction Phase	33	Construct low level water deflection berms, reduce clearing to a minimum to maintain vegetation cover. Avoid stockpiling of removed soils on wetlands as this will promote erosion of soil into wetlands and further deteriorating the wetlands.	
Oil spillages	Wetlands	Water quality contamination	Construction Phase	48	During the operational phase, the use of a detailed EMP should be encouraged. Storm water management measures should be followed. Sedimentation trapping methods should also be in place do reduce the creation of gully formation.	
Human dispersal of alien seeds/sapling by construction vehicles, shoes, clothes	Wetlands	Alien invasion of native species habitat	Construction Phase	44	A list of all possible alien vegetation that is probable to occur within site and as a result of mining activities within wetlands should be compiled and eradicated as soon as they occur.	
Increased excavation processes that may lead to more sediment being deposited into the wetlands	Wetlands	Gully formations	Construction and operation	20	During the operational phase, the use of a detailed EMP should be encouraged. Storm water management measures should be followed. Sedimentation trapping methods should also be in place do reduce the creation of gully formation.	
Continued mining activities	Wetlands	Water quality may be reduced by increased sedimentation and erosion	Operational phase	24	Mining activities should be within the mentioned buffer away from the wetlands. Introduce stormwater management measures as part of EMP	

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
Continued mining activities	Wetlands	Interruption of wetland habitat with potential decrease in species numbers and local biodiversity	Operational phase	44	Possible fencing off of the study area from the rest of the game farm will reduce the loss of biodiversity. existing habitat features should be incorporated into site design and protected from change	
Toxic chemicals from vehicles and mining machinery (oil, petrol, brake fluid etc.)	Wetlands	Pollution of wetland and habitat which could ultimately lead to underground water contamination	Operational phase	36	Servicing and refuelling of vehicles should take place outside of the mining area; Drip trays should be used to collect waste oil and other lubricants; Any effluents or waste containing oil, grease or other industrial substances must be collected in a suitable container and removed from the sites. Oil spills that may occur should be removed as soon as possible and the contaminated top soil disposed using proper procedures put in place	
Human dispersal of alien seeds/sapling by vehicles, shoes, clothes	Wetlands	Alien invasion of native species habitat	Operational phase	36	Alien species (including their seedlings and saplings) identified within the prospecting sites should be removed (manually preferably) to prevent their spreading; Alien species removal programme must be developed and implemented	

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
Site clearing, removal of topsoil and vegetation	Surface Water	Increased sediment loads from vegetation clearance and soil compaction	Construction, operational and decommissioning Phase	16	• Progressive rehabilitation of disturbed land should be carried out to minimize the amount of time that bare soils are exposed to the erosive effects of rain and subsequent runoff; • Implementation of the proposed basic storm water management plan is recommended at the mine site to channel and contain storm runoff; • Traffic and movement over stabilised areas should be controlled (minimised and kept to designated paths), and damage to stabilised areas should be repaired timeously and maintained; and • The total footprint area to be cleared for the development of mine infrastructure should be kept to a minimum by demarcating the construction areas and restricting removal of vegetation to the footprint areas only.	10
Fuel storage and Vehicular Movement Use and maintenance of haul roads (incl. transportation of minerals to plant	Surface Water	Water resources pollution due to spillage of oils, fuel and chemicals	Construction Phase	18	• Oil recovered from any vehicle or machinery on site should be collected, stored and disposed of by accredited vendors for recycling.	10
Stockpiles and general waste	Surface Water	Pollution of watercourses from general waste and sewage effluent	Operational phase	27	• A reticulated sewage disposal facility at the proposed mine site should mitigate potential water quality issues that may arise due to population increase; • General waste should be collected and disposed of adequately; and • A water quality monitoring plan needs to be produced and implemented to determine any changes in the water quality.	14

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
Vehicular movement of haulage vehicles and passenger vehicles as well as conveyor belts	Surface Water	Increased runoff due to soil compaction and increased paved surfaces	Operational phase	48	• Progressive rehabilitation of disturbed land should be carried out to minimize the compacted surfaces at the decommissioned mine.	14
Vehicular movement of haulage vehicles ,passenger vehicles, workshops	Surface Water	Contamination from leakage and spillage of chemicals, oils and grease	Closure and Decommissioning Phase	48	• Oil recovered from any vehicle or machinery on site should be collected, stored and disposed of by accredited vendors for recycling.	16
Rehabilitation of stockpile areas, PCD's and discard dump	Surface Water	Acid mine drainage problems and problems associated with general waste disposal	Closure and Decommissioning Phase	52	• Implement phytoremediation measures to correct contamination of water resources. Employ new technologies which are recently being developed to treat acid mine drainage to usable water quality levels.	44

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
Stripping, handling and placement of soil associated with pre construction land clearing and rehabilitation	Soil	Ø Loss of topsoil	construction and decommissioning	52	• It is recommended that all usable soil is stripped and replaced after final removal of the mining infrastructure. The soils are overall fairly shallow 30-120cm on Glenrosa and Mispah soils. • During the construction phase it is recommended that the topsoil be stripped and stockpiled in advance of construction activities that might contaminate the soil. Due to the shallow nature of the soils it is recommended to strip only 40-60cm of the soil. These estimates take into consideration a possible 10% topsoil loss through compaction and allow the rehabilitated areas to be returned to the pre-mining land capability, i.e. wildlife and gaming. • The stripped soils should be stockpiled upslope of areas of disturbance or mining development to prevent contamination of stockpiled soils by dirty runoff or seepage. Topsoil stripped should also be protected by a bund wall to prevent erosion of stockpiled material and deflect water runoff. • Care should be taken that stockpiles do not to block too many drainage lines to prevent erosion due to intense high rainfalls that often occur in the region • Soils within 100m of the Brak River should be kept undisturbed. • Any soil that might possibly be contaminated during the construction phase should be stripped and stockpiled in advance of construction activities.	44
Stockpiling of topsoil	Soil	Ø Loss of topsoil through erosion. Mixing of deep and surface soils during handling, stockpiling and subsequent placement. Ø Change to soil's	Construction Phase and operation	56	• Stockpiles can be used as a barrier to screen operational activities. If stockpiles are used as screens, the same preventative measures described above should be implemented to prevent loss or contamination of soil. • The stockpiles should not exceed a maximum height of 6m and it is recommended that the side slopes and	56

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
		physical, chemical and biological properties due to operational contamination of oils and coal dust			surface areas be vegetated in order to prevent water and wind erosion and to keep the soils biologically active. • If used to screen mining operations, the surface of the stockpile should not be used as roadway as this will result in excessive soil compaction.	
Backfilling and profiling	Soil	Change in natural surface topography due to re-profiling of surface after stripping	Deccomissioning	52	• Loss of topsoil and usable soil; Strip all usable soil and stockpile; Vegetate long-term soil stockpiles • Contamination of topsoil and stockpiled soil; Prevent contamination of topsoil and stockpiled soil; Site all soil stockpiles upslope from any mining / development activities • Position stockpiles upslope of mining areas, or as screens to restrict visibility of the mining operation provided that in doing so, the stockpile is not exposed to the risk of seepage or dirty water contamination. • Erosion of stockpiled soil • Ensure that all stockpiles have a storm water diversion berm for protection against erosion and contamination by dirty water.	52
vegetation clearing for open pit excavation, clearing for construction of buildings, roads and other infrastructure, waste dumps etc.	Vegetation	The area for the proposed development will be cleared of vegetation. This will result in the loss of indigenous species, disturbance of species of conservation concern and the fragmentation of plant communities. The removal of vegetation will also expose soil increasing the risk of erosion	Construction phase	100	• Limit all developments to the minimum area required, and leave as much as possible natural vegetation intact. • Conserve the areas that will not be developed, particularly the relatively large area on the southern parts of Berenice and Celine (conservation area?) • The outer edge of the open cast, including roads and other infrastructure, should be at least 100 m from the outer edge of the Brak River and its flood plain. The vegetation within this 100 m floodline must remain undisturbed and natural. • Control all waste dumping and avoid pollution of natural	80

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					vegetation, especially the Brak River and flood plain area • Conserve the hill that occurs on the southern boundary of Longford. The stormwater management plan should be designed with the conservation of the hill as a priority. • Avoid planting of exotic plant species	
Alien Invasive plant species on cleared areas(Construction)	Vegetation	Alien invasive plant species will encroach into disturbed areas. It is expected that extensive area will be disturbed, natural vegetation totally destroyed.	Construction phase	100	• Limit all developments to the minimum area required, and leave as much as possible natural vegetation intact. • Conserve the areas that will not be developed, particularly the relatively large area on the southern parts of Berenice and Celine (conservation area?) • The outer edge of the open cast, including roads and other infrastructure, should be at least 100 m from the outer edge of the Brak River and its flood plain. The vegetation within this 100 m floodline must remain undisturbed and natural. • Control all waste dumping and avoid pollution of natural vegetation, especially the Brak River and flood plain area • Conserve the hill that occurs on the southern boundary of Longford. The stormwater management plan should be designed with the conservation of the hill as a priority. • Avoid planting of exotic plant species	80
Open Pit mining	Vegetation	The area for the proposed development will be cleared of vegetation. This will result in the loss of indigenous species, disturbance of species of conservation concern and the fragmentation of plant communities. The removal of vegetation will also expose soil increasing the risk of erosion	Operational phase	100		64
Alien Invasive plant species on cleared areas (Haulage vehicles and human activities)	Vegetation	Alien invasive plant species will encroach into disturbed areas. It is expected that extensive area will be disturbed, natural vegetation totally destroyed.	Operational phase	100	• Ongoing alien plant control must be undertaken; • Areas which have been disturbed will be quickly colonised by invasive alien species. An ongoing management plan must be implemented for the clearing/eradication of alien species. • Monitor all sites disturbed by construction activities for colonisation by exotics or invasive plants and control these as they emerge.	80

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					• Avoid planting of exotic plant species in public areas or home gardens, use indigenous species.	
Change in land use (site clearing)	mammal and herpetofaunal	Total or near-total irreplaceable loss of mammal and herpetofaunal species is anticipated	Construction Phase	80	Limit all developments to the minimum area required, and leave as much as possible natural vegetation intact. • Conserve the areas that will not be developed, particularly the relatively large area on the southern parts of Berenice and Celine (conservation area?) • The outer edge of the open cast, including roads and other infrastructure, should be at least 100 m from the outer edge of the Brak River and its flood plain. The vegetation within this 100 m must remain undisturbed and natural. • Control al waste dumping and avoid pollution of natural vegetation, especially the Brak River and flood plain area · Conserve the hill that occurs on the southern boundary of Longford.	n.a
Change in land use (site clearing)	mammal and herpetofaunal Habitat	The mining operation will replace the current land-use practice which relies on prime natural resources and will thus be destructive to natural habitats through vegetation clearing .Opencast mining is responsible for continued loss of faunal habitat. This has widespread impact on ecological function and health of sensitive ecosystems...Displacement of	Construction Phase	80	Mitigating the impacts is impossible, although higher authorities may enforce statutory preconditions for five Red Listed trees and waterways, such as buffer zones. Limit all developments to the minimum area required, and leave as much as possible natural vegetation in tact. • Conserve the areas that will not be developed, particularly the relatively large area on the southern parts of Berenice and Celine (conservation area?) • The outer edge of the open cast, including roads and other infrastructure, should be at least 100 m from the outer edge of the Brak River and its flood plain. The vegetation within this 100 m must remain undisturbed and natural.	n.a

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
		extraordinary high vertebrate species richness			• Control al waste dumping and avoid pollution of natural vegetation, especially the Brak River and flood plain area · Conserve the hill that occurs on the southern boundary of Longford.	
Change in land use (open cast mining areas)	mammal and herpetofaunal Habitat	The mining operation will replace the current land-use practice which relies on prime natural resources and will thus be destructive to natural habitats through vegetation clearing .Opencast mining is responsible for continued loss of faunal habitat. This has widespread impact on ecological function and health of sensitive ecosystems...Displacement of extraordinary high vertebrate species richness	Construction Phase	80	Mitigating the impacts is impossible, although higher authorities may enforce statutory preconditions for five Red Listed trees and waterways, such as buffer zones. Limit all developments to the minimum area required, and leave as much as possible natural vegetation intact. • Conserve the areas that will not be developed, particularly the relatively large area on the southern parts of Berenice and Celine (conservation area?) • The outer edge of the open cast, including roads and other infrastructure, should be at least 100 m from the outer edge of the Brak River and its flood plain. The vegetation within this 100 m must remain undisturbed and natural. • Control al waste dumping and avoid pollution of natural vegetation, especially the Brak River and flood plain area · Conserve the hill that occurs on the southern boundary of Longford.	n.a

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
Change in land use (site clearing)	Loss of avian habitats.	Avian habitats, including mopane woodland, scrub and open areas will be destroyed by the proposed mine. From the Berenice layout plan that was provided, it appears that at the very least 50-70 % of the ~7,000 Ha of natural vegetation will be destroyed for the open cast pits, dumps, stockpiles, plants and other infrastructure, although it remains unclear how much (if any) natural vegetation will remain. This will represent a significant loss of habitat in a region of high conservation significance, and will affect a number of red-listed species, including several raptors.	Construction Phase	75	• Areas cleared for mining operations must be minimised. However, the scale of the proposed mining operation is such that irreversible environmental damage will occur even if this mitigation measure is implemented. Cumulative impacts: A large area of avian habitat has already been lost in this area because of the nearby Venetia mine and other existing or proposed mines, and the proposed Berenice mine will result in further losses in an area of high conservation significance. The impacts of habitat loss are particularly severe for large raptors like Martial Eagle that require large areas of intact habitat. · A specialist must be engaged to check the entire property for active nests of red-listed species, such as White-back Vulture, Martial Eagle and Tawny Eagle. Any such nests will need a buffer zone of 500 m radius around them to ensure that breeding birds are not disturbed	
Change in land use (open cast mining areas)	Loss of avian habitats.	Avian habitats, including mopane woodland, scrub and open areas will be destroyed by the proposed mine. From the Berenice layout plan that was provided, it appears that at the very least 50-70 % of the ~7,000 Ha of natural vegetation will be destroyed for the open cast pits, dumps, stockpiles, plants and other infrastructure, although it remains unclear how much (if any) natural	Operational phase	85	• Areas cleared for mining operations must be minimised. However, the scale of the proposed mining operation is such that irreversible environmental damage will occur even if this mitigation measure is implemented. Cumulative impacts: A large area of avian habitat has already been lost in this area because of the nearby Venetia mine and other existing or proposed mines, and the proposed Berenice mine will result in further losses in an area of high conservation significance. The impacts of habitat loss are particularly severe for large raptors like Martial Eagle that require large areas of intact habitat. · A specialist must be engaged to check the entire property for active nests of red-listed species, such as	

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
		vegetation will remain. This will represent a significant loss of habitat in a region of high conservation significance, and will affect a number of red-listed species, including several raptors.			White-back Vulture, Martial Eagle and Tawny Eagle. Any such nests will need a buffer zone of 500 m radius around them to ensure that breeding birds are not disturbed	
Change in land use (open cast mining areas)	mammal and herpetofaunal	Total or near-total irreplaceable loss of mammal and herpetofaunal species is anticipated	Operational phase	95	Limit all developments to the minimum area required, and leave as much as possible natural vegetation intact. • Conserve the areas that will not be developed, particularly the relatively large area on the southern parts of Berenice and Celine (conservation area?) • The outer edge of the open cast, including roads and other infrastructure, should be at least 100 m from the outer edge of the Brak River and its flood plain. The vegetation within this 100 m must remain undisturbed and natural. • Control al waste dumping and avoid pollution of natural vegetation, especially the Brak River and flood plain area · Conserve the hill that occurs on the southern boundary of Longford.	n.a
Human activities	Fauna	In addition to direct habitat loss, the disturbance of birds and other vertebrate fauna species in the surrounding areas will increase. This impact will be manifested both directly (e.g., increased poaching pressure and disturbance of nests) and indirectly (changes in prey availability, nesting material, etc.). Given the limited	Construction Phase	44	· Measures must be put in place to ensure that no illegal hunting of birds takes place on the mine property or in surrounding areas. · A specialist must be engaged to check the entire property for active nests of red-listed species, such as White-back Vulture, Martial Eagle and Tawny Eagle. Any such nests will need a buffer zone of 500 m radius around them to ensure that breeding birds are not disturbed.	33

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
		background information available, the impact assessment here pertains to the worst case scenario.				
Human activities	Fauna	In addition to direct habitat loss, the disturbance of birds and other vertebrate fauna species in the surrounding areas will increase. This impact will be manifested both directly (e.g., increased poaching pressure and disturbance of nests) and indirectly (changes in prey availability, nesting material, etc.). Given the limited background information available, the impact assessment here pertains to the worst case scenario.	Operational phase	52	· Measures must be put in place to ensure that no illegal hunting of birds takes place on the mine property or in surrounding areas. · A specialist must be engaged to check the entire property for active nests of red-listed species, such as White-back Vulture, Martial Eagle and Tawny Eagle. Any such nests will need a buffer zone of 500 m radius around them to ensure that breeding birds are not disturbed.	39
Mining processing activities	Ground and surface water pollution.	Pollution generated by the mine (e.g., acid mine drainage, accidental fuel spillages, as well as pollutants such as mercury and lead) has the potential to severely affect avian habitats and therefore bird species along the Brak River downstream of the mine, including potentially the entire Limpopo River downstream of Musina. The mining works program indicates that the sulphur content of the coal is	construction phase	60	· Implement a rigorous pollution prevention program as part of a comprehensive environmental management plan (EMP) and ensure that no pollution whatsoever enters local ground or surface water. This aspect of the EMP requires specialist input, and must reflect the pristine nature of downstream habitats, and the fact that the Limpopo River runs through a conservation area of global significance.	45

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
		high, and provision for water treatment is being made only towards the end of life of the mine (i.e., ~30 years after the start of mining).				
Mining processing activities activities	Ground and surface water pollution.	Pollution generated by the mine (e.g., acid mine drainage, accidental fuel spillages, as well as pollutants such as mercury and lead) has the potential to severely affect avian habitats and therefore bird species along the Brak River downstream of the mine, including potentially the entire Limpopo River downstream of Musina. The mining works program indicates that the sulphur content of the coal is high, and provision for water treatment is being made only towards the end of life of the mine (i.e., ~30 years after the start of mining).	Operational phase	68	· Implement a rigorous pollution prevention program as part of a comprehensive environmental management plan (EMP) and ensure that no pollution whatsoever enters local ground or surface water. This aspect of the EMP requires specialist input, and must reflect the pristine nature of downstream habitats, and the fact that the Limpopo River runs through a conservation area of global significance.	51

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
Air pollution from blasting, wind erosions and vehicle movement	Vegetation	The anticipated increase in haul traffic and opencast mining operations will lead to an increased settling of dust on adjacent vegetation. Continued increased levels of dust in the air has an affect on faunal species, particularly birds, but also on fauna species feeding on the vegetation.	Construction Phase	70	Implement a rigorous dust suppression program to minimize air pollution, particularly windborne particles produced by the mining process, stockpiles and discards dumps. This program should include (but not be limited to) the following measures: a) Shield stockpiles from predominant wind directions; b) vegetate areas and ensure continual capping and vegetation of the sides of mine residue facilities; c) regular spraying; d) continuously remove coal form site and reduce long-term stockpiling; e) clear coal spillages from site	36
Air pollution excavations and construction	Vegetation	The anticipated increase in haul traffic and opencast mining operations will lead to an increased settling of dust on adjacent vegetation. Continued increased levels of dust in the air has an affect on faunal species, particularly birds, but also on fauna species feeding on the vegetation.	Operational phase	80		42
Powerline	Birds	The impact of such lines on birds will depend on the route the new line will follow, the size and configuration of the towers and lines, and the impacts cannot be evaluated without this information. One key issue is whether or note new line will traverse the Soutpansberg Mountain range; this is an IBA as well as a UNESCO World Heritage site. The issue is particularly pertinent in view of	Construction Phase	36	Any power line linking the mine to the existing grid will need a stand-alone impact assessment that can only be completed once specific routes have been identified. Such as assessment needs to include an evaluation of alternative routes, and careful assessment of the risks posed to birds, in particular vultures and other large raptors.	22

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
		the number of species occurring in the area that are known to be vulnerable to collisions, including vultures and large eagles. Given the limited background information available, the impact assessment here pertains to the worst case scenario, where the lines generate high collision and electrocution risks.				
Powerline	Birds	The impact of such lines on birds will depend on the route the new line will follow, the size and configuration of the towers and lines, and the impacts cannot be evaluated without this information. One key issue is whether or not new line will traverse the Soutpansberg Mountain range; this is an IBA as well as a UNESCO World Heritage site. The issue is particularly pertinent in view of the number of species occurring in the area that are known to be vulnerable to collisions, including vultures and large eagles. Given the limited background information available, the impact assessment here pertains to the worst case scenario, where	Operational phase	56	Any power line linking the mine to the existing grid will need a stand-alone impact assessment that can only be completed once specific routes have been identified. Such as assessment needs to include an evaluation of alternative routes, and careful assessment of the risks posed to birds, in particular vultures and other large raptors.	28

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
		the lines generate high collision and electrocution risks.				
Clearing of vegetation and earthworks	Visual	Visual impacts are expected to result from the stripping of vegetation and earthworks associated with the pre-construction and construction phases of the proposed Berenice coal mine. The stripping of vegetation will result in the bare soil being exposed, creating a visual scar within the area, and a contrasting colours in the landscape	Construction Phase	22	Erosion control measures must be put in place if vegetation is to be cleared. Where possible, all the natural vegetation around the coal mine should be retained, especially vegetation surrounding the perimeter and boundary areas with neighbouring farms	16
Construction of offices, plant infrastructure ,workshops and other associated mine infrastructure	Visual Resource	The process of construction equipment and related works in the construction of the plant and associated mining areas (e.g. storage areas, access roads) will introduce visually intrusive elements into the landscape and locally result in increased traffic. Although considered a temporary and intermittent impact the amount of large vehicles will increase as construction progress. The construction of the project plant	Construction Phase	33	External signage should be kept to a minimum, were possibly shielding material should be utilised to fence of the construction	33

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
		and infrastructure will require removal of vegetation and alteration of the existing topography that will result in a change in the existing landscape character.				
Earthworks and construction of plant infrastructure	Visual	Night-time lighting will be required during construction. Due to the level of screening provided by the existing vegetation cover the impact of light pollution is expected to be limited, but may increase as construction progresses and more cranes and large plant are housed on site.	Construction Phase	22	• Where possible, all the natural vegetation around the coal mine should be retained, especially vegetation surrounding the perimeter and boundary areas with neighbouring farms. • During construction, selective lighting for the construction camps and other secured areas should be employed. Up-lighting of structures should be avoided	22
Fugitive dust from construction and vehicle movement	Visual Resource	Fugitive dust	Construction Phase	44	• Dust control measures must be implemented to reduce settling of dust on trees and buildings reducing the visual character of the area. • If clearing of vegetation or construction is to occur during the night, all lighting should be placed to ensure that excessive lighting does not escape the site; • When necessary, and particularly during the dry season, efficient watering of areas where construction activities result in dust creation and vehicular movements occur will should be used; and • There must be an enforcement of low vehicle speeds on site	18

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
Presence of topsoil, Run of Mine, product and ,overburden stockpiles and discard dumps; processing plant and other mining infrastructure	Visual impact of physical structures	Operational Phase Reduction in visual resource value due to presence of physical structures on site	Operational phase	56	• Where possible, natural vegetation around the Berenice Coal Mine should be retained. • Progressive rehabilitation of the coal mine should be undertaken. • Mine dumps and stock piles should not exceed 15m of height • Litter control measures should be kept in place to ensure that the site is maintained in a neat and tidy condition. • Employ 'smart architecture' on physical infrastructure to mimic natural elements and traditional building forms. • External signage should be kept to a minimum (with the exception of safety notifications). • Designated areas for material storage, waste sorting and temporary storage batching and other potentially intrusive activities will be created and screened off to the extent is feasible and • Where feasible trees must be transplanted to locations adjacent to the mine where they will not affected by mining activities.	44
presence of topsoil, Run of Mine, product and ,overburden stockpiles and discard dumps; processing plant and other	Visual impact of fugitive dust	Operational Phase Reduction in visual resource value due to Fugitive dust	Operational phase	56	• Where possible, natural vegetation around the Berenice Coal Mine should be retained. • Institute a rigorous planting regime along the project site boundaries to act as bio-filters. • Areas where vegetation has been cleared on site should have erosion control measures in place. • The planting of trees must be instituted along the entire access route to prevent dust plumes spreading onto farming activities neighbouring the gravel road.	44

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
mining infrastructure					• Progressive rehabilitation of the coal mine should be undertaken. • Dust control must be implemented by reducing and controlling dust through the use of approved dust suspension techniques as and when required. • Consider fitting drills with dust collection systems • All stockpiles of material that maybe blown away during windy spells (such as sand, soil, and excavated material etc.) will be suitably covered or other measures taken to prevent such occurrence. Suitable measures will be determined by the environmental control officer or site engineer based on the nature of the material, its use etc.	
mining infrastructure	Visual Impact of night time Illumination	Operational Phase Reduction in visual resource value due to Night-time illumination	Operational phase	56	• Outdoor lighting must be strictly controlled so as to prevent light pollution. • All lighting must be installed at downward angles. • Sources of light must as far as possible be shielded by physical barriers such as a planted trees and shrubs or built structures, where possible, natural vegetation around the Berenice Coal Mine should be retained so as reduce unnecessary illumination and “light spill”. • Consider the application of motion detectors to allow the application of lighting only where and when it is required. • The height of poles and masts determines how broadly the light is dispensed. If the lights are mounted at an appropriate height, they will provide maximum illumination while minimizing light pollution into the surrounding area.	24

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					• providing lights with cover fittings that limit lateral and upwards light “spill”, and positioning lights to shine towards the intended areas of illumination rather than using floodlights • The use of outdoor fixtures high up on tall structures should be limited or avoided. • Consider installing anti-reflective coating on metal surfaces to reduce the sunlight that is reflected and increase the amount of sunlight that is absorbed during daytime, to reduce the effect of glare and reflection of metal infrastructure. • Consider installing all electrical lines underground, to mitigate the potential impact of glare of such lines	
Demolition & Removal of all infrastructure	Visual Significance rating post closure	Reinstatement of visual resource value due to dismantling of infrastructure and subsequent rehabilitation of footprint areas. Permanent alteration of site topographical and visual character of mined areas	Closure and Decommissioning Phase	52	• Dismantle and remove all visible surface infrastructure during decommissioning; • Re-shape all footprint areas to be as natural in appearance as possible; • Implement progressive rehabilitation during operations; • Shape and profile the final mining void to be free draining if possible and establish a vigorous and self-sustaining vegetation cover on the final rehabilitated landforms • Conduct on-going monitoring and maintenance of the rehabilitated areas to ensure that they establish • Successfully and that erosion does not occur; Continuously assess condition of vegetation cover of rehabilitated areas for adequate cover density and species composition.	33

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					• Due to the unpredictable nature of vegetation growth the effectiveness of the re-vegetation will only become apparent after several years. Where specimens die, grow poorly or do not effect sufficient coverage the cause of the problem should be established and the afflicted specimens replaced, or a more suitable alternative established, based on a case-to-case basis; and • Employ control measures to eradicate weedy and alien invader plant species as required. A detailed post-closure land use plan be compiled for the mine, which will take into consideration all present and likely future land uses surrounding the site, to ensure that the site is successfully re-integrated into the existing visual fabric.	
Site development and mining	Demographic change process	Influx of workers	Construction and operation	24	• Optimise the use of local labour as far as possible. Establishing early on skills development programmes in the local area will support the possibility of finding skilled people locally; • Implementation of a Social and Labour Plan; • Develop a code of conduct with which contractors and their employees must comply. The code should deal with the interaction with local communities and substance abuse among other things; • Construction workers should be clearly identifiable by wearing proper construction uniforms displaying the logo of the construction company. Construction workers must also be provided with identification tags. • Have clear rules and regulations for access to the mine area and immediate surrounds to control	20

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					loitering. Consult with local SAPS to establish standard operating procedures for the control and removal of loiterers in the proximity of the site. • Develop skills transfer plans that would enable a worker to move from one project to another within the same area / region; • Develop a Stakeholder Engagement Plan (SEP) which clarifies the principles of engagement with community and other stakeholders, sets in place appropriate liaison forums (a community forum is recommended), and describes the grievance management procedure to be adopted by the Mine. Establishment of a local labour recruitment committee to monitor recruitment procedures and results; and • Communicate through media the recruitment procedures and priorities to discourage work seekers from outside the area.	
Mine development	Socio-cultural change process	Noise pollution	Construction and operation	27	• Construction activities during the construction phase to take place during daytime only; • Biannual noise assessments during construction and operation along the boundaries of the proposed Site to take place to identify noise intrusions; • Using acoustic silencers on noisy equipment, All machinery and/or plant, which radiate noise levels exceeding 85.0dBA to be acoustically screened off; • All vehicles operational at the proposed site to conform with the following health and safety standards, Operational procedures such as speed limits on roads on site; • Selecting equipment with lower sound power levels; • Installing acoustic enclosures for machinery and/or parts	18

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					causing radiating noise; • Conformance to the prevailing ambient noise level along the boundary of the proposed project area; • Plant and equipment design and selection, replacing older equipment with new technology that is often quieter; • House crushing plants within buildings, Enclosing conveyor systems; • Reducing impact noise by lining chutes with hard wearing rubber and polyurethane materials; • Using terrain to acoustically shield the operations, placing noisy equipment behind noise barriers; • Alternate safety systems on mobile equipment to replace reversing alarms and horns • Monitoring systems to reduce the impact of weather conditions and regular monitoring should also be implemented.	
Mine development	Socio-cultural change process	Crime, Safety and Security	Construction and operation	48	• Fence off servitudes and access roads and provide for strict access control measures to service roads and patrol service roads regularly; • Utilize sufficient mine security to regularly patrol the fences of the mine infrastructure, especially; • Liaise with the South African Police Service to enhance police patrol activity in the project area; • Support the community watch of the directly affected and neighbouring landowners which can report criminal or suspicious activity; and • Employment of local people on the mine to improve the poverty levels in the host and neighbouring communities.	20
Mine development	Socio-cultural change process	Integration with local community	Construction and operation	48	• Launch aggressive culturally appropriate STI and HIV/AIDS awareness campaigns; • Distribute condoms by placing them at centrally located points; • Enhance people's knowledge through awareness	24

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					campaigns on site, schools and community forums; • Encouraging people to get tested; • Equipping HIV-positive youth with personal and professional skills, such as psychosocial care training to enable them to better manage their status, to be positive role models, and to enhance their potential for employment; • Control access to the construction site to prevent sex workers; as well as • Employ local women to decrease their financial vulnerability.	
Mine development	Socio-cultural change process	Quality of life and sense of place	Construction and operation	56	• Establishment of an anti-poaching unit available to adjacent land owners, and establishing a security forum in collaboration with these land owners. Land owners are to be actively involved in the selection of the contracting company employed to conduct anti-poaching in the area. Increased security measures (fencing, access control and monitoring) on mine premises; v Properly constructed and secured fences can control access to construction sites; v Implementing strict access control of the project site and the contractors workforce camp; v Code of Conduct to form part of induction of new workers with a clear statement and procedure regarding access, conduct and identification. All construction workers should wear clothing marked (and reflective vests) with the logo of the construction firm/contractor or sub-contractor as well as identification cards that cannot be easily forged, so that they can be easily recognized as being legitimate;	24

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					and v Where possible workers to be screened including criminal background checks.	
Mine development	Institutional and Empowerment Changes Processes	Attitude formation against project	Construction and operation	30	The attitude formation variable seeks to assess changes relating to attitude formation that can be attributed to the Berenice Coal Mine specifically. Attitudes and interest group activity would not constitute impacts per se. It would rather be associated with an appraisal by I&APs of the proposed project, change events and perceived impacts. If such appraisal about the objects of thought (being the project; changes processes or impacts), includes evaluative judgments - positive, negative or neutral, these are by definition, attitudes (in short, how we feel about things).	30
Mine development	Institutional and Empowerment Changes Processes	Negotiation process	Construction and operation	33	• A Community Liaison Officer should be appointed to assist with stakeholder engagement. • Negotiations to be approached with the necessary cultural sensitivity with the effort to negotiate in the language understood by all affected parties. • Intensive engagement between Universal Coal Pty Ltd and the municipality well in advance of construction and operation of the mine should be undertaken. The establishment of a forum whereby local government and other major mines and industries in the area should be promoted by both the mine and the local municipality in this context the responsibilities of local government should be well	27

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					understood, and potential problems defined and addressed as early as possible.	
Mine development	Economic Change process	Direct formal employment opportunities to local individuals	Construction, operation and closure	56	Berenice Coal Mine intends to employ mostly local labourers during the construction phase of the proposed project, thus contributing to an economic impact in the area. Although job opportunities are viewed as positive impacts, it should be indicated that many job opportunities will be created during construction phase of the project thus providing economic relief to local community during this phase of the project. In addition to the employment opportunities, there is also potential skills transfer which will have a lasting impact on the community	60
Mine development	Economic Change process	Indirect formal and /or informal employment opportunities to local individuals	Construction, operation and closure	52	• Unskilled job opportunities should be awarded to the people from local neighbouring areas; • Equal opportunities for employment should be created to ensure that the local female and youth population also have access to these opportunities; • Individuals with the potential to develop their skills should be afforded training opportunities. • Mechanisms should be developed to provide alternative solutions for creating job security upon completion of the project; • Payment should comply with all applicable Labour legislation in terms of minimum wages and conditions of employment. • Where local labourers are employed on a more permanent basis, these labourers should be registered with the Unemployment Insurance Fund (UIF), Pay as You Earn (PAYE) or any other official bodies as required by law. This would enable the workers to claim UIF as a	60

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					means of continuous financial support when the workers' positions on the mine itself have become redundant or once the mine has come to the end of its construction phase comes to an end.	
Mine development	Economic Change process	Impact on existing businesses in surrounding areas	Construction , operation and closure	65	• Devise a compensation plan and policy for direct impacts of mining on adjacent farms, such as loss or pollution of land; • Establish a baseline of property values by conducting baseline valuations on representative properties and providing such to landowners, thereafter conducting monitoring valuations in periods as may be agreed with landowners; • Establish a communication channel with direct adjacent land owners to address impacts and grievances; • Screen mining activities from the adjacent farms and the main access road to minimize the impact on the general sense of place and tourists; • Procure goods and services from local or provincial suppliers as far as possible; • Procure ancillary services for goods purchased from outside of the Limpopo Province such as installation, customisation and maintenance, from local or provincial companies as far as possible. • Unskilled job opportunities should be afforded to the local households in ward 26 as a priority labour force sending area. Even if The Berenice Mine uses a recruiting agency, the local CPA and local ward Councillor should be utilized and involved in the recruitment process;	39

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					• Establish a database of local people with information on qualifications and skills, utilize this database to develop skills plans and recruit local people; • Implement early on skills development programmes in the areas where most job opportunities will be created, i.e. operators and drivers; • Include training for general life skills such as financial management and health; • Implement portable skills development programmes; • Design and implement economic development programmes that will assist people being retrenched in sustaining their livelihoods; • Establish a future forum with representation from the workforce to discuss potential difficulties and solutions; • Implementation of programmes to minimize and mitigate the impact of downscaling and retrenchment; • Through consultation with relevant key stakeholders, identify the segment that might benefit from informal indirect opportunities, and promote skills development and subsidization initiatives that are sustainable. Encourage, in consultation with key stakeholders, construction workers to use local services; • Equal opportunities for employment should be created to ensure that the local female population also have access to these opportunities bearing in mind that the Makhado area has a greater female population; v Individuals with the potential to develop their skills	

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					should be afforded training opportunities as part of the Mines SLP. Mechanisms should be developed to provide alternative solutions for creating job security upon completion of the project. • Payment should comply with applicable Labour Law legislation in terms of minimum wages. Where local labourers are employed on a more permanent basis, these labourers should be registered with the Unemployment Insurance Fund (UIF), Pay as You Earn or any other official bodies as required by law. This would enable the workers to claim UIF as a means of continuous financial support when the workers' positions on the construction itself has become redundant or once the construction and operational phase comes to an end.	
Preparation of the foot print area	Baseline Noise Levels	Increased noise levels on the proposed site	Construction Phase	27	• Construction activities to take place during daytime (6am – 10pm) only; • Biannual noise assessments along the boundaries of the site to take place to identify noise intrusions; • All machinery and/or plant which radiate noise levels exceeding 85.0dBA to be acoustically screened off; • All vehicles operational at the site to conform with the following health and safety standards: Noise Induced Hearing Loss Regulations, Occupational Health and Safety Act, 1993); (Act No. 85 of 1993 and the Occupational Hygiene Regulations, MHSAct (29 of 1996) • Selecting equipment with lower sound power levels;	27
Preparation of the foot print area	Baseline Noise Levels	Increased noise levels off the proposed Site	Construction Phase	7		7
Civil construction	Baseline Noise Levels	Increased noise levels along the boundary of the proposed Site	Construction Phase	27		18
Civil construction	Baseline Noise Levels	Increased noise levels at the proposed open pit area	Construction Phase	7		7

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
Grading and building of new roads	Baseline Noise Levels	Increased noise levels along the boundary of the proposed Site	Construction Phase	27	• Installing acoustic enclosures for machinery and/or parts causing radiating noise • Berms with a potential to act as a noise barrier should be constructed as soon as possible around open cast pits and other mining activities with the barrier being built as close as possible to the operations or at receptors as is feasible as possible. • It is recommended that the height of the berms/barriers be at least 2 m higher than the line of sight to the highest noise source from open cast pits and stockpile areas, although the higher the berm/barrier the better acoustical screen it will be. Certain heavy vehicles have their exhaust ports above the cabin of the vehicle and needs to be considered as the noise source point. • The barrier should be sufficiently long to block the line of sight from receptors to the sides of the mining operations; • Minimize any work that needs to take place at night. Night-time construction work should be limited to localities that are further than 2km from a noise-sensitive community when there is a direct line of sight (no barrier between the activity and receptor); • 1km from a noise-sensitive community when there exists a barrier between the activity and receptor; • Using the smallest/quietest equipment when operating near receptors; • Ensuring that equipment is well maintained and fitted with the correct and appropriate noise abatement measures. Acoustical mufflers (or silencers) should	18
Grading and building of new roads	Baseline Noise Levels	Increased noise levels at mine area	Construction Phase	45		27
Construction of buildings and/or plant	Baseline Noise Levels	Increased noise levels along the boundary of the proposed Site	Construction Phase	9		9
Construction of buildings and/or plant	Baseline Noise Levels	Increased noise levels at open pit and plant	Construction Phase	21		21
Mining activities area	Baseline Noise Levels	Increased noise levels on the proposed site	Operational phase	80		48
Mining activities area	Baseline Noise Levels	Increased noise levels off the proposed Site	Operational phase	11		11
Hauling of ore to siding or via road	Baseline Noise Levels	Increased noise levels along the feeder roads	Operational phase	68		39
Rehabilitation: Covering of open pit with	Baseline Noise Levels	Increased noise levels on the proposed Site	Closure and Decommissioning Phase	50		15

<table>
<tr><th>ACTIVITY</th><th>POTENTIAL IMPACT</th><th>ASPECTS AFFECTED</th><th>PHASE In which impact is anticipated</th><th>SIGNIFICANCE if not mitigated</th><th>MITIGATION TYPE</th><th>SIGNIFICANCE if mitigated</th></tr>
<tr><td>capping layer and top soil</td><td></td><td></td><td></td><td></td><td rowspan="6">be considered on equipment exhausts on open cast pits and stockpile areas; and
• it is to be noted that due to the length of the proposed railway link and the environmental impacts it has been proposed to consider a siding in Waterpoort as the main alternative and haul coal form the mine to the siding during off peak hours so as to reduce the negative impacts of slow moving heavy vehicles in the active R523 road.
• A suitable intersection where the Main Site Access Road intersects with D4 North Road should be constructed such that it complies with RTA Road Design requirements for rural access.
• An additional 2m of bitumen seal should be provided on the joining intersection on D3256 Road to achieve an overall carriageway width of 8m, i.e. 6m of sealed carriageway and 2 x 1m unsealed.
• The centre-line of the road should be marked.
• A comprehensive Transport Management Plan for construction and normal township development operation should be developed, which would be agreed with stakeholders and implemented.
• “Narrow intersection” signage at the approaches to the culvert near the intersection of the D3256 East Road and Gravel Road should be tarred.
• Additional guideposts on the culvert on the D3256 Road near the intersection of the Gravel Road and D3256 East Road should be installed. The impact of the Project generated traffic on the road pavements of the D3256 East Road and D3256 North Road</td><td></td></tr>
<tr><td>Rehabilitation: Covering of open pit with capping layer and top soil</td><td>Baseline Noise Levels</td><td>Increased noise levels off the proposed Site</td><td>Closure and Decommissioning Phase</td><td>40</td><td>8</td></tr>
<tr><td>Removal of buildings and infra- structure</td><td>Baseline Noise Levels</td><td>Increased noise levels along the feeder roads</td><td>Closure and Decommissioning Phase</td><td>35</td><td>7</td></tr>
<tr><td>Vehicle movement and Transportation of coal via road</td><td>Roads and Traffic</td><td>Heavy vehicle impact at the Intersections (congestion), increase in daily traffic</td><td>Construction, operation and closure</td><td>28</td><td>24</td></tr>
<tr><td>Transportation of coal via road</td><td>Roads and Traffic</td><td>Delay at Intersections</td><td>Construction, operation and closure</td><td>28</td><td>24</td></tr>
<tr><td>Transportation of coal via road</td><td>Roads and Traffic</td><td>Social Impact (unsafe pedestrian and drivers conditions)</td><td>Construction, operation and closure</td><td>27</td><td>24</td></tr>
</table>

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					would be negligible. However, it is recommended that a pavement investigation of the D Road be carried out to determine if pavement reconstruction is required. In addition, it is recommended that a developer agreement or contribution scheme, taking into account any road construction operations required for the D3256 West Road, be established with provincial RAL for the ongoing maintenance of the R584 East Road. • To mitigate the impact of over mass and overweight deliveries to the township development Site, a suitable entrance should be constructed on the D3256 North Road that complies with RTA requirements for site access. Following site construction, the specialized intersection would be utilised for emergency vehicle access only. An individual Traffic Control Plan would be developed and implemented for each over mass and overweight delivery taking into account the specialized mine route requirements	

The impact assessment was derived from the specialist studies undertaken taking into account the current environment of the area and the potential impact posed by the proposed coal mining project. Mitigation measures have been identified and will be critical to the management objectives of the project. In cases where the specialist did not quantify the significance of each impact before and after mitigation the EAP used a higher WOM significance so as not to understate the potential of the impact.

1.10.5 Cumulative Impacts

Cumulative effects are caused by the accumulation and interaction of multiple stresses affecting the parts and the functions of ecosystems. Of particular concern is the knowledge that ecological systems sometimes change abruptly and unexpectedly in response to apparently small incremental stresses. For purposes of this report, cumulative impacts have been defined as “the changes to the environment caused by an activity in combination with other past, present, and reasonably foreseeable human activities”.

Concern has been expressed on the coal mining project about the cumulative impact of mining on water resources, air, noise, and traffic, loss in biodiversity, tourism and agriculture. The current impact of human activity on agricultural, water and other resources has not been quantified or the information is not freely available from authorities to accurately quantify the additional impact of the mine. Consequently, the following cumulative assessment is purely qualitative and relies on conclusions about the extent of impacts from the mine in relation to other activities in the immediate vicinity of the area as well as the Makhado municipal area.

The table below serves as a summary of the main cumulative environmental impacts and state whether they are positive or negative in nature. The cumulative assessment takes into account the fact that there are mining right applications pending within the catchment however due to the fact that none are operational, the full extent of the cumulative impacts of COAL MINING within the area are purely speculative.

Table 25: Assessment of potential cumulative environmental impacts

Nature of the impacts	***Effects***	***Extent***
Contributing to energy security in the country as a result of mining coal	Positive	National
Local economic diversification	Positive	Local and regional
Improved standard of living of the directly and indirectly affected households through job creation. Mining will support hundreds of families with a multiplier effect of around four (4).	Positive	Regional and national
Urban sprawl and/or expansion of informal settlements.	Negative	Local

Nature of the impacts	***Effects***	***Extent***
Added pressure on local service delivery and infrastructure, including roads, water and sewage treatment works, schools, police services and waste management facilities.	Negative	Local
The use of imported labour, due to unavailability of local skilled labourers causing tension in local communities.	Negative	Local
Traffic will be increased as a result of expected trips generated by the proposed development during the construction, operation and decommission / close phases. This may lead to increased safety risks such as road accidents, which result in injuries and/or fatalities.	Negative	Local and regional
Potential significant negative changes in the air quality of the district as a cumulative effect due to other activities in the region already impacting on the air quality	Negative	Local and regional
The topography and landscape character will be altered and the overall visual resource of the area will be changed, affecting receptors located within close proximity. The negative impact can be mitigated to a degree, but the landscape character of the region will be changed from Eco tourism to mining.	Negative	Local
The application area lies within a Conservation Area and within a biosphere hence the possible increase in coal mines in the area will lead to loss of biodiversity.	Negative	Regional
The predicted PM2.5 and PM10 concentrations for cumulative impacts (taking into consideration the annual average measured baseline PM2.5 and PM10 concentrations) will increase due to vehicle movement and blasting activities	Negative	Local
Construction and operational activities, such as construction of mining infrastructure, fencing of project areas, vegetation removal, transportation of material and generation of waste, amongst others, will negatively affect species populations and habitats. This in turn will negatively impact on the status of the regional biodiversity and habitats.	Negative	Local and Regional

Nature of the impacts	*Effects*	*Extent*
Increased industrial development and mining activities will result in the introduction and increase of alien vegetation and foreign species. The general functioning and provision of ecosystem services in the greater area ecosystem will subsequently be reduced and impaired.	Negative	Local and regional
Vehicle movement on and off the site and blasting of the open pits will lead to an increase in baseline noise levels	Negative	Local
The visual character and sense of place will be negatively impacted including night lights.	Negative	Local
The additional abstraction of water within the catchment from the mining activity as well as decanting will lead to a drawdown whose impact radius is 2km. This additional drawdown coupled with current existing water uses will cause an increase in drawdown.	Negative	Local
During construction there will be stripping of topsoil and in addition to other activities in the region this will have an impact on the land capability with a loss of +-5000ha	Negative	Local
The land use change will have an impact on the ecotourism within the mining area and the related mining activities will also impact tourism	Negative	Local/regional

Groundwater

It can be deduced from the calculations depicting drawdown during mining of the proposed underground reserve that the cumulative groundwater drawdown at the streams close to the underground will have an impact. This is also the case for other watercourses such as wetlands. Drawdown is expected as a result of the mining operations.

Social

The aim of this section is to highlight the nature of the cumulative Socio-Economic impacts that are expected to occur as result of the combined effect of the Project and other current or planned operations in the area (e.g. other mining related projects in the Makhado region). Three possible cumulative impacts were identified: impacts related to population influx, dependency on mining to sustain the local economy, and impacts on local services and infrastructure.

Job creation and multiplier effects on the local economy

More than 511-521 people will be employed by the mine and its contractors during the operational phase of the project. The major employment sectors within the application area is agriculture and tourism. The contribution of mining and coal related industries to job creation will therefore be enhanced through the Project.

Secondly the Project, will result in several economic benefits for local communities through direct and multiplier effects. These effects are usually stimulated by wage bills, local and regional procurement spend, and investment into LED and skills development. The Project will add to the existing positive effect of mining on local economic development by applying national principles in terms of local employment and procurement, as well as LED.

Impacts related to population influx

The area will experience a significant influx of people in search of work at the coal mining operations. Population influx is also likely to exacerbate pressure on existing infrastructure and services, the growth or establishment of informal settlements and housing prices.

Increased pressure on local services and infrastructure

The expected influx of job-seekers into these areas, combined with the presence of an operational workforce and the influx already caused by coal mining and related industries will place pressure on local infrastructure such as roads, clinics, schools, sanitation and water access.

During the operational phase of the project 511-521 people will be permanently employed. This in itself may not have a significant impact on services, however in combination with the permanent workforce of mining operations and residual employees/work-seekers from the construction phase it may have a significant impact on service delivery, especially housing.

This impact also addresses the availability of schooling in the area. The impact on schooling is part of a cumulative one, as the current and planned mining operations are contributing to increased rate of in-migration and the resultant pressure on schools. To mitigate these impacts, it is recommended that the measures listed are applied in collaboration with stakeholders from within the industrial and governmental spheres.

Housing and Informal settlements

The influx of people as result of the Project (either by way of additional recruitment or in the expectation of employment) and other operations include those employed in the formal and informal sector, as well as job-seekers. The project might add to the current impact not only by increasing influx, but also restricting means to deal with it. The main concerns are that:

- The low-income market is already too highly priced for the lower Socio-Economic group, their spending power is limited and this combined with influx of people due to the combination of the Project, agriculture, and the flourishing industrial sector will result in increased housing demand and pricing. Escalating prices will lead to an increase in the number of informal housing developments; as a larger proportion of communities, might find formal accommodation options to expensive, which may force them to revert to informal settlements; and
- Those who cannot buy a house will rent, also exacerbating the existing shortage of houses for rent. Given that rental prices in towns like Makhado are already prohibitive for employees within the lower income brackets, they and the unemployed will seek properties in low-income areas. Consequently, there is likely to be an increase in demand for housing or informal stands.

Decrease in land available for residential development

Considerable economic growth and population influx have been triggered by the coal mining sector and related industries in the Ermelo area, which has resulted in a considerable demand of housing and housing development. As a result the LM is under severe pressure to allocate land for more housing developments, despite the fact that they have limited land options due to the fact that mining activities in the surrounding area have significantly decreased land suitable for residential development throughout the area.

Dependency on mining to sustain the local economy

Mining creates a much larger number of jobs than the services sector, and because mine workers tend to earn better salaries than those employed in most other sectors but all mines have a finite lifespan. Inevitably, mining operations in the area will at some point in the future begin to scale down and close affecting all coal dependant industries. Unless significant investment is made into economic diversification, the area is destined for a considerable economic slump once this process commences.

1.11 Summary of specialist reports.

The following specialist investigations were undertaken as part of the project:

- Hydrological Study
- Wetland Study.
- Groundwater study.
- Air quality study.
- Noise impact assessment.
- Flora and Fauna Study.
- Social Impact Assessment.
- Traffic Impact Assessment
- Heritage Assessment
- Soil and Land capability study
- Visual impact study

- Climate Change Impact Report.

(This summary must be completed if any specialist reports informed the impact assessment and final site layout process and must be in the following tabular form):-

Table 26: Recommendations of specialist reports

LIST OF STUDIES UNDERTAKEN	**RECOMMENDATIONS OF SPECIALIST REPORTS**	**SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT**
Air Quality Report	Recommendations Based on the results presented the following recommendations are outlined: • It is recommended that ambient air quality monitoring be undertaken to establish the baseline condition prior to the onset of operations on-site and in order to establish the level at which the proposed operations are noted to impact on the ambient air quality. • Fallout monitoring should be included to assess the level of nuisance dust associated with both mining and process related operations. Sampling of fallout should be undertaken within the neighbouring areas as well as on-site. Dust fallout monitoring should ideally be located on-site, around the pit and shafts, at the crusher and in the vicinity of major storage stockpiles. • Indicative PM10 and PM2.5 dust monitoring must also be undertaken at the same sites as mentioned under the previous bullet but also in and around potential fugitive emission sources to determine mitigation measures and focus management efforts • The most significant impacts for the proposed mine includes the storage of ROM stockpile, discard handling, waste rock stockpiles, use of the crushing and screening facility, general transportation and hauling and the release of gaseous pollutants from the ventilation shafts. The mitigation and management measures discussed in this report should be sufficient to ensure the mining operation can be conducted with minimal impact on the receiving environment and therefore not have a detrimental effect.	Specialist Findings are included in 1.9:Baseline Environment Recommendations have been included in the impact assessment and management measures as well as monitoring program included in these sections:1.10.4:**Assessment of each identified potentially significant impact and risk**
Baseline Noise Assessment	Recommendations	Specialist Findings are included in 1.9:Baseline Environment

	• The control measures should be introduced at the plant and along the haul route, especially closer to the sensitive receptors. For the wind speed reduction screens, consideration should be given to planting of the zones around the potential sources with trees. It is recommended that this should take place in two rows for effective wind and noise breaking. This zone could also contribute towards the general improvement of the area’s aesthetic appeal. • Regarding the blasting, scheduling the blast to take into consideration the meteorological conditions, i.e. low wind speed and low inversion potential, can be used to minimize the impacts of noise carrying over distances. People are generally more concerned over ground vibration and air blast levels that might cause building damage than the impact of the noise from the blast. However, these are normally associated with close proximity mining/quarrying. Current policies require that people within a radius of 500 meters be moved (permanent or temporary during blasting) due to the risk that blasting pose to them. Noise created during blasting is therefore the least of any concerns. • Quarterly noise monitoring is recommended to be conducted by an acoustical consultant or approved noise inspection authority for the first year of operation. A noise monitoring programme should be designed considering the locations of the closest noise-sensitive developments as well as any other areas identified by other specialist studies (fauna, avifauna, macro-invertebrates, etc).	Recommendations have been included in the impact assessment and management measures as well as monitoring program included in these sections:1.10.4:**Assessment of each identified potentially significant impact and risk**
Soil and land capability	Recommendations Impacts on the environment must be minimized or limited on construction sites. The following is recommended if the area will be used for mining purposes:	Specialist Findings are included in 1.9:Baseline Environment Recommendations have been included in the impact assessment and management measures as well as monitoring program

	- During the construction phase top soil should be removes and stockpiled in a designated area and vegetated to avoid loss of the soil due to wind and water erosion - Topsoil stockpiled areas should be no go zones for vehicles and no waste can be stored in this area to avoid contamination - Monthly surface water monitoring and quarterly groundwater monitoring will be implemented as an on-going process with high priority. High quality irrigation is present in some areas and should be kept in that state. If any changes are observed, the source of pollution should be determined and eliminated. - For monitoring purposed specialist should be used to evaluate the erosion and other possible impacts during the entire mining process. The entire area should be vegetated throughout the entire duration of mining due to the possibility of wind erosion and relative dry conditions (low clay contents in the top soils). - Specific control measures are needed to control water erosion and run-off to prevent excessive surface run-off from the site - Limit impacts to the footprints to keep physical impacts as small as possible - Areas for road and site lay-out should be minimized. There are already existing roads on the site, these roads should be used, as well as upgraded and maintained - Dust generation and vehicle associated pollution must be minimized. - Sampling sites need to be established up-stream and down-stream of the Brak River (non-perennial) for sediment analysis to measure potential soil loss via wind/water erosion as well as pollution from roads and stockpiles.	included in these sections:1.10.4:**Assessment of each identified potentially significant impact and risk**

	Soils need to be stock piled so that they can be used for rehabilitation. Concurrent rehabilitation of open pits is expected to be complied with. The Berenice project will be mined in four open cast phases. After completion of each pit complete rehabilitation will be implemented to allow for substantial time for the normalization of soils and proper monitoring of the rehabilitation whilst the company is still in operation. It is not possible to restore the soil potential and initial characteristics to its original state but huge improvements can be made in the methodology of stripping and re-dressing of soil material to ensure sustainability of rehabilitation. Over time these soils can produce proper agricultural yield production. All the farms are used for game farming and it is expected that the rehabilitation should be done in accordance to restore the land to this same use.	
Heritage Assessment	Please note that no Stone Age settlements, structures, features, assemblages or artefacts concentrations were recorded during the survey. Also, due to the nature of the topography and openness of the region no rock art sites were recorded. A total of 15 sites were recorded ranging from a Late Iron Age cattle outpost (Site 9), several farm worker house complexes (Sites 1, 8, 12 and 15), four individual grave and graveyard sites (Sites 2, 6, 7 and 14), a historic trade store (Site 13) situated along an existing ox Wagon trade route and to the more recent farmhouse complexes and associated infrastructure (Sites 4, 10 and 11). As a result please note the following recommendations: • A destruction permit will have to be applied for from SAHRA for the farm worker house complexes (Sites 1, 8, 12 and 15); • The site of the historic trade store (Site 13) and Late Iron Age cattle kraal settlement (Site	Specialist Findings are included in 1.9:Baseline Environment Recommendations have been included in the impact assessment and management measures as well as monitoring program included in these sections:1.10.4:**Assessment of each identified potentially significant impact and risk**

	• 9) will have to be surveyed and mapped (Phase 2); then an application submitted for a destruction permit from SAHRA; • The individual graves and graveyards (Sites 2, 6, 7and 14) will require a Phase 2 investigation (exhumation and reburial). Phase 2 enables the applicant to apply for a grave relocation permit. • During construction an ECO with heritage induction should be appointed to oversee the activities and report any items of archaeological importance to SAHRA • The area lies in a red zone with high probability for paleontological findings. It is essential that prior to construction a paleontology study be conducted focusing on areas where the open pit and infrastructure will be located. Also please note: Archaeological deposits usually occur below ground level. Should archaeological artefacts or skeletal material be revealed in the area during development activities, such activities should be halted, and a university or museum notified in order for an investigation and evaluation of the find(s) to take place (cf. NHRA (Act No. 25 of 1999), Section 36 (6)). Section 51 (1) of the SAHRA sets out the penalties associated with the unlawful removal of cultural, archaeological or paleontological artefacts. Contractors must be advised of the penalties prior to construction.	
Traffic Impact Assessment	As discussed previously the traffic engineering impact of the Project on the traffic of the study area would be negligible. Roads and intersections of the study area would be expected to operate satisfactorily with minimal delays and spare capacity. Therefore, no intersection improvements would be required.	Specialist Findings are included in Specialist Findings are included in 1.9:Baseline Environment Recommendations have been included in the impact assessment and management

	It is noted that the intersection of the D3256 North Road and Waterpoort D3256 East Road has been constructed by Provincial Council as a type “BA” intersection following a site inspection on the 06th June, 2016. It is also noted that the additional widened section has been bitumen sealed to provide additional safety for vehicles passing a right turn vehicle. Development of this intersection will also play a role in mining which is visible on the area. Based on forecast traffic volumes of the RTA Road Design Guide recommends a “BA” type intersection. A “BA” type intersection with the additional bitumen sealed width exceeds the standards of a “BA” type intersection, therefore, no intersection improvements would be required .The above notwithstanding, site construction activities and normal open casting operation would increase the annual average daily traffic (AADT) volume on D4 North Road from between 191 and 176 vehicles per day (veh/day) to between 243 (mining development operation) and 251 (site construction). For roads with this level of daily traffic, the RTA Road Design Guide recommends two sealed lanes of at least 3m in width. In accordance with this recommendation, and to ensure that the Project does not adversely affect traffic or road safety on the section of D3256 Road to be used by Project generated traffic, the following recommendations are made. ➢ A suitable intersection where the Main Site Access intersects with D3256 East Road should be constructed such that it complies with RTA Road Design requirements for rural access.	measures as well as monitoring program included in these sections:1.10.4:**Assessment of each identified potentially significant impact and risk**

	➢ An additional 2m of bitumen seal should be provided on the D3256 East Road to achieve an overall carriageway width of 8m, i.e. 6m of sealed carriageway and 2 x 1m unsealed shoulders. ➢ The centerline of the road should be marked and additional guide posts installed. ➢ A comprehensive Transport Management Plan for construction and normal township development operation should be developed, which would be agreed with stakeholders and implemented. ➢ "Narrow bridge" signage at the approaches to the culvert near the intersection of the D3256 Road and Waterpoort D3256 North Road should be installed. ➢ Additional guideposts on the culvert on the D3256 East Road near the intersection of the D3256 north Road and Waterpoort D3256 East road should be installed. In addition, UCDII will implement a comprehensive Transport Management Plan for construction and normal operation to ensure that impacts of the proposed development would be minimised. The Transport Management Plan would provide for the following. o Safe driving practices/procedures for crossing the narrow culvert near the intersection of the D4 North Road and Waterpoort D3643 East Road. o Community information and awareness program of traffic activities. This could include press releases, specific newsletters and letter drops to neighboring residents.	

	○ Sign posting of Waterpoort D3256 East road and the D3256 Vetfontein North road with heavy vehicle and construction signage during the site construction stage. ○ Restrictions on the timing of large equipment and material deliveries. ○ Establishment of an inspection and maintenance program for the local road network to ensure conditions of roads are maintained. ○ Driver code of conduct with disciplinary action for non-compliance. ○ Emergency, accident, incident, complaint or non-compliance response and reporting. ○ Training requirements. ○ Audit and review. • To mitigate the impact of the traffic generated by the Project on the road pavement of the D4 North Waterpoort Road as well as to address concerns from Provincial Council it is proposed to carry out a geotechnical investigation of pavement depths, materials and subgrade conditions. From this it can be determined if the existing pavement has the required strength to handle the increase in traffic volumes or if the pavement will need to be modified and strengthened. • Should the pavement require strengthening, it would be reconstructed from the Main Site Access Road to the intersection of the D3256 north road, a length of approximately 1.6km. • In addition, it is recommended that a developer agreement or contribution scheme, taking into account any road construction operations required for the D3643 East	

	Road, be established with provincial Council for the ongoing maintenance of the intersection and project site. • To mitigate the impact of Restricted Access Vehicles (RAVs), an individual Traffic Control Plan would be developed for each over mass and overweight delivery. The individual Traffic Control Plan would address the following issues. - NSW RTA and NSW Police permit requirements. - Use of escort vehicles where necessary. - Any localized pavement strengthening or road widening requirements for the particular delivery. - Provision of traffic controllers where difficult or unsafe maneuvers are required. - Restriction on times of delivery of over mass or over weight deliveries.	
Visual Impacts Assessment	**Recommendations** • Ensure, wherever possible all existing natural vegetation is retained and incorporated into the site rehabilitation to ensure views towards the proposed coal mine are impeded. • Dust suppression techniques should be in place at all the times during the construction and operational phases to ensure that undue interest is not drawn to the site. • If vegetation is to be cleared on site, erosion control measures should be kept in place to ensure that excessive scarring of the landscape is reduced.	Specialist Findings are included in 1.9:Baseline Environment Recommendations have been included in the impact assessment and management measures as well as monitoring program included in these sections:1.10.4:**Assessment of each identified potentially significant impact and risk**

	• If construction is to occur during the night, all lighting should be kept facing inward. This is to ensure that excessive light does not escape from the construction area. • Investigation into the establishment of vegetation and/or the construction of man-made barriers between the sensitive viewers and the proposed development must be undertaken during the construction and operational phases. • During construction, litter control measures should be kept in place to ensure that the site is maintained in a neat and tidy condition. • External signage should be kept to a minimum. • The mine must ensure low foot level lighting as possible, if it is possible where it is deemed safe, lighting should be avoided. Lighting pollution should be carefully considered and kept to a minimum wherever possible as light at night travels great distance. • Physical barriers could be used as shielding or cover to prevent excess light leaving the site. It is also important to ensure that where possible, lighting should be faced/ shielded inward away from the viewer. Areas of high reflective surfaces should be covered in an attempt to reduce the reflection from the development. • During operations, litter control measures should be kept in place to ensure that the site is maintained in a neat and tidy condition. • The re-vegetation of the site during the operational phase should be considered only if it does not interfere with operations or pose a risk to the health and safety of people and animals. Vegetation around a structure tends to breaks the outline of the structure against the landscape and will therefore allow for the structure to be less pronounced. Vegetation can be used to reduce the visual scarring of the landscape and potentially reduce the visual impacts of the proposed development. • Stock piles should not exceed 15m in height.	

	• Blasting should be done under controlled conditions (i.e. windy days must be avoided and must be done in such a way that must be minimised). • Re-establish vegetation within the development footprint areas to allow for the VAC of the area to be increased. All infrastructure used should be disassembled and removed from site to ensure the site resembles a natural state and the environment be restored to a condition whereby the natural functioning of the ecosystem can take place.	
Flora Assessment	Recommendations Where-ever the mining operation will take place within the boundaries of the study site, and where-ever associated infrastructure will be built (buildings, plant, roads, etc), and where-ever waste dumps will be located, the natural vegetation will be destroyed. All protected trees and other plant species of conservation concern will be permanently eradicated. The scale of the proposed mine is such that it will simply not be possible to completely mitigate all or even most of the impacts. Only limited possibilities exist to mitigate these severe impacts. The following recommendations have been made: • The outer edge of the open cast, including roads and other infrastructure, should be at least 100 m from the outer edge of the Brak River and its flood plain. The vegetation within this 100 m must remain undisturbed and natural. Any development within 500 m from the outer edge of the River and flood plains area will need a Water Use Licence. • The pans are also regarded as ecologically highly sensitive, though these are very small and isolated wetland systems that can be destroyed without much vegetation ecological consequences (see wetland report). • Vegetation on the hills has medium-high sensitivity, and these ecosystems should also be conserved. The lay-out plan indicates that the northern hill on Berenice will	Specialist Findings are included in 1.9:Baseline Environment Recommendations have been included in the impact assessment and management measures as well as monitoring program included in these sections:1.10.4:**Assessment of each identified potentially significant impact and risk**

	be destroyed, but a similar hill in the southern part of Berenice will not be within the boundaries of the open cast pit. It is therefore suggested that this southern hill be protected against any development. • Also of concern is the impact roads and dirty water drain on the hill that occurs on the southern boundary of Longford. This is a unique hill with unique plant species composition and should be conserved, with no development on or so close to the hill, that it may be negatively affected. A road and drainage line on the hill is not feasible • Several Nationally Protected tree (National Forests Act 1998) or NEMBA plant species (Government Notice No. 2007, National Environmental Management: Biodiversity Act, 2004) were recorded from within the study area. These include: – Adansonia 266igitate – Balanites maughanii – Boscia albitrunca – Combretum imberbe – Sclerocarya birrea – Boscia albitrunca (Sheppard tree, Witgat, Matoppie) is particularly widespread and many individuals (probably hundreds) occur on the study site. Some of the species listed above are fairly rare in the area and only few individuals were noted. In terms of section 15(1) of the National Forests Act, 1998, (see also Government Notice No 29062 of 8 Sept 2006) no person may cut, disturb, damage or destroy any protected tree or	

	possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license granted by the Minister to an applicant and subject to such period and conditions as may be stipulated. Contravention of this declaration is regarded as a first category offence that may result in a person who is found guilty of being sentenced to a fine or imprisonment for a period up to three years, or to both a fine and imprisonment. It is suggested that younger individuals of Baobab and Sclerocarya birrea (Marula) that occur in the way of the development, be transplanted to areas that will not be mined or developed. Furthermore, all individuals of Sesamothamnus lugardii found in the way of the mine or other development should also be transplanted. The applicant will be required to obtain a permit from the department of forestry for the translocation of the protected trees. A nursery is also recommended Any individuals of the mentioned species that are not directly in the way of the development should be left to survive. • The extent to which a site is ecologically connected to surrounding areas is a key determinant of its sensitivity. Systems with a high degree of landscape connectivity amongst one another are perceived to be more sensitive and will be those contributing to ecosystem service or the overall preservation of biodiversity. The proposed mine is located in an area that is relatively unspoilt and of high conservation value, as a result of being managed primarily for game farming. The environmental management plan for the proposed mining activities, in addition to	

	minimising impacts at the site itself, must include measures to ensure that negative environmental impacts do not affect surrounding area. • From a vegetation and flora perspective, the area is considered as worthy of conservation, the impacts of the proposed mining operations are regarded as high because the vegetation of large areas will be destroyed, and although some mitigation measures are proposed, these will not result in conservation of most of the natural vegetation.	
Fauna Assessment	Recommendations made included: • Limit all developments to the minimum area required, and leave as much as possible natural vegetation intact. • Conserve the areas that will not be developed, particularly the relatively large area on the southern parts of Berenice and Celine (conservation area?) • The outer edge of the open cast, including roads and other infrastructure, should be at least 100 m from the outer edge of the Brak River and its flood plain. The vegetation within this 100 m must remain undisturbed and natural. • Control al waste dumping and avoid pollution of natural vegetation, especially the Brak River and flood plain area • Conserve the hill that occurs on the southern boundary of Longford. • Areas cleared for mining operations must be minimised. However, the scale of the proposed mining operation is such that irreversible environmental damage will occur even if this mitigation measure is implemented. Cumulative impacts: A large area of avian habitat has already been lost in this area because of the nearby Venetia mine and other existing or proposed mines, and the proposed Berenice mine will result in further losses in an area of high conservation significance. The	Specialist Findings are included in 1.9:Baseline Environment Recommendations have been included in the impact assessment and management measures as well as monitoring program included in these sections:1.10.4:**Assessment of each identified potentially significant impact and risk**

	impacts of habitat loss are particularly severe for large raptors like Martial Eagle that require large areas of intact habitat. A specialist must be engaged to check the entire property for active nests of red-listed species, such as White-back Vulture, Martial Eagle and Tawny Eagle. Any such nests will need a buffer zone of 500 m radius around them to ensure that breeding birds are not disturbed	
Social Impact Assessment	The results of the study indicate that the recommended mitigation measures are expected to reduce the significance of negative impacts to acceptable levels, while positive impacts will on average be significantly enhanced to maximise benefits to surrounding communities. Ongoing monitoring, management and implementation of measures outlined in specialist reports will be critical to ensuring environmentally intrinsic impacts do not affect communities. The results of the study indicate that the recommended mitigation measures are expected to reduce the significance of negative impacts to acceptable levels, while positive impacts will on average be significantly enhanced to maximise benefits to surrounding communities The following key recommendations are put forward, based on the results of the SIA: • The project should go ahead on the conditions that, the developer must maintain frequent communication with the communities, taking into consideration the needs of different groups; • Local labour must be employed wherever possible; • Engage the services of a Social Engagement Officer to ensure that social impacts are mitigated during construction and operational phases.	Specialist Findings are included in 1.9:Baseline Environment Recommendations have been included in the impact assessment and management measures as well as monitoring program included in these sections:1.10.4:**Assessment of each identified potentially significant impact and risk**

Groundwater Assessment	Recommendations ➢ The groundwater model should be updated when 2 years monitoring data is available. ➢ Water levels in the surrounding boreholes must be measured on a monthly basis before and after mining commenced. ➢ Water levels in boreholes up to 2 km from the mine must be monitored on a monthly basis before and after mining activities commenced to determine the decrease in water level. ➢ Data must be used to update the numerical groundwater model ➢ A detailed hydrocensus in the nearby farms is required. The hydrocensus should record the positions of the groundwater sources as well as the water level and depth of these sources. ➢ The monitoring protocol and mitigation measures should be adhered to. The monitoring programme must include all the metal ions above total concentration threshold zero. ➢ Flow meters should be installed to obtain legal water supply and water use information ➢ The position of flow meters is very important	Specialist Findings are included in 1.9:Baseline Environment Recommendations have been included in the impact assessment and management measures as well as monitoring program included in these sections:1.10.4:**Assessment of each identified potentially significant impact and risk**
Aquatic Assessment	Due to the lack of water flow during the assessment period the SASS5 protocol was not used to determine the overall ecological status of the sites. All sites were assessed and evaluated in terms of their surrounding habitat and possible impacts to the aquatic ecosystem. All proposed mitigation measures should be adhered to during both construction and operation phases to ensure the watercourses condition does not deteriorate any further.	Specialist Findings are included in 1.9:Baseline Environment Recommendations have been included in the impact assessment and management measures as well as monitoring program included in these sections:1.10.4:**Assessment**

	The following recommendations were made: ➢ Construct erosion control measures (rip rap, silt trap, gabions, etc.) especially at the stream banks as well as the inlet and outlet of the culverts; ➢ Implement a weed control measures within the stream during construction and maintain the riparian zone at low to no invasion levels through regular weed control follow-ups; ➢ Rehabilitation of disturbed area must be undertaken concurrently with construction activities; ➢ It is also recommended that construction be undertaken during dry season.	**of each identified potentially significant impact and risk** 1.12:Environmental impact statement
Wetland Assessment and delineation	Wetland indicators that were identified on site included the terrain unit indicator, hydrophytes and soil wetness. These indicators were used in identifying and confirming the boundary of the wetlands. During the site assessment, soil wetness was experienced on the permanent zones of the wetlands where evidence of surface water was observed, however the wetlands were delineated from the point of previous wetland boundary. According to the NWA Section 21 (c) and (i) guidelines, any development that takes place within 500m of a watercourse constitutes a water use, which requires a Water Use Licence before development can commence. The open cast mining activities will take place within the stated 500m of a watercourse; however, a 100 m buffer was created for these wetlands due to detrimental impacts posed to wetlands by mining. All mining activities are to take place within the 100 m buffer recommended for this project.	Specialist Findings are included in 1.9:Baseline Environment Recommendations have been included in the impact assessment and management measures as well as monitoring program included in these sections:1.10.4:**Assessment of each identified potentially significant impact and risk**
Climate Change Impact Assessment	Key points that should be considered with respect to climate change and the broader local community: • With respect to the demographic profile, women are generally considered to be more vulnerable to climate change than their male counterparts, as women generally head	Specialist Findings are included in 1.9:Baseline Environment

	up the household whilst males leave to urban centres, as a result, firewood and water collection is often a women's primary responsibility; • A high unemployment rate points to existing socio-economic vulnerabilities. High levels of poverty, low-income distribution and low education levels all contribute to vulnerability. Social vulnerability from climate change will result in further inequalities and reduced capacity to cope with climate shocks; and • A local community that is largely younger than 15 or older than 65 indicates a higher dependency ratio. Increased economic strain on households can lead to increased vulnerability to climate change impacts. The following key points that should be considered with respect to climate change and the broader environmental context: • Climate change will affect natural ecosystems, reducing their ability to withstand impacts. The continued loss of biodiversity and degradation of ecosystems, and impacts to water resources weakens their ability to provide essential services. • A RAMSAR recognised wetland (Makuleke) has been identified within the Vhembe District Municipality. Wetlands have important regulatory functions in that they moderate floods. They allow for attenuation of flood peaks thus reducing the risks to people and infrastructure. In addition, wetlands improve water quality though filtration and detoxification.	Recommendations have been included in the impact assessment and management measures as well as monitoring program included in these sections:1.10.4:Assessment of each identified potentially significant impact and risk

Copies of studies undertaken were attached under Annexure 5 – Specialist Reports (Appendices 1-15) with the final submission. The DFFE requested that the Climate Change Impact assessment be undertaken and include with the amended EIR, it is therefore attached.

1.12 Environmental impact statement

1.12.1 Summary of the key findings of the environmental impact assessment;

The key finding of the Environmental Impact Assessment are categorised into sections

1. The Baseline environment:
   a. From the studies conducted it has been noted that the project area lies within a biodiversity Conservation area and that the Vhembe Biosphere Forum has applied to increase the buffer to include the project area.
   b. The area has severe water restrictions due to the low rainfall and high temperatures
   c. The site has a very rich flora and fauna diversity
2. Positive and negative Impacts of the project and proposed layout.

(The positive and negative impacts have been discussed in 1.10.2: The positive and negative impacts that the proposed activity (In terms of the initial site layout) and alternatives will have on the environment and the community that may be affected.)

1.12.2 Final Site Map

Provide a map at an appropriate scale which superimposes the proposed overall activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers.

The final composite map is included under_ 2.3 :Composite Map.

1.12.3 Summary of the positive and negative implications and risks of the proposed activity and identified alternatives;

Refer to **Table 23: Positive and negative impacts considering the alternatives described for the proposed Berenice Project**.

1.12.4 Proposed impact management objectives and the impact management outcomes for inclusion in the EMPr;

Based on the assessment and where applicable the recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.

A detailed assessment of the impacts as well as the Management objectives have already been included in the summary of specialist recommendation as well as in 1.10.4: **Assessment of each identified potentially significant impact and risk**. The impact management outcomes have been summarised as follows:

- Prevent impacts from occurring where possible (e.g. prevent the contamination of the surrounding environment through effective clean and dirty water separation and management at the site).
- Limit / control impacts and the severity thereof where possible (e.g. control impacts by limiting the area of disturbance; limit the severity of impacts to the surrounding environment by ensuring that PCD and storm water control measures are designed and operated at 110% capacity.
- Remedy impacts that could not be prevented / limited / controlled and / or avoided (e.g. remedy impacts caused by spillages by cleaning up of any spillages and the associated affected areas).
- Enhance positive impacts in whatever manner may be possible to increase the positivity thereof (e.g. if / when any positions become available at the mine, source employment locally).

1.12.5 Final proposed alternatives.

(Provide an explanation for the final layout of the infrastructure and activities on the overall site as shown on the final site map together with the reasons why they are the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment)

The final layout of infrastructure has been chosen based on the best and most practical alternatives available refer to Annexure 5- Specialist Reports_ Appendix 1 Site Layout. The alternatives in terms of the project at hand have been identified and investigated in depth in this report. The following information regarding alternatives has been included in various parts of this EIAR as indicated:

- The project alternatives (including the no-project alternative) were identified and described, along with the advantages and disadvantages of each alternative
- The positive and negative impacts of the proposed alternatives
- The risks associated with the identified alternatives
- A motivation where no alternative sites were considered was provided
- A statement motivating the alternative development location within the overall site was provided

1.12.6 Aspects for inclusion as conditions of Authorisation.

Any aspects which have not formed part of the EMPr that must be made conditions of the Environmental Authorisation

Due to the fact that the layout design is conceptual it is expected that the knowledge gaps for the project at hand (and therefore aspects where information may be considered insufficient) revolve around exact designs, and in some cases, locations. Therefore the following conditions of authorisation are proposed:

- The environmental authorisation will be subject to the availability of an approved water use license or proof that the said application process is underway.
- Prior to construction a tree removal, relocation or destruction permit must be applied for detailing the species being affected and as such the permit must be submitted to the DMR.
- A detailed paleontological study focusing on all the areas where earthworks and construction will take place will need to be undertaken and the report should be submitted to both SAHRA and DMR for assessment and record keeping.
- Detailed designs of the proposed PCD must be compiled in line with the design criteria stipulated in the water reports and IWWMP. The final as-built designs plans will be provided to the DMR who are the competent authority for record keeping purposes once construction has been completed.
- Detailed designs of the associated water management infrastructure (silt trap, berms, trenches, pumps, etc.) must be compiled in line with recommendation made by DWS, the Visual Study and the Flora Assessment. The final as-built designs will be provided to the DMR who are the competent authority for record keeping purposes once construction has been completed.
- The exact locations of the proposed infrastructure may still need to be moved in the future. Any such infrastructure must be confined to the dirty water management area. Prior to and after completion of construction of any such infrastructure, the Competent Authority should be informed of the location thereof for record keeping purposes.
- The timing around when the water treatment plant will be commissioned as well as the designs will need to be submitted to the provided to the DMR who are the competent authority for record keeping purposes.

1.12.7 Description of any assumptions, uncertainties and gaps in knowledge.

(Which relate to the assessment and mitigation measures proposed)

Specialists appointed to conduct assess the baseline information and in-depth studies for the Berenice Project, were provided with (at least) the following information:

- Site layout plan

- Scoping Report
- Mine works program
- previous studies conducted for the area
- Specialist studies were also shared among specialist

Site access was arranged for each specialist which was graciously granted by the farmers. Each specialist conducted site visits on the farm to do on-site testing, sampling, visual observations, as required for their specialist investigation.

A summary of the assumptions and limitations noted by specialists has been noted below:

- **Flora**

Assumptions and Limitations

The most important limitation was that the vegetation survey was done at the end of a very droughty summer and the herbaceous vegetation was quite dormant.

- **Fauna**

Assumptions and Limitations

The vertebrate team is SACNASP-registered and has sufficient experience and ample access to information sources to confidently compile lists of biota such as presented herein to support conclusions, conservation status, impact calculations and suggested mitigation measures based on site visits. In instances where doubt exists, a species is assumed to be a possible occupant (viz. Red rock rabbits, pygmy shews, pythons and bull frogs); -this approach renders the conclusions to be robust. In instances where the possible occurrence has significant ecological implications, an intensive survey is recommended. In view of the latter, it is highly unlikely that an intensive survey to augment this site visit will add significantly to the data base, and the additional costs are unlikely to warrant the effort.

- **Heritage**

Assumptions, restrictions and gaps in knowledge

No severe physical restrictions were encountered as gravel roads provided access to the survey areas. The underlying premise during the survey was to rely intensively on local knowledge of the landscape and oral testimonies of the location of various heritage sites. Apart from some early Venda sites (e.g. Machemma, Verulam and Verdun) very little archaeological and historical research have been done in this specific valley area just north of the Soutpansberg. However, intensive research has been conducted for several decades further north along the Limpopo River basin and further east in the Nzhelele River valley.

- **Land Capability**

Assumptions and limitations

Limitations are land characteristics, which have an adverse effect on capability. Permanent limitations are those which cannot easily be corrected. Temporary limitations can be corrected, at least by minor land improvements. Land is classified mainly on the basis of permanent limitations. The general rule is that if any one limitation is of sufficient severity to lower the land to a given class it is allocated to that class, no matter how favourable all other characteristics might be.

- **Baseline Noise**

Assumptions and limitations

Using the point source and attenuation-by-distance model, the following assumptions were made:

- The study assumed no attenuation due to absorption at the ground surface takes place. The effects of frequency-dependent atmospheric absorption were also not considered.
- Meteorological conditions. Neutral weather conditions, i.e. windless and inversionless, and standard conditions of temperature and humidity (20 C and 50%RH) were assumed, representing a neutral evaluation of the noise impact.
- Ambient noise levels. Measured levels are assumed typical of the environment, representing a neutral evaluation of the noise impact.
- Barrier effect of temporary stockpiles and levees. Because of the highly mobile nature of all operations on the proposed opencast pit, the effect of these temporary structures on the noise climate was not considered, representing a conservative evaluation of the potential noise impact.
- Current noise control technology is assumed. No allowance is made in the noise level predictions for improvements in noise control techniques or mitigation measures which may be incorporated into the proposed project, representing a conservative evaluation of the potential noise impact.
- Worst case operational noise level assumption. The highest noise level of plant as measured at the operating sites was used as the criterion value for the noise predictions at the proposed project.

- **Visual Assessment**

Assumptions and limitations

The following limitations, constraints and assumptions are applicable to this study:

- Visual perception is by nature a subjective experience, as it is influenced largely by personal values. For instance, one viewer experiences as an intrusion in the landscape, another may regard as positive. Such differences in perception are greatly influenced by culture, education and socio-economic background. A degree of subjectivity is therefore bound to influence the rating of visual impacts. To limit such subjectivity, a combination of quantitative and qualitative assessment methods has been used. A high degree of reliance has been placed on analysis based on GIS view shed and visibility analysis and on making transparent assumptions and value judgements where assumptions or judgements are necessary

- The purpose of this visual impact assessment study is to identify the visual impact of the project in relation to the existing landscape setting. However, while an effort is made to be rigorous and logical in the assessment process, the element of subjectivity does influence the ratings. It has nevertheless been reported in McCool, S.F. et al (1986) that the professional visual assessor is more critical than the public.
- The view shed generated in GIS is not 100% accurate and has therefore been ground truth during the site visit. Some viewpoints which are indicated on the view shed as being inside of the view shed, can be outside of the view shed. This is due to the modification of the natural environment surrounding the study area. Natural vegetation also plays a significant role and can have a positive or negative influence on the view shed.
- Determining a visual resource in absolute terms is not achievable. Evaluating a landscapes visual quality is both problematic and complex. Sundry approaches have been developed, but they all have one problem in common; unlike noise or air pollution which can be measured in a relatively simple way, for the visual landscape mainly qualitative standards apply. Therefore, subjectivity cannot be excluded in the assessment procedure (Lange, 1994). Individually there is a great variation in the evaluation of the visual landscape based on different experiences, social level and cultural background. Exacerbating the situation is the inherent variability in natural features. Climate, season, atmospheric conditions, region, sub region, all affect the attributes that comprises the landscape. What is considered scenic to one person may not be to another (NLA, 1997).
- The view shed illustrates the areas from which the proposed development is likely to be visible. It does not take local undulations, existing vegetation and man-made structures into account. Due to the interval of the contours, many of the undulations or natural landscape features smaller than 20 m tall in the surrounding areas could be lost. This means that the proposed development may not be visible from everywhere within the view shed, as the development may be obscured by other existing infrastructure, vegetation or small/localised variations in the topography. It therefore indicates a “worst case” scenario.

- **Social impact Assessment**

Assumptions and Limitations

The study is subject to the following assumptions and limitations:

- The primary assumption underpinning this study is that the assessment was done with the information available to the specialist at the time of executing the study, within the available timeframes and budget. The sources consulted are not exhaustive, and additional sources which may contain additional information might exist.
- Statistical data of the study area is based partly on the data collected during the 2011 Census as well as 2007 Community Survey. In some instances, the social characteristics of an area might have changed significantly in the intervening years. The figures presented in the social profile should therefore be regarded as indicative rather than a completely accurate reflection of current conditions.
- Conclusions presented in this report are derived primarily from results of previous research and secondary sources.

- **Groundwater Modelling**

Assumptions and limitations

Groundwater numerical models are usually used to simulate and develop hydrogeological management solutions, i.e. the prediction of contaminant plume migration and groundwater level changes over time. A model, no matter how sophisticated, will never describe the investigated groundwater system without deviation of model simulations from the actual physical process (Spitz, 1996). Therefore, it is necessary to make assumptions to simplify the complex, real world hydrogeological conditions into a simplified, manageable model.

The numerical model simulations need assumptions to be made during the translation of the numerical code into site-specific model. These assumptions ,which reflects data gaps in the conceptual model regarding the aquifer distribution and the aquifer parameters ,can results in areas of uncertainty in the model output and predictions.

During the development of the site specific hydrogeological conceptual model for Berenice Coal Mine, the following data gaps. And or uncertainties were identified:
Actual aquifer parameters for the study area is largely unknown and the thirteen nine (39) existing boreholes within the proposed mining area formed the basis for the aquifer parameters estimates as input values into calibration flow model. For lithological units different than that of the immediate study area, literature research was used for reference values ;

- Monitoring boreholes data (water levels) , was only available within the immediate mining area , the NGA data was not used ,sections of the model domain was therefore not ,thereby affecting the confidence level of the model;

- Considering the spatial extent of the model domain , and the limit rainfall stations within the study area ,rainfall data from a single station was used to represent entire study area
- Actual transmissivity values of the Tshipise, Bosbokpoort and Verrulam faults zones are unknown .based on literature studies the Tshipise fault zone has high transmissivity values.
- A number of small faults structures occur within the model domain and these were not individually considered in terms of numerical groundwater model. The model was run on the basis of equivalent porous media
- The impact of other mining activities irrigations around and close to the prosed mine is unknown on the groundwater regime and therefore not considered in the model
- Constant thickness were considered for the two layers of the model throughout the catchment area 26 meters and 300 meters

- **Aquatic Ecological Assessment**

Assumptions and limitations

The following limitations were identified during the assessment:

- During the assessment all sites were dry. Due to this, water quality analysis and aquatic assessment (SASS5) were not undertaken.

- **Wetland Assessment**

Assumptions and limitations

- The maps available are still relevant and can be used as representation of site conditions.
- Global Positioning System (GPS) technology is inherently inaccurate and some inaccuracies, due to the use of handheld GPS instrumentation, may occur. If more accurate assessments are required the wetlands will need to be surveyed and pegged according to surveying principles.
- Aquatic, wetland and riparian ecosystems are dynamic and complex. The effects of natural seasonal and long-term variation in the ecological conditions are therefore largely unknown.
- Fauna and flora assessments undertaken were mainly for the purposes of supporting the Present Ecological Status and Ecological Importance and Sensitivity that is required as part of the wetland assessment. Extensive fauna and flora assessment outside of the wetland system did not form part of this report.

Notwithstanding the above, Jomela is confident that these assumptions and limitations do not compromise the overall findings of this report. It is recommended that throughout the life of mine when the critical environmental aspects be monitored and reports such as the groundwater study be periodically be updated. The ECO and environment team should update the EIR as and when legislation changes or as required if deemed necessary during performance assessments. For the purpose of this application it has been deemed that studies undertaken are sufficient.

1.12.8 Reasoned opinion as to whether the proposed activity should or should not be authorised

1.12.8.1 Reasons why the activity should be authorized or not.

The factors taken into consideration when assessing whether authorisation should be granted or note the need and desirability, positive impacts and impact management measures needs to be weighed up against the identified potential negative impacts, to see whether the benefits of the project could justify the negative impacts.

It is the opinion of the EAP that the majority of impacts will have medium significance before mitigation however the loss in habitat has a high severity even post closure. It is recommended that if clearances are kept at a minimum and relevant permits be applied for as well as potential replanting, re-seeding and nurseries of indigenous and protected species form part of the mitigation measures.

With the extensive specialist information generated to establish the baseline environmental conditions of the project area the EAP recommends that the activity be authorised subject to all relevant legislation. The EAP has also made available in the report stating the water restrictions, critical biodiversity area and the pristine nature of the area. This report was subject to relevant commenting authorities and their recommendations should be taken into cognisance during the authorisation process.

1.12.8.2 Conditions that must be included in the authorisation

- No new NEMA, NEMWA, NWA listed activity which is not included in this application may not be undertaken without prior legislative authorisation.
- Annual environmental reports should be submitted to the department including water monitoring reports.
- An EMP Performance Assessment must be undertaken every two years by an external, independent, suitably qualified person. A copy of the Performance Assessment report must be submitted to the DMR.

1.12.8.2.1 Specific conditions to be included into the compilation and approval of EMPr

The EMPr has been compiled and is under Part B of this EIAR document. The EMPR includes all aspects associated with the proposed new mining activities and related infrastructure. The EMPr includes items identified and recommended in the specialist report which were undertaken to assess potential impacts and mitigation measures for the project.

1.12.8.2.2 Rehabilitation requirements

The concurrent rehabilitation requirements are as follows:

- All open pit areas should be rehabilitated as soon as the mining in that section has been finalised;
- Slopes of rehabilitated areas must be gentle sloped to minimise loss of topsoil due to erosion of topsoil;
- Re-vegetation of rehabilitated areas must be done immediately;
- Rehabilitated areas must be free draining;
- Rehabilitation activities must be actively monitored on a regular basis to ensure the long-term sustainability thereof; and
- The rehabilitation and closure objectives should be implemented as described in 2.8.4.1: Rehabilitation Plan and 2.8.4.2:Final Closure

1.12.9 Period for which the Environmental Authorisation is required.

The Environmental Authorisation is required for the life of mine which is 33 years. Taking into account the maximum timeframes allocated for a mining right it is therefore expected that UCDII will need to renew their mining right once the 30years expire.

1.12.10 Undertaking

Confirm that the undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to both the Scoping and the Environmental Management Programme report.

Herewith I, the person whose name and identity number is stated below, confirm that I am the person authorised to act as representative of the applicant in terms of the resolution submitted with the application, and confirm that the above report comprises EMP compiled in accordance with the guideline on the Departments official website and the directive in terms of sections 29

and 39 (5) in that regard, and the applicant undertakes to execute the Environmental management programme as proposed.	
Full Names and Surname	Minah Moabi
Identity Number	7901190390080

1.13 Financial Provision

State the amount that is required to both manage and rehabilitate the environment in respect of rehabilitation.

The value of the financial provision that will be required to rehabilitate the environment in respect of rehabilitation, including the proposed mining activities was determined to the value of **R 16,049,881.00** in the final EIR prior to submission thereof to the Competent Authority.

1.13.1 Explain how the aforesaid amount was derived.

The financial provision has been compiled in line with the DMR and NEMA guidelines and requirements. The breakdown of the financial provision are included in the EMPR in table **Table 36: Financial Provision** which forms part of this report.

1.13.2 Confirm that this amount can be provided for from operating expenditure.

(Confirm that the amount, is anticipated to be an operating cost and is provided for as such in the Mining work programme, Financial and Technical Competence Report or Prospecting Work Programme as the case may be).

The amount required for the financial provision will be provided in the form of a bank guaranteed cheque or into a rehabilitation trust.

1.13.3 Deviations from the approved scoping report and plan of study.

1.13.3.1 Deviations from the methodology used in determining the significance of potential environmental impacts and risks.

(Provide a list of activities in respect of which the approved scoping report was deviated from, the reference in this report identifying where the deviation was made, and a brief description of the extent of the deviation).

No deviation has been made from the plan of study provided for in the Scoping Report. The layout was ammended but this only served to minimise negative impacts on the Brak River and floodline areas.

1.13.3.2 Motivation for the deviation.

No deviation has been made from the plan of study provided for in the Scoping Report, and therefore no additional motivation is required

1.13.4 Other Information required by the competent Authority

Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998). the EIA report must include the:-

1.13.4.1 Impact on the socio-economic conditions of any directly affected person.

(Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any directly affected person including the landowner, lawful occupier, or, where applicable, potential beneficiaries of any land restitution claim, attach the investigation report as **Appendix 2.19.1** and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6.and 2.12.herein).

Refer to Annexure 5 – Appendix 11 Social Impact Assessment

The landowners will be directly affected by the mining activity as it will interfere with the current game hunting eco-tourism activities. The impacts that will affect the landowners include but not limited to:

- Loss of land capability where the open its will be developed
- Loss of land where the roads and infrastructure will be constructed
- Increased noise and visual disturbances
- Loss of income from the loss of guests due to the change in the natural scenic environment
- Loss of indigenous vegetation and sensitive habitats
- Suffer losses due to increased criminal activity (poaching)

The financial losses due to the change in the land use at the six farms will need to be compensated for by way of land use agreements with the legal occupiers as well as the land claimants once the claim are finalised and ownership is now in their custodian. In order to mitigate specific risks of criminal activity to directly affected and neighbouring landowners, it is recommended that:

- Fence off servitudes and access roads and provide for strict access control measures to service roads and patrol service roads regularly;
- Utilize sufficient mine security to regularly patrol the fences of the mine infrastructure, especially;
- Liaise with the South African Police Service to enhance police patrol activity in the project area;
- Support the community watch of the directly affected and neighboring landowners which can report criminal or suspicious activity; and
- Employment of local people on the mine to improve the poverty levels in the host and neighboring communities.

1.13.4.2 *Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act.*

(Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any national estate referred to in section 3(2) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) with the exception of the national estate contemplated in section 3(2)(*i*)(vi) and (vii) of that Act, attach the investigation report as **Appendix 2.19.2** and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6.and 2.12.herein).

Refer to Annexure 5 – Appendix 7 Heritage Impact Assessment

In terms of section 38 of the National Heritage Resources Act, 1999 (Act no. 25 of 1999), a comprehensive heritage impact assessment (HIA) investigation in accordance with the provisions of Sections 38(1) and 38(3) of the *said act* and focuses on the survey results from a cultural heritage survey. The HIA study was undertaken in order to establish if any localities of heritage significane were present on the property.

A total of 15 sites were recorded ranging from a Late Iron Age cattle outpost (Site 9), several farm worker house complexes (Sites 1, 8, 12 and 15), four individual grave and graveyard sites (Sites 2, 6, 7 and 14), a historic trade store (Site 13) situated along an existing ox wagon trade route and to the more recent farmhouse complexes and associated infrastructure (Sites 4, 10 and 11).

As a result please note the following recommendations:

- A destruction permit will have to be applied for from SAHRA for the farm worker house complexes (Sites 1, 8, 12 and 15);
- The site of the historic trade store (Site 13) and Late Iron Age cattle kraal settlement (Site 9) will have to be surveyed and mapped (Phase 2); then an application submitted for a destruction permit from SAHRA;
- The individual graves and graveyards (Sites 2, 6, 7and 14) will require a Phase 2 investigation (exhumation and reburial).
- Fencing off of the grave site
- Adhere to a 50m buffer zone from the burial site. The buffer should be measured from the fence area
- Compiling a Heritage Site Management Plan (HSMP) is recommended. However if the proposed infrastructure plan changes, relocation of the grave may be necessary.
- If relocation is necessary, a Burial Grounds and Grave Census (BGGC) is recommended to identify bona fide stakeholders and descendants who will be consulted with regards to the pending grave relocation.

- A Heritage Watching Brief is recommended for the construction phase when ground clearance commences. This task includes the presence of a qualified archaeologist to identify and assess any heritage resources that may be uncovered during ground clearance.
- Should chance archaeological materials or human burial remains be exposed during subsurface construction work on any section of the mining development laydown sites, work should cease on the affected area and the discovery must be reported to the heritage authorities immediately so that an investigation and evaluation of the finds can be made. The overriding objective, where remedial action is warranted, is to minimize disruption in construction scheduling while recovering archaeological and any affected cultural heritage data as stipulated by the PHRA and NHRA regulations.
- It is proposed that prior to construction a full paleontological study be undertaken. Artefact identification and removal should be done in accordance to relevent legisltation.

1.13.5 Other matters required in terms of sections 24(4)(a) and (b) of the Act.

(the EAP managing the application must provide the competent authority with detailed, written proof of an investigation as required by section 24(4)(b)(i) of the Act and motivation if no reasonable or feasible alternatives, as contemplated in sub-regulation 22(2)(h), exist.

Section 24(4)(b)(i) of the NEMA (1998) states the following "*Procedures for the investigation, assessment and communication of the potential consequences or impacts of activities on the environment must include, with respect to every application for an environmental authorisation and where applicable investigation of the potential consequences or impacts of the alternatives to the activity on the environment and assessment of the significance of those potential consequences or impacts, including the option of not implementing the activity*"

The alternatives in terms of the project at hand have been identified and investigated in depth in this report. The following information regarding alternatives has been included in various parts of this EIR as indicated:

- The alternatives for the current layout plan were considered in detail with the aim to minimise impacts and protect natural resources.
- The previous layout plan was revised to take into account the Hill on Longford, the proximity of discard dumps to the brak river, the removal of open pit areas falling within floodlines and the minimisation of site clearances.
- The project alternatives (including the no-project alternative) were identified and described,
- The positive and negative impacts of the proposed alternatives have been described,
- The risks associated with the identified alternatives have been described,
- A motivation where no alternative sites were considered was provided , and
- A statement motivating the alternative development location within the overall site was provided.

The alternatives, descriptions, motivations, assessments, etc have all been considered in detail in this report and are therefore not repeated here.

1.13.5.1 Waste Streams and Management

1.13.5.1.1 Key Waste Streams

The following waste streams might be generated at the proposed Berenice Colliery:

- General domestic waste (e.g. food waste, papers, plastics, glass, cans, garden waste, etc.)
- Sewage and sullage from the office, change house and workshop
- Overburden (softs and hards)
- Coal discard
- Spent oil and grease from mine workshops, as well as hydrocarbon containers
- Fluorescent tubes, old batteries, waste paints
- Scrap waste (scrap metals, empty chemical containers, and metal off-cuts)
- Wood waste (packaging material)
- Disused electronic equipment

The overburden and discard are mine residues falling within the ambit of hazardous waste requiring authorisation under the National Environmental Management: Waste Act, 2008. Thus, the mining right application includes an integrated environmental authorisation and waste licence application, which are running concurrently to the IWULA compilation process.

The listed activities requiring licensing are:

National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008): CATEGORY B

- Storage of hazardous waste
  - The storage of hazardous waste in lagoons excluding storage of effluent, wastewater or sewage.
- Treatment of waste
  - The treatment of hazardous waste in excess of 1 ton per day calculated as a monthly average; using any form of treatment excluding the treatment of effluent, wastewater or sewage.
- Disposal of waste on land
  - The disposal of any quantity of hazardous waste to land.

1.13.5.1.2 Waste Management

The hierarchy for waste management will be followed as outlined below.

- Waste prevention: the prevention and avoidance of the production of waste;
- Recovery: the recycling or re-use of waste;
- Waste reduction: the reduction of the volume/quantity or hazardous nature of waste during mine operation and production;
- Waste treatment: the treatment of waste to reduce the volume of waste, risk to human and the environmental, and the degree of hazard;
- Waste disposal/discharge/emission: the environmentally acceptable and safe disposal or discharge of waste in line with the National Environmental Management Waste Act, 2008 (Act No. 59 of 2008).

Table 27: **Berenice Colliery Waste Stream Identification**

Infrastructure/Activity	Waste	Waste Categorization
Ablution	Sewage Sullage (grey water)	Hazardous
Stockpiles	Overburden stockpiles Coal discard and slurry disposal facility	Hazardous
Offices	Waste papers, plastic, glass bottles, food waste	General waste
Mine vehicles	Hydrocarbon waste generated by spillages; Operations of vehicle and diesel generators	Hazardous waste
Workshop	Fluorescent tubes, old batteries, waste paints, and transformers; Oily and grease waste, petrol contaminated material, and oil related products	Hazardous waste
	Scrap metals, empty chemical containers, metal off-cuts), used tyres	Hazardous waste

Table 28: **Waste facility Locations**

Activity Description	Capacity/Flow Rate/Dimensions	Coordinates	Property Description
Package sewage treatment plant	64 m3	22° 45’ 57.52” S 29° 26’ 22.20” E	Matsuri 358 MS
Discard dump	Facility life span: 33 years Capacity: 30 855 475 m3 Depositional rate: 1 402 522 t/yr	22° 46’ 20.47” S 29° 26’ 32.45” E	Matsuri 358 MS
Soft and hard overburden dump	21 000 000 t/annum	22° 42’ 52.79” S	Celine 547 MS

		29° 29' 37.32" E 22° 42' 53.48" S 29° 30' 05.15" E	Doorvaart 355 MS

Waste management at Berenice Colliery will be guided by the hierarchy for waste management, which supports sustainable development through promoting sustainable and cleaner production, waste minimisation, reuse, recycling and waste treatment. Disposal is regarded as a last resort and practiced in an environmental sound and socially acceptable manner, and subject to the NEMWA and applicable regulations.

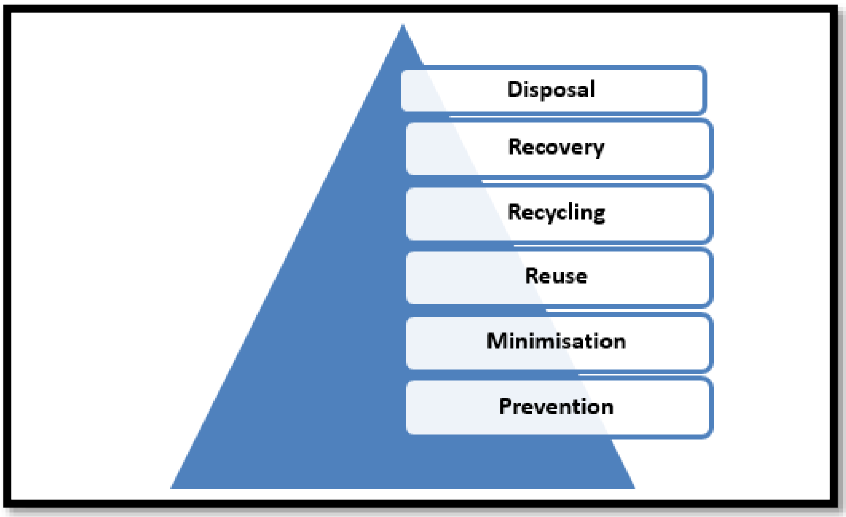


Figure 52: Waste Hierarchy

Hazardous wastes such as chemical containers, spent oil, diesel and grease will be stored in dedicated containers and collected at regular intervals by a registered sub-contractor and disposed of at a licensed disposal site. No hazardous waste streams will be disposed of on the mine premises, except authorised under the NEMWA, e.g. in the case of coal discard and slurry. Spillages will be cleaned up and disposed of in an appropriate manner.

Scrap material that has salvageable value will be collected, sorted and reused where possible. However, if quantities of this waste stream are significant, Universal Coal will work with local communities through the established structures in SLP programmes, to establish a local-based organisation to recover and sell or reuse the scrap metal.

General waste is collected in marked containers and removed from the premises by a registered contractor on a weekly basis. Safe disposal certificates will be retained for record-keeping, for all waste streams disposed off site.

1.13.5.1.2.1 Waste Management

The National Environmental Management Waste Act (NEMWA), 2008 (Act No. 59 of 2008) is the statutory regulator of all hazardous waste generated by any form of development. All waste (solid, liquid or gases) at Berenice Colliery will be managed in accordance with provisions and prescripts in the NEMWA and relevant Regulations. Berenice Colliery will develop waste management procedures as part of the ISO 14001 Environmental Management Systems (EMS) for the operation. These procedures will outline steps to be followed during handling, storage, transportation and disposal or reuse of all waste streams emanating from the activities, products and services of the mine. These procedures will also give an overview of different types of waste generated within the mine and will classify these accordingly. Furthermore, it will provide provision for reclamation and recycling of waste.

1.13.5.1.2.2 Waste Separation and Handling

General domestic waste will be disposed through a colour coded bin system at the proposed Berenice Colliery for different types of material. Domestic waste and scrap metals will be collected in rubbish bins. All domestic waste, commercial waste, industrial waste, and other waste classified as General Waste under the South African Minimum Requirements for Waste Disposal by Landfill (DWS, 1998) will be removed from the site by an appropriate licensed water removal contractor and disposed of at a licensed general waste facility.

1.13.5.1.2.3 Hazardous Waste

Hazardous waste such as grease, used oils, acids, fluorescent tubes, medical waste will be stored in containers at the mine. Care will be taken not to mix different hazardous chemicals within one container. Full, sealed hazardous waste containers will be removed from the site to the Temporary Hazardous Storage Facility within 48 hours and once sizeable loads are attained, they will be dispatched to an authorized hazardous waste disposal facility. There are no known authorised hazardous waste disposal sites in Limpopo Province.

Safe Disposal Certificates will be obtained and kept in record at the mine. Recyclable hazardous waste such as oils will be collected by an authorised contractor such as Oilkol and Kia-Ora Oils for recycling purposes.

Raw sewage and grey water from the mine offices, change house facility including ablution, and workshops will be handled by a package sewage treatment plant. The sewage system will have capacity for 511 people and thus has sufficient capacity to also handle the increased demand for the mine. Effluent from the sewage treatment plant will be drained to the pollution control dam for reuse at the processing plant facility and dust suppression. In addition, chemical mobile toilets will be provided for at the mine workings and the raw sewage will be collected by authorised contractors for disposal into a licensed waste water treatment works. Safe Disposal Certificates will be obtained and kept in record at Berenice Colliery.

1.13.5.1.2.4 Waste Management Facilities

- **Reclamation Yard**

This area will be used for separation of domestic or industrial waste to be converted into energy and reusable materials resulting in savings of natural resources. The area will be barricaded to ensure that there is no litter and upkeep at all times. Only recyclables non-hazardous waste will be brought to this area from the different sites on the mine for sorting purposes.

- **Hazardous Waste Storage Facility**

All hazardous waste generated on site will be temporarily stored at this facility. Hazardous waste will be removed by a contractor to a licensed off-site hazardous waste disposal facility.

- **Bio-remediation Facility**

Soils that have been contaminated with hydrocarbons (oils, grease, diesel, petrol) and are to be taken to the designated bio-remediation facility for temporary storage before being dispatched to an off-site authorized hazardous waste facility or treated *in-situ*. Should it be deemed necessary in future, a bioremediation facility may be built to treat these materials on site using the proposed methodology below. However, it is currently anticipated that only limited quantities will be generated as the fleet required running a mine of this magnitude is minimal and thus expecting little waste soil generation.

- **Bio-remediation procedure:**

The process of bio-remediation will be completed according to the following steps:

- STEP 1: For larger spills (covering a surface area of more than 1 m2), contain the spill using equipment provided in the spill kit/absorbent materials. For smaller spills (covering a surface area of less than 1 m2);
- STEP 2: Lift contaminated soils/ gravels and place them on a concreted surface/ plastic lining/drum where storm water run-off collected on this surface is contained;
- STEP 3: Apply selected bio-remediation product to the contaminated soils/ materials. The volume of product used will depend on the volume of the contamination in the soils and should be guided by the manufacturer's instructions;
- STEP 4: Wet the contaminated soils/ gravels. The volume of water used should be guided by the manufacturer's instructions;
- STEP 5: Till the soils/ gravels to mix in the bio-remediation products, ensure all contaminated material is wet and to aerate the contaminated material;
- STEP 6: Cover the contaminated soils/gravel with plastic to contain moisture and heat;

- STEP 7: Repeat steps 3 to 6 once a week until the soils appear and/or feel clean;
- STEP 8: Send a sample of the contaminated material for testing to determine the hydrocarbon contamination, in parts per million. As there is no guideline as to the allowable levels of hydrocarbons occurring in soils (due to the varying natural levels), a soil/ gravel sample from an un-polluted area of the site must be sent away for testing to determine the baseline condition which must be attained;
- STEP 9: If the soils/ gravels are still contaminated, repeat steps 3 to 7 until the hydrocarbon content of the soils/ gravels equals the baseline condition described above;
- STEP 10: Make use of the cleaned soils during concurrent rehabilitation.

1.13.5.1.2.5 Strategies and Performance Objectives/Goals

The purpose of this document is to clearly outline control strategies that link with agreed performance criteria for those potential environmental impacts as identified, be it public or worker related or specific to the broader surrounding environment. This is addressed through linkage to the following closure objectives:

- Leave rehabilitated ground to ensure blending with the surrounding environment;
- Minimisation of environmental damage or impacts to the extent that they are acceptable to stakeholders involved;
- Safeguarding of the safety and health of people and other organisms from hazards associated with operations;
- To leave the sensitive areas untouched and intact as they were prior to the mining activity;
- The elimination of the risk to the environment due to naturally occurring forces by ensuring physical and chemical stability of all structures;
- Mine closure is achieved efficiently, cost effectively, and in compliance with the relevant legal requirements;
- The social impacts resulting from mine closure are managed in such a way that establishment of a socially stable community in line with the principles of sustainable development is facilitated;
- Comprehensive monitoring takes place and that sound environmental standards have been followed;
- The Best Practical Guidelines that are available at the time of closure will be used;

1.13.5.1.2.6 Measures to achieve and sustain performance objectives

Universal Coal intends to operate in line with the principles of ISO14001 Environmental Management System during all mining phases. The mine will develop an Environmental Management System

(EMS) that will aim at ensuring that all possible impacts associated with activities or processes undertaken at the mine are identified and mitigation measures implemented to avoid or minimise environmental degradation and to promote a healthy and safe working environment.

The EMS will incorporate environmental procedures to manage aspects that will have the potential to pose a risk of environmental pollution or degradation. These procedures will include water and waste management procedures. Environmental procedures will be updated regularly as aspect change or when there is a need for operational and technological advancement. The EMS will provide the mine with reporting requirements and conditions of the issued licenses form an integral part of the system. This inadvertently ensure that mitigation measures for impacts associated with mining activities or processes on neighbouring communities and other sstakeholders are undertaken with due consideration of the relevant stakeholders interests. The ISO 14001 system is based on the Deming`s management approach (Plan-Do-Check-Act) (PDCA), and all systems, procedures and documents are reviewed regularly to ensure that objectives of the system are being met, and that the system is continually improved.

In order for Universal Coal to measure their compliance with the closure objectives they require to:

- Remove all infrastructure from the site in such a manner that no contamination of soils and water takes place;
- Slope the discard dump to such an angle (24 degrees in most cases) that the site drains naturally after rainfall event;
- Re-place all topsoil stripped from the site and vegetate slopes with naturally occurring indigenous vegetation;
- Continue with monitoring activities (surface and groundwater) during post-closure until the quality of the environment has returned to an acceptable state as agreed with appropriate stakeholders;
- Provide skills and training to the local community that will allow for sustainable job creation after mining has been completed.

1.13.5.1.3 Waste Management Plan

Table 29: **Berenice Colliery Waste Management Plan**

PURPOSE AND SCOPE
An essential part of an Environmental Management Plan is the development and implementation of a Waste Management Plan to identify, classify, store and dispose of hazardous, non-hazardous and other wastes generated on site.
RESPONSIBILITY

It is the responsibility of management, employees, contractors and visitors to Berenice Mine, to ensure that waste is kept to a minimum and the environment is not polluted or contaminated. Attention will be given to the requirements as laid down in the National Environment Management Act (Act 107 of 1998),	All employees and contractors
DEFINITION/REFERENCE	
Waste is as specified in Section 20, ECA 1998 (Act No 73 of 1989). Waste will include waste that: minimum requirements for Waste Disposal by Landfill is discarded by any person; or is accumulated and stored by any person with the purpose of eventually discarding it with or without prior treatment connected with the discarding thereof; or is stored by any person with the purpose of recycling, re-using or extracting a usable product from such matter. <u>Waste</u> means any matter, whether gaseous, liquid or solid or any combination thereof, which is from time to time designated by the Minister by notice in the Gazette as an undesirable or superfluous by-product, omission residue or remainder of any processor activity.	
Non Hazardous waste which is not reused or recycled will only be disposed of at a designated and permitted site (NEMA, 1998 (Act 107 of 1998).	
PROCEDURE	
General	RESPONSIBILITY
All employees and contractors at/to UCDII Berenice Mine must: Adhere to the relevant safety and health codes of practices in the work place, in respect to waste handling and disposal. Take reasonable care to protect his/her health and safety and the health and safety of his/her fellow employees and also use and take proper care of protective clothing and other health and safety equipment that is provided for the protection against the identified risks.	All
UCDII Berenice Mine has an obligation to adhere to all environmental legislation and has implemented a waste management system to manage all waste streams to reduce the environmental impact thereof.	All
Safe Disposal Certificates forms part of the management of hazardous waste streams to ensure that the hazardous waste has been disposed of correctly.	Appointed Waste Contractor
An emergency procedure must form part of the action plan on spillages of the hazardous waste streams. Such incidents must be reported and dealt with immediately.	SHE Manager
The movement of hazardous waste must be traceable at all times and documentation is to be kept for a minimum period of 3 (three) years.	SHE Manager
Formal audits on all landfill sites must be conducted on a 6 (six) monthly basis.	Environmental Manager

An effective system to be implemented and kept in place to measure quantities of waste generated and disposed of.	SHE Manager
Waste Management Approach	**Responsibility**
To ensure the effectiveness of waste management, it is essential that waste is separated at source according to UCDII Berenice Mine waste stream classification Hazardous waste - BLACK General waste - GREEN Scrap Metal - WHITE Toxins - BLUE Garden refuse - YELLOW Medical waste – RED (if any)	Appointed Waste Contractor
After separation, waste is to be stored in designated areas where pollution from waste is minimised.	All
To minimise disposal, waste products are to be re-used or recycled as far as reasonably practical.	All
A contractor will removes all waste from site for safe disposal. All waste collected from the Mine must have gate passes from Security before being removed from the Mine. The gate pass will indicate the type of waste collected, registration number of a vehicle and a driver's name. Gate pass must have the Security personnel and Environmental officer's / SHE Manager's signature.	Appointed Waste Contractor SHE Manager
Documentation confirming the safe disposal of all waste and supporting reports will be submitted to the Environmental Manager for record keeping.	SHE Manager
Hazardous Waste	
Liquids Definition: The following Waste matter is included but is not limited to: Used machine/motor oils Degreasers/Solvents Pesticides/herbicides Paint, Old/redundant paint, left over paint, Paint tins Acids / expired chemicals Expired medicines	All employees/contractors
Used Oil	**RESPONSIBILITY**
This includes but is not limited to engine oil, transmission oil, hydraulic oil and transformer oil.	

All used oil generated at UCDII Berenice Mine, will be pumped into storage containers/drums, at all times taking into account the protection of the environment and the risk of pollution.	All employees/contractors
Under no circumstances may any oil be premeditatedly released directly onto the ground or to negatively impact the environment.	All employees/contractors
When transporting containers, care will be exercised at all times to prevent pollution or contamination of the environment.	All employees/contractors Appointed Waste Contractor
All used oil (in containers) should be stored in a designated, bunded storage area for safe collection and subsequent disposal by an authorized, permitted contractor, at an authorized, permitted recycling/disposal site.	Appointed Waste Contractor SHE Manager
The design, construction and operation of all equipment and facilities, required for the effective collection, containment, control and disposal of used oils will at all times comply with legislation to prevent pollution and/or contamination of the environment.	All contractors SHE Manager
Suitable spill kits and absorbent materials will be available at all times for the containment and clearing of any spills.	All employees/contractors
Attention should be given to: The risk of fire Contamination/Pollution Use of correct Personal Protective Equipment Safety of personnel	All employees/contractors
In the event of a spillage the emergency response procedure will be followed to ensure prompt action.	All employees/contractors
Degreasers and Solvents	Responsibility
This includes all current and obsolete solvents or degreasers that may be in use.	
All redundant or obsolete degreasers and/or solvents will be placed in sealed drums and sent to an allocated waste site for disposal.	Appointed Waste Contractor SHE Manager All employees/contractors
No redundant or obsolete degreasers and/or solvents will be discarded or washed into drains, sewerage or storm water systems.	All employees/contractors

All redundant/degreasers/solvents must be stored separately to prevent: a) Chemical reaction b) Toxic fumes/gases c) Contamination/Pollution of the environment.	All employees/contractors
Herbicides, Pesticides and Fertilisers	Responsibility
This includes all weed killers, insect sprays and their empty containers.	
All redundant/expired weed killers and insect sprays will be placed in separate marked, sealed containers and sent to the allocated waste site.	Gardening contractor
No redundant/expired weed killers and insect sprays will be discarded into any drain, sewage system, in any field or pit.	Gardening contractor
All redundant/expired weed killers and insect sprays will be stored separately in demarcated areas.	Gardening contractor
Only permitted, authorized waste removal contractors will be allowed to remove redundant/expired, herbicides/pesticides from the waste separation site to an authorized, permitted hazardous waste disposal site.	Waste contractor Environmental Manager
Storage facilities will be designed and constructed so as to prevent pollution to the environment.	All employees/contractors
Containers (except aerosol cans) which contained pesticides/herbicides will be punctured, flattened and properly disposed of by an authorized and permitted waste contractor at an approved hazardous waste disposal site.	Waste contractor
Attention will be given to Safe Handling Risk of fire or explosion Correct use of Personal Protective Equipment	
Paint and Cleaning liquids	Responsibility
This includes left over paint that cannot be used, redundant and old paint, cleaning liquids, such as turpentine or any other brush cleaners, rags and empty paint tins.	All employees/contractors
Left over, old paint, liquid cleaners, cleaning rags or empty paint tins will be placed in hazardous waste containers.	All employees/contractors
These items may not be discarded into a pit, buried or disposed of in any manner that could cause pollution or contamination to the environment.	All employees/contractors
No empty paint/cleaning liquid containers, cleaning materials etc. are to be left in the field but must be returned to the workshops for correct disposal, to the waste separation site.	All employees/contractors

No paint or cleaning liquids will be discarded onto the ground or disposed of into any sewer, drain or storm water system.	All employees/contractors
Washing and cleaning of painting equipment will be done in such a manner that the discharge water will go through a dirty water system	All employees/contractors
All left over, redundant, old paint and cleaning materials will only be disposed of by a permitted and authorized waste disposal contractor to a permitted hazardous waste disposal site.	All employees/contractors Waste contractor
The design and construction of all facilities required for the collection, containment and disposal of paint and liquid cleaners must always be kept separate.	All employees/contractors
All storage facilities will always comply and conform to the legislation to prevent pollution or contamination of the environment.	All employees/contractors
Attention will be given to: The risk of fire. Required ventilation. Use of applicable Personal Protective Equipment	All employees/contractors
Acids	Responsibility
This includes battery acid and other corrosive liquids.	
All redundant/old acids will be stored in separate containers away from other chemicals and hazardous substances.	All employees/contractors
All containers should be marked “corrosive and poisonous”	All employees/contractors
No old or redundant acid will be disposed of into any drain, sewer or storm water system or disposed of into the domestic waste stream.	All employees/contractors
Only an authorized and permitted waste removal contractor will be allowed to remove these to a hazardous waste disposal site	Waste contractor
A recognized neutralizing agent such as agricultural lime will be kept available to neutralize any spills that might occur.	SHE Manager
Safety shower facilities should be provided at storage/handling sites.	SHE Manager
Asbestos	Responsibility
This includes: Brake pads, asbestos off cuts and any other asbestos product or products containing asbestos.	All employees/contractors
No asbestos material shall be disposed of into scrap metal or domestic waste containers.	All employees/contractors

No asbestos materials shall be dumped into a pit.	All employees/contractors
All asbestos waste will be collected and contained in such a manner that it shall not pose a health hazard.	All employees/contractors
All asbestos waste will be disposed of by an authorized and permitted waste disposal contractor at a permitted disposal site via the Waste Separation Site.	Waste Contractor All employees/contractors
Batteries	**Responsibility**
This includes all batteries.	
Designated storage facilities for scrap batteries will be designed and constructed to prevent pollution to the environment in case of accidental leakage or spillage in the case of automotive batteries.	All employees/contractors
Scrap batteries will be stored and kept separate from other chemicals to prevent a possible chemical reaction, chemical fire, toxic fumes and burns. All health and safety aspects will therefore be taken into consideration during the handling/storing of scrap batteries. Personal Protective Equipment to be utilized and worn.	All employees/contractors
Scrap batteries may not be discarded at a landfill site, or into a pit.	All employees/contractors
All scrap battery removal contractors will conform to the applicable legislation to prevent pollution or contamination of the environment.	Waste Contractor
Contaminated Soil	**Responsibility**
This includes soil contaminated by oil, diesel, petrol, chemicals, coal duff and any other hazardous substances that could pose a health hazard or pollute the environment.	
Only an authorized and permitted hazardous waste removal contractor shall be allowed to remove this type of hazardous waste to a hazardous waste disposal site, should it be so decided	All employees/contractors Waste contractors
Fluorescent Tubes / Lamps	**Responsibility**
This includes fluorescent tubes, sodium vapour lamps and mercury vapour lamps.	
All used fluorescent tubes/lamps will be crushed and placed in sealed drums.	All employees/contractors
All drums will be sent to the Waste disposal Site for disposal.	Waste contractor

Only an authorized and permitted waste removal contractor may remove these containers to a licensed waste disposal site.	Waste contractor
Emergency treatment will be given in the case of lacerations, etc.	Occupational Health Practitioner
Oily/Greasy rags	Responsibility
This includes all used rags containing grease and oil, or any other hazardous substance.	
All contaminated rags will be discarded in hazardous waste bins.	All employees/contractors
No contaminated rags may be washed, buried or burned.	All employees/contractors
An authorized and permitted waste contractor will remove the greasy/oily rags at an authorized and permitted waste disposal site for disposal.	All employees/contractors Waste contractors
All used Aerosol cans	Responsibility
This includes spray paint cans, furniture polish, solvents, quick start and other products contained in aerosol containers.	
No aerosol cans may be dumped in scrap metal containers.	All employees/contractors
No aerosol cans may be incinerated or punctured.	All employees/contractors
No aerosol cans will be left lying in the field or dumped in the workings.	All employees/contractors
No empty aerosol cans may be discarded except by an authorized and permitted waste disposal contractor to an authorized and permitted disposal site. It's hazardous and must be disposed of in a hazardous bin to be collected by waste disposal contractor.	Waste Contractor
Attention will be given to risk of explosion.	All employees/contractors
Empty Drums	Responsibility
All empty containers i.e. oil drums, electric cleaner drums, solvent drums and other 5, 25 or 210 litre drums, regardless of what the contents were.	
No Empty drums will: Be washed out in the working place; Be left in the field, discarded into the workings; Be discarded on to any dump;	All employees/contractors

Be stored or discarded in any manner that will cause pollution to the environment; Be used to contain water or any other substance, other than the original substance.	
Containers will be removed by an authorized and permitted waste removal contractor to an authorized and permitted waste disposal site.	All employees/contractors Waste Contractor
No site manager will permit any empty container to be purchased or removed from the mine property by any employee or contractor, except the waste collection company.	Management
Used machine/vehicle filters	Responsibility
This includes oil, air and fuel filters.	
No filters of any description will be disposed: Into any domestic refuse bins Into any scrap metal containers Into the workings Into a waste disposal/landfill site.	All employees/contractors
Care will be taken to eliminate spills from filters, to prevent pollution or contamination of the environment.	All employees/contractors
Used filters will be transported to the workshops for disposal into hazardous waste containers.	All employees/contractors
Hazardous waste will be disposed of by an authorized and permitted contractor, at an authorized and permitted waste disposal site.	Waste Contractor
Contaminated PPE	Responsibility
This includes all used PPE.	
Used PPE will be disposed of into hazardous waste containers.	All employees/contractors
No used PPE will be discarded: Into any domestic refuse bins; Into any scrap metal containers; Into the workings; or Onto a non-hazardous waste disposal/ landfill site.	All employees/contractors
All used PPE will be discarded by an authorized and permitted waste disposal contractor, at an authorized and permitted waste disposal site.	Waste Contractor
Scrap rubber hydraulic oil pipes	
This includes all scrap and used hydraulic oil pipes.	Waste Contractor

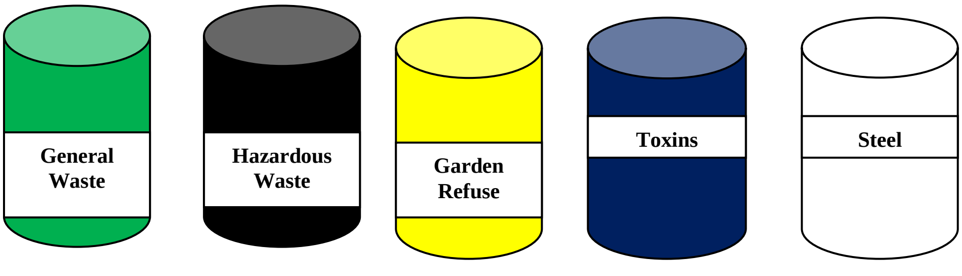
All scrap hydraulic oil pipes shall be disposed of into designated Hazardous Waste Bins, for removal by an authorised, permitted waste disposal contractor. This waste stream shall not be discarded into scrap metal bins, buried or burned. Care shall be taken when disposing of hydraulic oil pipes that any oil left in the pipes is run out into a container before disposal. Care shall be taken not to contaminate the soil when running and tapping out the hydraulic oil from scrap hydraulic oil pipes. Any oil spills must be cleaned up immediately using the available absorbent materials. Designated holding facilities for scrap tyres, rubber bands, conveyor belt and rubber products shall be designed and constructed so as not to contaminate/pollute the environment. All safety, health and environmental risk requirements shall be considered and adhered to, to prevent: (a) Fires (b) Burns (c) Damage to company property. (d) Inhalation of noxious and toxic fumes and gases. (e) Air pollution as a result of the toxic smoke generated when burning (f) Ground pollution	
Electronic Waste (E-Waste)	
Electronic waste include computers (central processing units (CPU), monitors, printers and miscellaneous peripheral devices such as the keyboard, mouse, scanner, CD writers, loudspeakers, web cameras), cell phones, typical electronic household appliances, medical electronic and electrical equipment. No used E-Waste of shall be disposed of into any domestic and or hazardous refuse bins or scrap metal containers. E-Waste shall be disposed of into the enclosed and lockable disposal bin allocated for E-Waste. All E-Waste shall only be recycled by an authorized contractor approved and appointed by Berenice	All employees/contractors Waste contractor
Sewage Sludge	
This includes sludge from the Sewage Waste Water Treatment Plant. This also includes the dried sewage sludge together with the waste from the manual operated inlet screen.	Waste contractor

The dried sludge should be taken off the sludge drying beds and then disposed off in a Hazardous container for removal by the relevant waste contractor.	
Non Hazardous Waste	Responsibility
Surface Solids Scrap Metal Domestic Waste Recyclable Waste Garden refuse Un-used, damaged coal sample bags (Plastic) Building Rubble.	
Scrap Metal	Responsibility
Scrap metal will be sent to the scrap yard/ workshop area where it will be stored for not more than one month and removed by the responsible contractors	All Contractors
Plastic Containers	Responsibility
All empty plastic containers will be collected at the workplace and sent to the waste separation site on a continual basis for disposal.	Contractor
No empty plastic containers will be: Discarded into any scrap metal containers. Buried Burned Destroyed in any manner Discarded into the pit	All employees/contractors
No empty plastic containers will be sold or given to any employees or any other parties except authorized / permitted waste disposal contractors or an original supplier.	All employees/contractors Waste contractor
Domestic Waste	Responsibility
This includes cans, plastic, bottles and kitchen refuse.	
All domestic waste will be removed by an authorized and permitted contractor, to an authorized and permitted waste disposal site.	Waste Contractor
Garden Refuge	Responsibility
Include all garden refuse	
A waste disposal contractor will dispose all garden waste, which is not re-used, at an authorized and permitted landfill site.	Waste Contractor
Scrap Tyres	Responsibility

All scrap tyres will: Be stored at a designated site allocated for scrap tyres. Not be discarded onto any refuse dump or landfill site. Not be discarded into scrap metal bins. Not be burned. Not be left behind or dumped in the field.	All employees/contractors
An authorized removal contractor will dispose of all surplus scrap tyres.	Waste Contractor
Building rubble	Responsibility
This includes bricks, cement, sand & stone, but does not include other types of waste as described above.	
No building rubble may be dumped at the scrap yard.	All employees/contractors
All building rubble will be discarded by an authorized and permitted waste disposal contractor, at an authorized and permitted waste disposal site.	Waste Contractor
Scrap electrical cable	Responsibility
This includes all types of electrical cable. No scrap electrical cable may be left after a task has been completed. All scrap electrical cable shall be held in a designated disposal facility for possible re-use. All health, safety and risk requirements shall be considered and adhered to by all employees and contractors at all times. Attention shall be given to his/her risk of fire, correct/safe storage and the use of Personal Protective Equipment.	All employees/contractors Waste contractor
WASTE DISPOSAL SITES (LANDFILL SITES)	
There will be no waste disposal / landfill sites on	All employees/contractors
All waste material or substances; Hazardous or non-Hazardous will be removed by an authorized and permitted waste disposal contractor to an authorized and permitted disposal site via the waste separation site.	Waste Contractor
WASTE REMOVAL FROM WASTE SEPARATION SITE	
Waste will only be removed by an authorized and permitted contractor from the waste separation site.	Waste Contractor
A permitted contractor will empty/remove all Green Skips on a 48-hour call for service.	Waste Contractor

All hazardous bins, fluorescent tube containers and toxic bins at the waste separation site will be emptied/removed on a 48-hour call for service by an authorized and permitted contractor.	Waste Contractor
The contractor will be advised by telephone to empty the full skips.	All employees/contractors
TRAINING	Responsibility
The employees should be made aware of the potential hazards associated with waste disposal and removal. Regular, documented, internal training sessions / checks on the employees involved will ensure an understanding of what is needed to comply with this guideline.	
All employees/contractors will be involved in the management of waste. Supervisors will need to be well aware on what are required in order to comply to waste management legislation. Employees will need to be well informed by their superiors on what should to be done concerning waste, and how it must be done.	Environmental Manager Waste Contractor
RECORDS	Responsibility
Waste disposal contract Waste disposal certificates / Safe disposal records	Environmental Manager

WASTE STREAMS



General Waste	Hazardous Waste	Garden refuse	Toxins	Steel
Cans/ tins	Oil/grease/lubricants contaminated	Garden refuse only	Herbicides	Steel Scrap metals steel
Office waste	Contaminated PPEs		Pesticides	
Bottles	Degreasers solvents		Fluorescent tubes	
Plastic containers	Oil rags		Asbestos	
Papers	Contaminated absorbents		Paint tins	
			Acid contaminated	
			Batteries	
			Aerosol tins	

PART B

2 ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

2.1 Draft environmental management programme.

a) **Details of the EAP**

(Confirm that the requirement for the provision of the details and expertise of the EAP are already included in PART A, section 1(a) herein as required).

The details of the EAP were included in Section A (1) in Part A of this report and is therefore not repeated in this section.

2.2 Description of the Aspects of the Activity

(Confirm that the requirement to describe the aspects of the activity that are covered by the draft environmental management programme is already included in PART A, section (1) (h) herein as required).

The aspects of the activity are described in Section D in Part A of this report, and are therefore not repeated here.

2.3 Composite Map

(Provide a map **(Attached as an Appendix)** at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers)

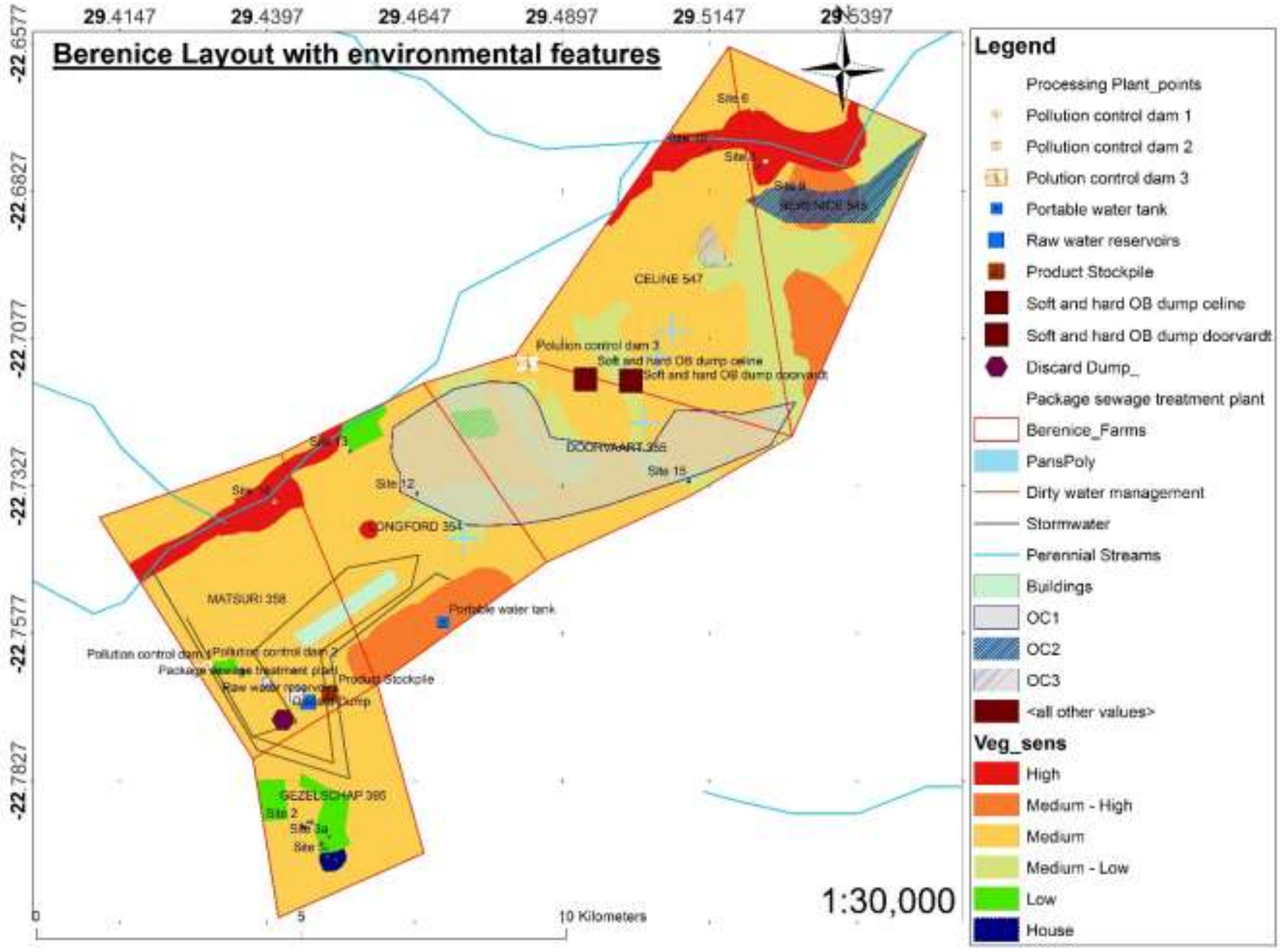


Table 30: **Berenice Colliery Infrastructure Coordinates**

Infrastructure	Latitude	Longitude	Farm
Raw water reservoirs	-22.769342°	29.446592°	Matsuri 358 MS
Potable water tank (treated)	-22.755744°	29.469556°	Matsuri 358 M
Package sewage treatment plant	-22.765978°	29.439500°	Matsuri 358 MS
Pollution control dam 1-Full Capacity: 45 000 m3	-22.763311°	29.428256°	Matsuri 358 MS
Pollution control dam 2 -Full Capacity: 45 000 m3	-22.762931°	29.429650°	Matsuri 358 MS
Pollution control dam 3 - Full Capacity: 140 000 m3	-22.711914°	29.483939°	Doorvaart 355 MS
Discard dump Facility life span: 33 years	-22.772353°	29.442347°	Matsuri 358
Soft and hard overburden dump	-22.714664°	29.493700°	Celine 547 MS
Soft and hard overburden dump	-22.714856°	29.501431°	Doorvaart 355 MS
Product stockpile (coal)	-22.768017°	29.450294°	Matsuri 358 MS
Processing Plant	-22.768153°	29.444661°	Matsuri 358 MS

2.4 Description of Impact management objectives including management statements

The EIR provides a detailed assessment of the impacts as well as the Management objectives. The impact management outcomes for the site have been described in 2.7: Impact Management Actions section in the EMPR, and included the following aspects:

- Prevention.
- Limitation / control.
- Remedying.
- Enhancement.

2.4.1 Determination of closure objectives.

(Ensure that the closure objectives are informed by the type of environment described in 2.4 herein)

The objectives for mine closure for the Berenice Project are all included in the impact tables and described as mitigation measures. The mitigation measures should all be implemented in order to limit the impacts the mining and mining-related activities may have on the environment, as well as to restore the environment as far as practicably possible to pre-mining conditions. Mitigation measures and rehabilitation work should be conducted throughout the LOM. There are four key objectives that should be considered in terms of mine Closure; these are:

- To protect public health and safety.
- To alleviate or eliminate environmental damage.
- To achieve a productive use of the land, or a return to its original condition or an acceptable alternative.
- To the extent achievable, provide for sustainability of social and economic benefits resulting from mine development and operations.

The main objects in terms of mine Closure are:

- To protect health and safety of any person and / or animal that enters the Berenice mine boundary area.
- To rehabilitate, alleviate and eliminate environmental damage as far as practically possible.
- To rehabilitate land to a level that would (at least) support wildlife or grazing land use.
- To generate sustainable projects, that will continue to have benefits and supply jobs to the local community, but also provide a service as well as (possibly) fund itself.

2.4.1.1 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.

In addition to mitigation measure to manage impact on the project site, the monitoring program and remediation measures should be complied with. A detailed monitoring program is represented in **Table 38: Impacts requiring monitoring programmes and reporting frequency**.
The monitoring program should focus on the following aspects but not limited to:

- Groundwater;
- Flora and Fauna;
- Blasting and ground vibrations;
- Noise and Air quality; and
- Surface movement and subsidence

The following aspects should be monitored regularly:

- Pollution control dams, clean and dirty water separation structures;
- Oil and water Spillages;
- Clean Water holding facilities;
- Fugitive Dust and sedimentation;
- Discard dump and waste management areas;
- Stockpiles.

In addition to monitoring the emergency response and remediation procedure has developed has to be implemented. The purpose of this procedure is to anticipate the occurrence of environmental crises, which may occur due to unforeseen circumstances. Since these events cannot be accurately predicted or prevented, a procedure has been prepared that must be followed should such an incident occur, which will assist in the mitigation, remediation and conservation of the environment and contribute to the safety of workers and the surrounding communities.

2.4.1.2 Potential risk of Acid Mine Drainage.

(Indicate whether or not the mining can result in acid mine drainage).

Acid-Base Accounting (ABA) tests were performed by Naledzi Waterworks (Pty) Ltd for the studies (Berenice groundwater, 2017) on the three boreholes on the farms Matsuri and Berenice. Six samples were analyzed and acid generation capacity was determined by ABA. . All samples were sent to WaterLab (Pty) Ltd in Pretoria, South Africa for analysis. The laboratory program included the following test work:

- X-ray Diffraction (XRD);
- X-ray Florescence (XRF);
- Acid-Base Accounting (ABA);
- Net- Acid Generation (NAG); and
- Synthetic Precipitation Leaching Procedure (SPLP)

Paste pH, also included in the ABA procedure, is a rapid measure of the current geochemical condition of the sample due to the presence of weathering products on the surfaces, and ion exchange (Usher et al., 2003). Statistically, samples with a paste pH smaller than 4 are considered potentially acid forming and contain significant acidic sulphate salts (up to 30.1 kg H_2SO4/t equivalent) that will immediately produce acid upon exposure to water. Samples with a paste pH of 4 to 5 are considered potentially acid forming as well but have a lower stored acidic salt content (up to 9.0 kg H_2SO_4/t equivalent) (Weber et al, 2006).

2.4.1.3 Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage.

To remedy acid mine drainage that may occur at the Berenice Project site, a pollution control dam (PCD) will be constructed to contain mine-affected water.

2.4.1.3.1 Pollution control dam

The purpose of the proposed PCD, is to contain contaminated water produced by the mining operations. The proposed PCDs will be constructed in order to serve as storage facilities for mine affected water and will be operational for the duration of the operational life of the site, where after it will be rehabilitated.

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

Whilst Residual Impacts have not been included in detail in the groundwater report it is expected that during the application for mine decommissioning closure the following will be undertaken:

- ➢ Use of monitoring data throughout the life of mine on mine water, groundwater, surface water, subsidence and other geotechnical impacts from the open pit activities be reviewed;
- ➢ Water quality assessments to supplement the residual impact assessment after closure (monitoring timeframes will be stipulated in the WULA and closure plan) and

- Measure to manage residual impacts post mining will need to be designed and implemented including a monitoring program to assess the effectiveness of such measures.

It is proposed that the water treatment plant be used to remedy the residual impacts to groundwater as a result of the development of a pollution plume. Water will need to be pumped from the open pit area areas for treatment, further minimising the development of a pollution plume.

The contaminant plumes that could be generated from discard dump and waste rock facilities could be captured by the OC1 mine dewatering cone of depression the drawdown cone in the final 8 years of mining will be deepest in OC3 (58 m). The predicted drawdown cone extends to about 2km in maximum. Groundwater levels in impacted boreholes are predicted to recover to pre-mining levels with 100 years after closure. Pre-mining groundwater levels are in the proposed pit areas are below the pits decant elevation.

2.4.1.4.1 Groundwater residual impacts and management actions

2.4.1.5 Volumes and rate of water use required for the mining, trenching or bulk sampling operation.

The mine make-up water requirement would be 5 000m^3/d (5Ml/d). The water balance is detailed in the table below:

Table 31: Berenice Colliery Preliminary Water Balance

No.	Facility Name	Water In (m^3/d)		Water Out (m^3/d)		Balance (m^3/d)	Comment
		Water Circuit/stream	Quantity (m^3/d)	Water Circuit/stream	Quantity (m^3/d)	Balance (m^3/d)	
1	**Mining Component**	Groundwater influx (OC1 pit)	2460.000	Pit dewatering to PCD2	1845.000		
		Groundwater influx (OC2 pit)	1270.000	Evaporation	615.000		OC2 dewatering from year 26
		Groundwater influx (OC3 pit)	1190.000				OC3 dewatering from year 20
		Total	**2460.000**		**2460.000**	**0.000**	
2	**Coal Processing Plant**	Raw feed (ROM) moisture		Waste slurry to discard	2264.102		
		Make-up water from PCD 1	985.145	Product coal moisture	900.820		
		Make-up water from PCD 2	1754.380	Evaporation	550.000		
		Raw water reservoir	1380.700	Dust suppression	60.000		
		Total	**4120.225**		**3774.922**	**345.303**	
3	**Discard Facility**	Coal slurry from processing plant	2264.102	Return water to PCD1	1218.846		
		Rainfall	25.005	Evaporation	604.943		
				Discard phreatic water	351.500		

No.	Facility Name	Water In (m³/d)		Water Out (m³/d)		Balance (m³/d)	Comment
		Water Circuit/stream	Quantity (m³/d)	Water Circuit/stream	Quantity (m³/d)	Balance (m³/d)	
				Seepage	0.000		
		Total	**2289.107**		**2175.289**	**113.818**	
4	**Pollution Control Dam (PCD) 1**	Treated sewage effluent	64.000	Processing plant make-up water	985.145		
		Return water from discard facility	1218.846	Dust suppression	160.000		
		PCD1 catchment area	86.207	Evaporation	108.185		
				Dust suppression			
				Seepage	0.000		
		Total	**1369.053**		**1253.330**	**115.723**	
5	**Pollution Control Dam (PCD) 2**	Inflow from pit workings	1845.000	Processing plant make-up water	1754.380		
		Rainfall/runoff to PCD	177.736	Evaporation	208.356		
				Seepage	0.000		
				Dust suppression	60.000		
		Total	**2022.736**		**2022.736**	**(0.000)**	

No.	Facility Name	Water In (m³/d)		Water Out (m³/d)		Balance (m³/d)	Comment
		Water Circuit/stream	Quantity (m³/d)	Water Circuit/stream	Quantity (m³/d)	Balance (m³/d)	
6	**Sewage Package Plant**	Sewage and grey water from mine office and change house	64.000	Treated sewage effluent to PCD1	64.000		
		Total	**64.000**		**64.000**	**-**	
7	**Raw Water Reservoir**	Groundwater abstraction (Boreholes)	1623.000	Potable water tank (domestic water use)	80.000		
				Processing plant	1380.700		
				Transmission losses	162.300		
		Total	**1623.000**		**1623.000**	**-**	
	Total Water Balance		**13 948.121**		**13 373.277**	**574.844**	

2.4.1.6 Has a water use licence has been applied for?

A water use license application process has been initiated. A pre-application meeting and site visit has been conducted with Department of Water and Sanitation. An IWWMP has been compiled for the integrated water Use license Application and has been made privy to the public participation process.

2.5 Impacts to be mitigated in their respective phases

The impacts to be mitigated have been identified in the EIR, and are described in **Table 24: Assessment of each identified potentially significant impact and risk**. Identified impacts to be mitigated have been included in Heading 2.6 below thus not repeated in this section**.**

2.6 Impact Management Outcomes

(A description of impact management outcomes, identifying the standard of impact management required for the aspects contemplated in paragraph;

The impact management outcomes have been described in detail in Section 2.7 Below.

2.7 Impact Management Actions

(A description of impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (c) and (d) will be achieved).

Table 32: Impact Management objectives, outcomes and standards to be achieved.

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Construction Phase	Air pollution from blasting, wind erosions and vehicle movement	Vegetation	Increase in dust generation settling on adjacent vegetation. Continued increased levels of dust in the air has an effect on faunal species, particularly birds, but also on fauna species feeding on the vegetation.	Control through a dust suppression programme. This program should include (but not be limited to) the following measures: a) Shield stockpiles from predominant wind directions; b) vegetate areas and ensure continual capping and vegetation of the sides of mine residue facilities; c) regular spraying; d) continuously remove coal form site and reduce long-term stockpiling; e) clear coal spillages from site	Construction phase	Minimisation of air pollution, particularly windborne particles.	Legal Compliance with : Compliance with National Dust Control Regulations (GNR 827). National Environmental Management: Biodiversity Act 10 of 2004
Construction phase	Alien Invasive plant species on cleared areas	Vegetation	Alien invasive plant species will encroach into disturbed areas. It is expected that extensive area will be disturbed, natural vegetation totally destroyed.	Control through Management and Monitoring and implementation of an alien invasive management plan. - Remediation Alien species removal programme must be developed and implemented	Construction phase	Removal of alien invasive species including managing the distribution of weeds and invasive species avoided.	Compliance with the National Environmental Management: Biodiversity Act 10 of 2004 and the Alien and Invasive Species Lists, 2014.

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Construction Phase	Change in land use (site clearing)	Loss of avian habitats.	Avian habitats, including mopane woodland, scrub and open areas will be destroyed by the proposed mine. The area required for mining and infrastructure is 5.5ha. This will represent a significant loss of habitat in a region of high conservation significance, and will affect a number of red-listed species, including several raptors.	Control through legislative compliance: Tree removal permit. Prevention. A specialist must be engaged to check the entire property for active nests of red-listed species, such as White-back Vulture, Martial Eagle and Tawny Eagle. Any such nests will need a buffer zone of 500 m radius around them to ensure that breeding birds are not disturbed	Construction phase	No unauthorised vegetation clearing. Areas cleared for mining operations must be minimised.	Legal Compliance National Environmental Management: Biodiversity Act (No 10 of 2004).
Construction Phase	Change in land use (site clearing)	mammal and herpetofauna	Total or near-total irreplaceable loss of mammal and herpetofauna species is anticipated	Control and Manage: Implement buffer zones The outer edge of the open cast, including roads and other infrastructure, should be at least 100 m from the outer edge of the Brak River and its flood plain. Monitoring of the buffer zones should form part of the EM roles for internal audits.	Construction phase	The vegetation within the riparian areas of the Brak River must remain undisturbed and natural	Legal Compliance National Environmental Management: Biodiversity Act (No 10 of 2004). Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Construction Phase	Change in land use (site clearing)	mammal and herpetofauna Habitat	Site clearing and removal of indigenous vegetation will lead to a loss of faunal habitat. This has widespread impact on ecological function and health of sensitive ecosystems. Displacement of extraordinary high vertebrate species richness	Control and management Mitigating the impacts is impossible, although higher authorities may enforce statutory preconditions for five Red Listed trees and waterways, such as buffer zones.	Construction phase	No unauthorised vegetation clearing. Areas cleared for mining operations must be minimised.	Legal Compliance National Environmental Management: Biodiversity Act (No 10 of 2004).
Construction Phase	Change in land use (open cast mining areas)	mammal and herpetofauna Habitat	Opencast mining is responsible for continued loss of faunal habitat. This has widespread impact on ecological function and health of sensitive ecosystems. Displacement of extraordinary high vertebrate species richness	Mitigating the impacts is impossible, even though minimisation of vegetation removal. Although higher authorities may enforce statutory preconditions for five Red Listed trees and waterways, such as buffer zones. The outer edge of the open cast, including roads and other. Control all waste dumping and avoid pollution of natural vegetation, especially the Brak River and flood plain area infrastructure, should be at least 100 m from the outer edge of the Brak River and its flood plain. The vegetation within this 100 m must remain undisturbed and natural.	Construction phase	No unauthorised vegetation clearing. Areas cleared for mining operations must be minimised.	Legal Compliance National Environmental Management: Biodiversity Act (No 10 of 2004).National Environmental Management: Waste Act (2008) (Act 59 of 2008) and Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Construction Phase	Civil construction	Baseline Noise Levels	Increased noise levels along the boundary of the proposed Site	Construction activities will take place during between 07:00 and 15:00 on weekdays only to limit the impact on adjacent landowners. Construction vehicles and machinery will be regularly maintained to minimise noise generation.	Construction phase	Minimization through noise limitation and control	Noise Induced Hearing Loss Regulations, Occupational Health and Safety Act, 1993); (Act No. 85 of 1993 and the Occupational Hygiene Regulations, MHSAct (29 of 1996), SABS 083, SANS 10083 National Environmental Management Act, Air Quality Act (NEMAQA) (Act No. 39 of 2004)
Construction Phase	Clearing of vegetation and earthworks	Visual	Visual impacts are expected to result from the stripping of vegetation and earthworks associated with the pre-construction and construction phases of the proposed Berenice coal mine. The stripping of vegetation will result in the bare soil being exposed, creating a visual scar within the area, and a contrasting colours in the landscape	Control and Minimise Site clearances and Erosion control measures must be put in place if vegetation is to be cleared.	Construction phase	Reduced visual impacts on the site, adjacent landowners and residents	Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (DEADP, Provincial Government of the Western Cape, 2005).

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Construction Phase	Construction for site establishment and mining infrastructure	Pan	Negative impact on flora and fauna from human interference on site	Minimising and monitoring Mining activities should be within the mentioned buffer away from the wetlands. Implement stormwater management measures contained in this DEIAR/EMP.	Construction phase	The pan on Longford will be destroyed by the mining activities and a water use licence has been applied for.	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.
Construction Phase	Construction of buildings and/or plant	Baseline Noise Levels	Increased noise levels along the boundary of the proposed Site. Increased noise levels at open pit and plants	Control and Minimisation Construction activities will take place during between 07:00 and 15:00 on weekdays only to limit the impact on adjacent landowners. Construction vehicles and machinery will be regularly maintained to minimise noise generation.	Construction phase	Minimization through noise limitation and control	Noise Induced Hearing Loss Regulations, Occupational Health and Safety Act, 1993); (Act No. 85 of 1993 and the Occupational Hygiene Regulations, MHSAct (29 of 1996) and National Environmental Management Act, Air Quality Act (NEMAQA) (Act No. 39 of 2004)

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Construction Phase	Construction of offices, plant infrastructure ,workshops and other associated mine infrastructure	Visual Resource	The process of construction equipment and related works in the construction of the plant and associated mining areas (e.g. storage areas, access roads) will introduce visually intrusive elements into the landscape and locally result in increased traffic. The construction of the project plant and infrastructure will require removal of vegetation and alteration of the existing topography that will result in a change in the existing landscape character.	Control by construction in low lying areas to reduce the view shed and minimise tree removal for screening effect. External signage should be kept to a minimum, were possibly shielding material should be utilised to fence of the construction	Construction phase	Reduced visual impacts on the site, adjacent landowners and residents	Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (DEADP, Provincial Government of the Western Cape, 2005).

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Construction phase	Construction of surface infrastructure (e.g. access roads, pipes, storm water diversion berms, change houses, admin blocks, drilling, blasting and development of pits for mining, etc.)	Air Quality	. Activities of vehicles on access roads, levelling and compacting of surfaces, as well localised drilling and blasting will have implications on ambient air quality. The above mentioned activities will result in fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust)Bulldozing, excavation, drilling and blasting operations will result in the emission of dust to atmosphere	- Minimisation: Working areas should be limited to the demarcated construction area only, and vehicular movement must be limited to designated haul roads and construction areas only. - Remediate: Disturbed areas should be rehabilitated as soon as possible to limit the development of erosion. timed blasting when there is no wind, dust suppression on roads, dampening of materials being transported, timeously completion of construction to reduce increased exposure time,	Construction phase	Minimisation of air pollution, particularly windborne particles.	Legal Compliance with : Compliance with National Dust Control Regulations (GNR 827).
Construction Phase	Construction trenches and excavations on wetland and associated river	Pans	Water quality deterioration (Pollution from suspended material)	Control, Mitigation and Management through an appropriate water management system should be used during the construction period, including, for example, efficient land drainage and the use of constructed ponds for receiving site runoff to reduce the impact of runoff on nearby watercourses.	Construction phase	Protection of pans on site. As part of the water use license DWS will give recommendations	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Construction Phase	Earthworks and construction of plant infrastructure	Visual	Night-time lighting will be required during construction. Due to the level of screening provided by the existing vegetation cover the impact of light pollution is expected to be limited, but may increase as construction progresses and more cranes and large plant are housed on site.	Control: Consider the application of motion detectors to allow the application of lighting only where and when it is required. - Minimising Sources of light must as far as possible be shielded by physical barriers such as a planted trees and shrubs or built structures, where possible, natural vegetation around the Berenice Coal Mine should be retained so as reduce unnecessary illumination and "light spill". All lighting must be installed at downward angles.	Construction phase	Reduced visual impacts on the site, adjacent landowners and residents	Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (DEADP, Provincial Government of the Western Cape, 2005).
Construction Phase	Fuel storage and Vehicular Movement Use and maintenance of haul roads (incl. transportation of minerals to plant	Surface Water	Water resources pollution due to spillage of oils, fuel and chemicals	Control and manage: Oil recovered from any vehicle or machinery on site should be collected, stored and disposed of by accredited vendors for recycling.	Construction phase	Compliance with proper waste management for hazardous and non-hazardous waste	National Environmental Management: Waste Act (2008) (Act 59 of 2008) and Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Construction Phase	Fugitive dust from construction and vehicle movement	Visual Resource	Fugitive dust	Control and remediation Institute a rigorous planting regime along the project site boundaries to act as bio-filters. Remediating Progressive rehabilitation of the coal mine should be undertaken.	Construction phase and rehabilitation	Minimisation of air pollution, particularly windborne particles.	Legal Compliance with : Compliance with National Dust Control Regulations (GNR 827).
Construction Phase	Grading and building of new roads	Baseline Noise Levels	Increased noise levels along the boundary of the proposed Site	Minimisation Construction activities will take place during between 07:00 and 15:00 on weekdays only to limit the impact on adjacent landowners. Construction vehicles and machinery will be regularly maintained to minimise noise generation. Ensuring that equipment is well maintained and fitted with the correct and appropriate noise abatement measures. Acoustical mufflers (or silencers) should be considered on equipment exhausts.	Construction phase	Minimization through noise limitation and control	Noise Induced Hearing Loss Regulations, Occupational Health and Safety Act, 1993); (Act No. 85 of 1993 and the Occupational Hygiene Regulations, MHSAct (29 of 1996), SABS 083, SANS 10083 National Environmental Management Act, Air Quality Act (NEMAQA) (Act No. 39 of 2004)

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Construction Phase	Human activities	Fauna	In addition to direct habitat loss, the disturbance of birds and other vertebrate fauna species in the surrounding areas will increase. This impact will be manifested both directly (e.g., increased poaching pressure and disturbance of nests) and indirectly (changes in prey availability, nesting material, etc.). Given the limited background information available, the impact assessment here pertains to the worst case scenario.	Minimisation and monitoring: Measures must be put in place to ensure that no illegal hunting of birds takes place on the mine property or in surrounding areas.·	Construction phase	Manage and control illegal hunting activities. A specialist must be engaged to check the entire property for active nests of red-listed species, such as White-back Vulture, Martial Eagle and Tawny Eagle. Any such nests will need to be relocated.	Legal Compliance National Environmental Management: Biodiversity Act (No 10 of 2004).National Environmental Management: Waste Act (2008) (Act 59 of 2008) and Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.
Construction Phase	Human dispersal of alien seeds/sapling by construction vehicles, shoes, clothes	Pans	Alien invasion of native species habitat	Control through Management and Monitoring and implementation of an alien invasive management plan. - Remediation Alien species removal programme must be developed and implemented	Construction phase	Removal of alien invasive species including managing the distribution of weeds and invasive species avoided.	Compliance with the National Environmental Management: Biodiversity Act 10 of 2004 and the Alien and Invasive Species Lists, 2014. Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
							requirements of the Water Use License.
Construction Phase	Land clearing	Pans	Biodiversity loss	Control, Prevention and Minimising: Avoid stockpiling of removed soils on wetlands.	Construction phase	The creation of artificial pan wetland on a different location within the farm is encouraged. The creation of artificial will promote habitat life within the farm instead of total destruction.	Legal Compliance National Environmental Management: Biodiversity Act (No 10 of 2004). Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.
Construction Phase	Land clearing	Pans	Soil loss	Control and Management: Construct low level water deflection berms, reduce clearing to a minimum to maintain vegetation cover. Avoid stockpiling of removed soils on wetlands as this will promote erosion of soil into wetlands and further deteriorating the wetlands.	Construction phase	Soil management, revegetation and sediment analysis for monitoring pollution	Compliance with the National Water Act (36 of 1998)

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Construction phase	Mining processing activities	Ground and surface water pollution.	Pollution generated by the mine (e.g., acid mine drainage, accidental fuel spillages, as well as pollutants such as mercury and lead) has the potential to severely affect avian habitats and therefore bird species along the Brak River downstream of the mine)	Minimising and Monitoring, Implement a rigorous pollution prevention program as part of a comprehensive Environmental Management Plan (EMP)	Construction phase, operation , decommissioning and post closure	Groundwater monitoring will be done quarterly with the groundwater model updated every 2 years. Implementation of the IWWMP	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.
Construction Phase	Oil spillages	Pans	Water quality contamination	Control and Monitor: Storm water management measures should be followed. Sedimentation trapping methods should also be in place do reduce the creation of gully formation.	Construction phase	Waste management, revegetation and sediment analysis for monitoring pollution	National Environmental Management: Waste Act (2008) (Act 59 of 2008) and Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.
Construction Phase	Oil spillages	Pans	Water quality deterioration (Pollution from suspended material)	Implementation of waste management and remediation: Access to pan areas will be restricted for vehicles,	Construction phase	Protection of pans on site. As part of the water use license DWS will give recommendations	National Environmental Management: Waste Act (2008) (Act 59 of 2008) and Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Construction Phase	Powerline	Birds	The impact of such lines on birds will depend on the route the new line will follow, the size and configuration of the towers and lines, and the impacts cannot be evaluated without this information. The issue is particularly pertinent in view of the number of species occurring in the area that are known to be vulnerable to collisions and electrocution risks, including vultures and large eagles	Minimise: Any power line linking the mine to the existing grid will need a stand-alone impact assessment that can only be completed once specific routes have been identified. Such as assessment needs to include an evaluation of alternative routes, and careful assessment of the risks posed to birds, in particular vultures and other large raptors.	Construction phase	Tap into the already existing powerlines on the site.	Legal Compliance National Environmental Management: Biodiversity Act (No 10 of 2004).

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Construction Phase	Preparation of the foot print area	Baseline Noise Levels	Increased noise levels on the proposed site	- Minimisation Construction activities will take place during between 07:00 and 15:00 on weekdays only to limit the impact on adjacent landowners. Biannual noise assessments along the boundaries of the site to take place to identify noise intrusions; Berms with a potential to act as a noise barrier should be constructed as soon as possible around open cast pits and other mining activities with the barrier being built as close as possible to the operations or at receptors as is feasible as possible. Construction vehicles and machinery will be regularly maintained to minimise noise generation. Ensuring that equipment is well maintained and fitted with the correct and appropriate noise abatement measures. Acoustical mufflers (or silencers) should be considered on equipment exhausts on open cast pits and stockpile areas	Construction phase	Noise control through stipulated working hours. Impacts on aspects outside of the demarcated areas reduced. Noise levels on site reduced.	All machinery and/or plant which radiate noise levels exceeding 85.0dBA to be acoustically screened off; SABS083, SANS 10083 Noise Induced Hearing Loss Regulations, Occupational Health and Safety Act, 1993); (Act No. 85 of 1993 and the Occupational Hygiene Regulations, MHSAct (29 of 1996)

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Construction Phase	Preparation of the foot print area	Baseline Noise Levels	Increased noise levels off the proposed Site	- Minimisation: It is recommended that the height of the berms/barriers be at least 2 m higher than the line of sight to the highest noise source from open cast pits and stockpile areas, although the higher the berm/barrier the better acoustical screen it will be. Certain heavy vehicles have their exhaust ports above the cabin of the vehicle and needs to be considered as the noise source point.	Construction phase	Impacts on aspects outside of the demarcated areas reduced. Noise levels on site reduced. All machinery and/or plant which radiate noise levels exceeding 85.0dBA to be acoustically screened off;	SABS083, SANS 1 0083. Noise Induced Hearing Loss Regulations, Occupational Health and Safety Act, 1993); (Act No. 85 of 1993 and the Occupational Hygiene Regulations, MHSAct (29 of 1996)
Construction phase	Site clearing, removal of topsoil and vegetation	Air Quality	Variable Dust generation from as land clearing, topsoil removal, loading of material, hauling, grading, stockpiling, bulldozing and compaction	- Minimisation: Working areas should be limited to the demarcated construction area only, and vehicular movement must be limited to designated haul roads and construction areas only. - Remediate: Disturbed areas should be rehabilitated as soon as possible to limit the development of erosion. timed blasting when there is no wind, dust suppression on roads, dampening of materials being transported, timeously completion of construction to	Construction phase	Minimisation of air pollution, particularly windborne particles.	Impacts on aspects outside of the demarcated areas reduced. Compliance with National Dust Control Regulations (GNR 827).

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
				reduce increased exposure time,• Topsoil should not be removed during windy months (August, September and October) due to associated wind erosion heightening dust levels in the atmosphere.			
Construction phase	Site construction and grading	Groundwater quantity	Changes in runoff and infiltration that could reduce groundwater recharge	Control and minimise : limit the removal of vegetation and opportunities for revegetation will be maximised	Construction phase	Reduced runoff, soil compaction and revegetation to increase infiltration	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.
Construction phase	Vegetation clearing for open pit excavation, clearing for construction of buildings, roads and other	Vegetation	The area for the proposed development will be cleared of vegetation. This will result in the loss of indigenous species, disturbance of species of conservation concern and the fragmentation of plant communities.	- Compliance: Application for a tree removal permit and Avoid planting of exotic plant species	Construction phase	Conservation of protected species, relocation, nursery establishment	Legal Compliance National Environmental Management: Biodiversity Act (No 10 of 2004). National Forests Act, 1998 (Act No. 84 of 1998)

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
	infrastructure, waste dumps etc.		The removal of vegetation will also expose soil increasing the risk of erosion				
Construction phase and decommissioning phase	Stripping, handling and placement of soil associated with pre construction land clearing and rehabilitation	Soil	Loss of topsoil	Prevention: Soils within 100m of the Brak River should be kept undisturbed. Minimising During the construction phase it is recommended that the topsoil be stripped and stockpiled in advance of construction activities that might contaminate the soil Rehabilitation: Due to the shallow nature of the soils it is recommended to strip only 40-60cm of the soil. These estimates take into consideration a possible 10% topsoil loss through compaction and allow the rehabilitated areas to be returned to the pre-mining land	Construction phase and decommissioning phase	Vegetation of topsoil stockpiles, covering the stockpiles and implement concurrent rehabilitation to reduce the exposure of the soil to erosion elements	Rehabilitation targets, closure objectives and end-use objectives are met. Conservation of Agricultural Resources Act (No 43 of 1983). Environment Conservation Act (No 73 of 1989).

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
				capability, i.e. wildlife and gaming.			
Construction Phase and operation	Stockpiling of topsoil	Soil	Loss of topsoil through erosion.	Control, Minimise and rehabilitate Stockpiles can be used as a barrier to screen operational activities. If stockpiles are used as screens, the same preventative measures described above should be implemented to prevent loss or contamination of soil.	Construction, operation, rehabilitation and closure	Vegetation of topsoil stockpiles, covering the stockpiles and implement concurrent rehabilitation to reduce the exposure of the soil to erosion elements	Conservation of Agricultural Resources Act (No 43 of 1983).

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Construction Phase and operation phase	Fuel storage and Vehicular Movement Use and maintenance of haul roads (incl. transportation of minerals to plant	Groundwater quality	Fuel and hydrocarbon leakages and spillages from the transporting vehicles may cause groundwater contamination	Control and Management: All storage areas containing hazardous material will have secondary containments of containers the volumes of the largest tank or container plus 10%. Resort to immediate clean up after accidental spillage. Divert runoff from haul roads that may contain hydrocarbons into lined pollution control dams.	Construction, operation, rehabilitation and closure	Implement a rigorous pollution prevention program as part of a comprehensive environmental management plan (EMP) and ensure that no pollution whatsoever enters local ground or surface water.	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.
Construction Phase and operation phase	Increased excavation processes that may lead to more sediment being deposited into the wetlands	Pans	Gully formations	Control and Management: Storm water management measures should be adopted and implemented through the IWWMP	Construction, operation, rehabilitation and closure	Sedimentation trapping methods should also be in place do reduce gully formation.	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Construction Phase and operation phase	Mine development	Institutional and Empowerment Changes Processes	Attitude formation against project	The attitude formation variable seeks to assess changes relating to attitude formation that can be attributed to the Berenice Coal Mine specifically. Attitudes and interest group activity would not constitute impacts per se. It would rather be associated with an appraisal by I&APs of the proposed project, change events and perceived impacts. If such appraisal about the objects of thought (being the project; changes processes or impacts), includes evaluative judgments - positive, negative or neutral, these are by definition, attitudes (in short, how we feel about things).	Construction Phase and operation phase	Increase awareness and community engagement Appointment of a community liaison officer	National Environmental Management Act (107/1998).
Construction Phase and operation phase	Mine development	Institutional and Empowerment Changes Processes	Negotiation process	- Management: A Community Liaison Officer should be appointed to assist with stakeholder engagement.	Construction Phase and operation phase	Conform to the guidelines of the SLP	Mining Charter and Mineral and Petroleum Resources Development Act, Act 28 of 2002.
Construction Phase and operation phase	Mine development	Socio-cultural change process	Crime, Safety and Security	Control and Prevention: Fence off servitudes and access roads and provide for strict access control measures to service roads and patrol service roads regularly; Management:	Construction Phase and operation phase	Conform to the guidelines of the SLP, Neighbourhood watch, liaise with SAPS	Mining Charter and Mineral and Petroleum Resources Development Act, Act 28 of 2002. National Environmental Management Act (107/1998).

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
				Liaise with the South African Police Service to enhance police patrol activity in the project area;			
Construction Phase and operation phase	Mine development	Socio-cultural change process	Integration with local community	Awareness: Launch aggressive culturally appropriate STI and HIV/AIDS awareness campaigns; Enhance people's knowledge through awareness campaigns on site, schools and community forums; access control, increased female hires to reduce financial vulnerability	Construction Phase and operation phase	Conform to the guidelines of the SLP, Community engagement, SHEQ management objectives	Mining Charter and Mineral and Petroleum Resources Development Act, Act 28 of 2002. National Environmental Management Act (107/1998). Occupational Hygiene Regulations, MHSAct (29 of 1996)
Construction Phase and operation phase	Mine development	Socio-cultural change process	Quality of life and sense of place	• Manage Establishment of an anti-poaching unit available to adjacent land owners, and establishing a security forum in collaboration with these land owners. Land owners are to be actively involved in the selection of the contracting company employed to conduct anti-poaching in the area. Increased security measures (fencing, access control and monitoring) on mine premises;	Construction Phase and operation phase	Conform to the guidelines of the SLP, Neighbourhood watch, liaise with SAPS	Mining Charter and Mineral and Petroleum Resources Development Act, Act 28 of 2002. National Environmental Management Act (107/1998).
Construction Phase and operation phase	Site development and mining	Demographic change process	Influx of workers	Manage: Local hiring and HR implementing the SLP, stakeholder engagement	Construction Phase and operation phase	Conform to the guidelines of the SLP	Mining Charter and Mineral and Petroleum Resources Development Act, Act 28 of 2002

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Construction Phase and operation phase	Stockpiling of topsoil	Soil	Mixing of deep and surface soils during handling, stockpiling and subsequent placement. Change to soil's physical, chemical and biological properties due to operational contamination of oils and coal dust	Design and management: The stockpiles should not exceed a maximum height of 6m and it is recommended that the side slopes and surface areas be vegetated in order to prevent water and wind erosion and to keep the soils biologically active.	Construction Phase and operation phase	Vegetation of topsoil stockpiles, covering the stockpiles and implement concurrent rehabilitation to reduce the exposure of the soil to erosion elements	Conservation of Agricultural Resources Act (No 43 of 1983).
Construction phase	General transportation, hauling and vehicle movement on site	Air Quality	Transportation of the workers and materials in and out of mine site will be a constant feature during the construction phase. This will however result in the production of fugitive dust (containing TSP, as well as PM10 and PM2.5) due to suspension of friable materials from earth roads. dust emissions from haul track,	- Minimisation: Working areas should be limited to the demarcated construction area only, and vehicular movement must be limited to designated haul roads and construction areas only. - Remediate: Disturbed areas should be rehabilitated as soon as possible to limit the development of erosion. timed blasting when there is no wind, dust suppression on roads, dampening of materials being transported, timeously completion of construction to reduce increased exposure time,	Construction phase	Minimisation of air pollution, particularly windborne particles.	Compliance with National Dust Control Regulations (GNR 827).

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Operational phase	Air pollution excavations and construction	Vegetation	The anticipated increase in haul traffic and opencast mining operations will lead to an increased settling of dust on adjacent vegetation. Continued increased levels of dust in the air has an effect on faunal species, particularly birds, but also on fauna species feeding on the vegetation.	Control through a dust suppression. Minimising and monitoring: This program should include (but not be limited to) the following measures: a) Shield stockpiles from predominant wind directions; b) vegetate areas and ensure continual capping and vegetation of the sides of mine residue facilities; c) regular spraying; d) continuously remove coal form site and reduce long-term stockpiling; e) clear coal spillages from site	Operational Phase	Minimisation of air pollution, particularly windborne particles.	Impacts on aspects outside of the demarcated areas reduced. Compliance with National Dust Control Regulations (GNR 827).
Operational phase	Alien Invasive plant species on cleared areas (Haulage vehicles and human activities)	Vegetation	Alien invasive plant species will encroach into disturbed areas. It is expected that extensive area will be disturbed, natural vegetation totally destroyed.	Control through Management and Monitoring and implementation of an alien invasive management plan. Remediation Alien species removal programme must be developed and implemented	Operational phase	Removal of alien invasive species including managing the distribution of weeds and invasive species avoided.	The distribution of weeds and invasive species avoided. Compliance with the National Environmental Management: Biodiversity Act 10 of 2004 and the Alien and Invasive Species Lists, 2014. Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Operational phase	Beneficiation by means of crushing and screening	Air Quality	. The crushing process releases fugitive dust, especially if there are no enclosure and water sprays. Dust contained within the RoM ore can be released into the atmosphere during this process i.e. fugitive dust (containing TSP, as well as PM10 and PM2.5). Wind erosion from stockpiles can be a perennial source of dust if not properly managed during and post mining operations.	Minimisation: Working areas should be limited to the demarcated construction area only, and vehicular movement must be limited to designated haul roads and construction areas only. Remediate: Disturbed areas should be rehabilitated as soon as possible to limit the development of erosion. timed blasting when there is no wind, dust suppression on roads, dampening of materials being transported, timeously completion of construction to reduce increased exposure time,• Thus it may be necessary to provide air conditioning so the operator has no need to open doors or windows.	Operational phase	Minimisation of air pollution, particularly windborne particles. Impacts on aspects outside of the demarcated areas reduced	. Compliance with National Dust Control Regulations (GNR 827).

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Operational phase	Change in land use (open cast mining areas)	Loss of avian habitats.	Avian habitats, including mopane woodland, scrub and open areas will be destroyed by the proposed mine. The area required for mining and infrastructure is 5.5ha. This will represent a significant loss of habitat in a region of high conservation significance, and will affect a number of red-listed species, including several raptors.	Control through legislative compliance: Tree removal permit. Prevention. A specialist must be engaged to check the entire property for active nests of red-listed species, such as White-back Vulture, Martial Eagle and Tawny Eagle.	Operational phase	No unauthorised vegetation clearing. Areas cleared for mining operations must be minimised.	Legal Compliance National Environmental Management: Biodiversity Act (No 10 of 2004).
Operational phase	Change in land use (open cast mining areas)	mammal and herpetofauna	Total or near-total irreplaceable loss of mammal and herpetofauna species is anticipated	- Minimise: Limit all developments to the minimum area required and leave as much as possible natural vegetation intact.	Operational phase	No unauthorised vegetation clearing. Areas cleared for mining operations must be minimised.	Legal Compliance National Environmental Management: Biodiversity Act (No 10 of 2004).
Operational phase	Continued mining activities	Pans	Water quality may be reduced by	Control, Mitigation and Management through an appropriate water management system should be used during the construction period, including, for example, efficient land drainage and the use of constructed ponds for receiving	Operational phase	Protection of pans on site. As part of the water use license DWS will give recommendations Water quality and PES monitoring will be implemented	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
				site runoff to reduce the impact of runoff on nearby watercourses.			
Operational phase	Continued mining activities	Pans	increased sedimentation and erosion	Control and Management: Construct low level water deflection berms, reduce clearing to a minimum to maintain vegetation cover. Avoid stockpiling of removed soils on wetlands as this will promote erosion of soil into wetlands and further deteriorating the wetlands.	Operational phase	Sedimentation trapping methods, revegetation and sediment analysis for monitoring pollution	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.
Operational phase	Continued mining activities	Pans	Interruption of wetland habitat with potential decrease in species numbers and local biodiversity	Protection and management measures: Possible fencing off of the study area from the rest of the game farm will reduce the loss of biodiversity. existing habitat features should be incorporated into site design and protected from change	Operational phase	Site access restrictions on sensitive areas. Fencing off of areas.	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Operational phase	Generation of stockpiles and associated mining waste	Air Quality	dust generated from waste rock, evaporation of hydrocarbon fuels from storage tanks and spillages, waste oils chemicals plus hazardous waste	Control and Minimisation through the demarcated of operational areas, and vehicular movement must be limited to designated haul roads and construction areas only. - Remediate: Reduce stockpiles and ROM exposure time and dampening of materials being transported		Minimisation of air pollution, particularly windborne particles through rehabilitated as soon as possible to limit the development of erosion.	Impacts on aspects outside of the demarcated areas reduced. Compliance with National Dust Control Regulations (GNR 827).
Operational phase	Hauling of ore to siding or via road	Baseline Noise Levels	Increased noise levels along the feeder roads	Manage: To mitigate the impact of over mass and overweight deliveries to the Site, a suitable entrance should be constructed on the D3256 North Road that complies with RTA requirements for site access. Following site construction, the specialized intersection would be utilised for emergency vehicle access only.	Operational phase	An individual Traffic Control Plan would be developed and implemented for each over mass and overweight delivery taking into account the specialized mine route requirements	National Environmental Management Act, Air Quality Act (NEMAQA) (Act No. 39 of 2004); Southern African Road Safety Manual (National Department of Transport 1999)

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Operational phase	Human activities	Fauna	In addition to direct habitat loss, the disturbance of birds and other vertebrate fauna species in the surrounding areas will increase. This impact will be manifested both directly (e.g., increased poaching pressure and disturbance of nests) and indirectly (changes in prey availability, nesting material, etc.). Given the limited background information available, the impact assessment here pertains to the worst case scenario.	Minimise Measures must be put in place to ensure that no illegal hunting of birds takes place on the mine property or in surrounding areas.· A specialist must be engaged to check the entire property for active nests of red-listed species, such as White-back Vulture, Martial Eagle and Tawny Eagle. Any such nests will need a buffer zone of 500 m radius around them to ensure that breeding birds are not disturbed.	Operational phase	Manage and control illegal hunting activities. A specialist must be engaged to check the entire property for active nests of red-listed species, such as White-back Vulture, Martial Eagle and Tawny Eagle. Any such nests will need a buffer zone of 500 m radius around them to ensure that breeding birds are not disturbed.	Legal Compliance National Environmental Management: Biodiversity Act (No 10 of 2004).
Operational phase	Human dispersal of alien seeds/sapling by vehicles, shoes, clothes	Pans	Alien invasion of native species habitat	Control through Management and Monitoring and implementation of an alien invasive management plan. Remediation Alien species removal programme must be developed and implemented	Operational phase	Removal of alien invasive species including managing the distribution of weeds and invasive species avoided.	Compliance with the National Environmental Management: Biodiversity Act 10 of 2004 and the Alien and Invasive Species Lists, 2014. Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
							requirements of the Water Use License.
Operational phase	Mining activities area	Baseline Noise Levels	Increased noise levels on the proposed site	Minimise operation to day time 6am to 6pm	Operational phase	Noise control through stipulated working hours. Impacts on aspects outside of the demarcated areas reduced. Noise levels on site reduced	No noise impact after hours. Impacts on aspects outside of the demarcated areas reduced.
Operational phase	mining infrastructure	Visual Impact of night time Illumination	Operational Phase Reduction in visual resource value due to Night-time illumination	Control: Consider the application of motion detectors to allow the application of lighting only where and when it is required. Minimising : Sources of light must as far as possible be shielded by physical barriers such as a planted trees and shrubs or built structures, where possible, natural vegetation around the Berenice Coal Mine should be retained so as reduce unnecessary illumination and "light spill". All lighting must be installed at downward angles.	Operational phase	Reduced visual impacts on the site, adjacent landowners and residents	Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (DEADP, Provincial Government of the Western Cape, 2005).

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Operational phase	Mining processing activities	Ground and surface water pollution.	Pollution generated by the mine (e.g., acid mine drainage, accidental fuel spillages, as well as pollutants such as mercury and lead) has the potential to severely affect avian habitats and therefore bird species along the Brak River downstream of the mine, including potentially the entire Limpopo River downstream of Musina. The mining works program indicates that the sulphur content of the coal is high, and provision for water treatment is being made only towards the end of life of the mine (i.e., ~30 years after the start of mining).	Minimising and Monitoring, Implement a rigorous pollution prevention program as part of a comprehensive environmental management plan (EMP) and ensure that no pollution whatsoever enters local ground or surface water. **As already mentioned, the project plans to use recycled water for the washing plant to minimise the use of ground water.** **The project plans to install a pollution control dam that has a 1:100 stormwater threshold.** **Reducing the requirement for freshwater for mine processes with a sufficient water treatment plant.**	Operational phase	Groundwater monitoring will be done quarterly or as required by the Water Use Licence, with the groundwater model updated every 2 years. Implementation of the IWWMP	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Operational phase	Open cast mining	Groundwater	Open cast mining below the water table will result in pit inflows	Pit inflows cannot be mitigated. Provision needs to be made within the mine water balance for the reuse or treatment of pit inflows.	Operational phase	Boreholes will be drilled around the pit for abstraction lowering the water table hence minimising decant. This water will then be used at the processing plant.	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.
Operational phase	Open cast mining	Groundwater quality	increased potential for groundwater contamination due to seepages from the overburden stockpiles	Minimise: Compact footprint area of the overburden stockpiles to minimise ground water infiltration. Stormwater run-off from the overburden stockpiles will be diverted into dirty water dams. A groundwater resource monitoring program will be implemented during to detect the groundwater contamination	Operational phase	Groundwater monitoring will be done quarterly with the groundwater model updated every 2 years. Implementation of the IWWMP	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License and National Environmental Management: Waste Act (2008) (Act 59 of 2008)
Operational phase	Open cast mining	Groundwater quality	Water contained in dirty water dams may impact on groundwater quality	Design and Monitoring Pollution control dams need to be and designed to comply with NEMA and NWA requirements (At 36 of 1998). Manage any leakages and spill to prevent ground water contamination. Implement groundwater monitoring to detect groundwater contamination	Operational phase	Groundwater monitoring will be done quarterly with the groundwater model updated every 2 years. Implementation of the IWWMP	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License and National Environmental Management: Waste Act (2008) (Act 59 of 2008)

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Operational phase	Open cast mining	Groundwater quality	Baseflow reduction caused by mining	No Impacts Brak river and other streams in the project area are non-perennial and there are no base flow in them. The baseflow into the streams and Brak river won't be affected by the mining activities	Operational phase	Groundwater monitoring will be done quarterly with the groundwater model updated every 2 years. Implementation of the IWWMP	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License and National Environmental Management: Waste Act (2008) (Act 59 of 2008)
Operational phase	Open cast mining	Groundwater quality	Mine dewatering and groundwater abstraction for water supply purposed could reduce groundwater levels in the area	Control and management Pit dewatering will cause a cone of drawdown which will affect the neighbouring farms in the Norths, east and south of the project site. The extent of the zone of influence will not extend beyond 2000m and the maximum drawdown in the affect areas will range between 5 and 58m thereby expected to impact on the yields of any supply boreholes around the mining area.	Operational phase	Possible mitigation against such an impact is temporary water supply by the mine	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Operational phase	Open Pit mining	Vegetation	The area for the proposed development will be cleared of vegetation. This will result in the loss of indigenous species, disturbance of species of conservation concern and the fragmentation of plant communities. The removal of vegetation will also expose soil increasing the risk of erosion	Compliance: Application for a tree removal permit and avoid planting of exotic plant species	Operational phase	No unauthorised vegetation clearing. Areas cleared for mining operations must be minimised.	Legal Compliance National Environmental Management: Biodiversity Act (No 10 of 2004).
Operational phase	Powerline	Birds	The impact of such lines on birds will depend on the route the new line will follow, the size and configuration of the towers and lines, and the impacts cannot be evaluated without this information. Given the limited background information available, the impact assessment here	Minimise: Any power line linking the mine to the existing grid will need a stand-alone impact assessment that can only be completed once specific routes have been identified. Such as assessment needs to include an evaluation of alternative routes, and careful assessment of the risks posed to birds, in particular vultures and other large raptors.	Operational Phase	Tap into the already existing powerlines on the site.	Legal Compliance National Environmental Management: Biodiversity Act (No 10 of 2004).

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
			pertains to the worst-case scenario, where the lines generate high collision and electrocution risks.				
Operational phase	presence of topsoil, Run of Mine, product and ,overburden stockpiles and discard dumps;	Visual impact of fugitive dust	Operational Phase Reduction in visual resource value due to Fugitive dust	Remediate and Management: Institute a rigorous planting regime along the project site boundaries to act as bio-filters. Remediating Progressive rehabilitation of the coal mine should be undertaken.	Operational phase	Reduced visual impacts on the site, adjacent landowners and residents	Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (DEADP, Provincial Government of the Western Cape, 2005). Compliance with National Dust Control Regulations (GNR 827).
Operational phase	Presence of topsoil, Run of Mine, product and ,overburden stockpiles and discard dumps;	Visual impact of physical structures	Operational Phase Reduction in visual resource value due to presence of physical structures on site	Minimising: Where possible, natural vegetation around the Berenice Coal Mine should be retained.	Operational phase	Reduced visual impacts on the site, adjacent landowners and residents	Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (DEADP.

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Operational phase	processing plant and other mining infrastructure	Visual impact of fugitive dust	Operational Phase Reduction in visual resource value due to Fugitive dust	Managing: Institute a rigorous planting regime along the project site boundaries to act as bio-filters. Remediating Progressive rehabilitation of the coal mine should be undertaken.	Operational phase	Reduced visual impacts on the site, adjacent landowners and residents	Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (DEADP, Provincial Government of the Western Cape, 2005). Compliance with National Dust Control Regulations (GNR 827).
Operational phase	processing plant and other mining infrastructure	Visual impact of physical structures	Operational Phase Reduction in visual resource value due to presence of physical structures on site	Minimising: Progressive rehabilitation of the coal mine should be undertaken. Mine dumps and stock piles should not exceed 15m of height and trees must be transplanted to locations adjacent to the mine where they will not affected by mining activities.	Operational phase	Reduced visual impacts on the site, adjacent landowners and residents	Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (DEADP).

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Operational phase	Removal of overburden, mineral extraction and backfilling when possible (including drilling/blasting hard overburden & stockpiling)	Air Quality	Drilling is an intermittent exercise that emits fugitive dust. There will be fumes from diesel trucks transporting ore to the stockpiles and conveyor belts at crushing and screening facilities. The conveyor belts deposit the minerals into the crusher, the crushing process releases fugitive dust. Activities by machinery in the mining process will lead to exhaust fumes from vehicles and dust from drilling and blasting processes. Fugitive dust (containing TSP, as well as PM10 and PM2.5) occurs as a result of the aforementioned processes.	Minimisation: Working areas should be limited to the demarcated construction area only, and vehicular movement must be limited to designated haul roads and construction areas only. Remediate: Disturbed areas should be rehabilitated as soon as possible to limit the development of erosion.	Operational phase	Minimisation of air pollution, particularly windborne particles.	Legal Compliance with National Dust Control Regulations (GNR 827).

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Operational phase	Stockpiles and general waste	Surface Water	Pollution of watercourses from general waste and sewage effluent	Control and Mitigate: A reticulated sewage disposal facility at the proposed mine site should mitigate potential water quality issues that may arise due to population increase; Management:	Construction, Operation and Decommissioning Phase	Waste management plan, surface water quality monitoring plan to monitor sedimentation	National Environmental Management: Waste Act (2008) (Act 59 of 2008) and Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.
Operational phase	Toxic chemicals from vehicles and mining machinery (oil, petrol, brake fluid etc.)	Pans	Pollution of wetland and habitat which could ultimately lead to underground water contamination	Management actions: Servicing and refuelling of vehicles should take place outside of the mining area; Minimising Drip trays should be used to collect waste oil and other lubricants; Remediation Any effluents or waste containing oil, grease or other industrial substances must be collected in a suitable container and removed from the sites. Oil spills that may occur should be removed as soon as possible and the contaminated top soil disposed using proper procedures put in place	Operational phase	Waste management plan, surface water quality monitoring plan to monitor sedimentation. Bioremediation of oil spillages	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License and National Environmental Management: Waste Act (2008) (Act 59 of 2008)

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Operational phase	Use and maintenance of haul roads (incl. transportation of minerals to plant	Air Quality	Transportation of the workers and materials in and out of mine site will be a constant feature during the operational phase and result in the production of fugitive dust (containing TSP, as well as PM10 and PM2.5) due to suspension of friable materials from earth roads. Substantial secondary emissions may be emitted from material moved out from the site during grading and deposited adjacent to roads	Minimisation: Working areas should be limited to the demarcated construction area only, and vehicular movement must be limited to designated haul roads and construction areas only. Remediate: Disturbed areas should be rehabilitated as soon as possible to limit the development of erosion. As well as a dust suppression program.	Operational phase	Minimisation of air pollution, particularly windborne particles.	Compliance with National Dust Control Regulations (GNR 827).
Operational phase	Vehicular movement of haulage vehicles and passenger vehicles as well as	Surface Water	Increased runoff due to soil compaction and increased paved surfaces	Control and Minimisation: Working areas should be limited to the demarcated construction area only, and vehicular movement must be limited to designated haul roads and construction areas only.	Operational phase	Disturbed areas should be rehabilitated as soon as possible to limit the development of erosion and increased soil compaction	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
	conveyor belts						
Construction Phase, operation phase and decommissioning phase	Mine development	Economic Change process	Direct formal employment opportunities to local individuals	Implementation and Management: Berenice Coal Mine intends to employ mostly local labourers during the construction phase of the proposed project, In addition to the employment opportunities, there is also potential skills transfer which will have a lasting impact on the community. SLP hiring, bursary, and retrenchment guidelines will be adopted.	Construction Phase, operation phase and decommissioning phase	Conform to the guidelines of the SLP, use of the Labour Law in Human resources, Community engagement, SHEQ management objectives	Mining Charter and Mineral and Petroleum Resources Development Act, Act 28 of 2002. National Environmental Management Act (107/1998).
Construction Phase, operation phase and decommissioning phase	Mine development	Economic Change process	Impact on existing businesses in surrounding areas	Implementation Downscaling of activities and closure applications will be according to an approved closure plan as well as the SLP guidelines. Community engagements will be paramount.	Construction Phase, operation phase and decommissioning phase	Conform to the guidelines of the SLP, use of the Labour Law in Human resources, Community engagement, SHEQ management objectives	Mining Charter and Mineral and Petroleum Resources Development Act, Act 28 of 2002. National Environmental Management Act (107/1998).

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Construction Phase, operation phase and decommissioning phase	Site clearing, removal of topsoil and vegetation	Surface Water	Increased sediment loads from vegetation clearance and soil compaction	Rehabilitation and Monitoring Progressive rehabilitation of disturbed land should be carried out to minimize the amount of time that bare soils are exposed to the erosive effects of rain and subsequent runoff.	Construction Phase, operation phase and decommissioning phase	Implementation of a storm water management plan is recommended at the mine site to channel and contain storm runoff;	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.
Construction Phase, operation phase and decommissioning phase	Transportation of coal via road	Roads and Traffic	Delay at Intersections	Control and Minimise Minimise delays, accident risk, safety driving conditions, responsible driving and accountability, vehicle tracking	Construction Phase, operation phase and decommissioning phase	Traffic Management plans and propose doff peak movement of vehicles off site	Southern African Road Safety Manual (National Department of Transport 1999)
Construction Phase, operation phase and decommissioning phase	Transportation of coal via road	Roads and Traffic	Social Impact (unsafe pedestrian and drivers conditions)	Control and Minimise Minimise delays, accident risk, safety driving conditions, responsible driving and accountability, vehicle tracking	Construction Phase, operation phase and decommissioning phase	Traffic Management plans and propose doff peak movement of vehicles off site	Southern African Road Safety Manual (National Department of Transport 1999)
Construction Phase, operation phase and decommissioning phase	Vehicle movement and Transportation of coal via road	Roads and Traffic	Heavy vehicle impact at the Intersections (congestion), increase in daily traffic	Control and Minimise Minimise delays, accident risk, safety driving conditions, responsible driving and accountability, vehicle tracking	Construction Phase, operation phase and decommissioning phase	Traffic Management plans and propose doff peak movement of vehicles off site	Southern African Road Safety Manual (National Department of Transport 1999)

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Closure Phase and Decommissioning Phase	Demolition & Removal of all infrastructure	Visual Significance rating post closure	Reinstatement of visual resource value due to dismantling of infrastructure and subsequent rehabilitation of footprint areas. Permanent alteration of site topographical and visual character of linked areas	Control and Monitoring Monitoring of invasive species. Re- Shape and profile the final mining void to be free draining if possible and establish a vigorous and self-sustaining vegetation cover on the final rehabilitated landforms. A detailed post-closure land use plan be compiled for the mine, which will take into consideration all present and likely future land uses surrounding the site, to ensure that the site is successfully re-integrated into the existing visual fabric.	Construction Phase, operation phase and decommissioning phase	Minimising Where possible, natural vegetation around the Berenice Coal Mine should be retained.	Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (DEADP, Provincial Government of the Western Cape, 2005).
Closure Phase and Decommissioning Phase	Demolition & Removal of all infrastructure (incl. transportation off site)	Air Quality	The process includes dismantling and demolition of existing infrastructure, transporting and handling of topsoil on unpaved roads in order to bring the site to its initial/rehabilitated state. Demolition and removal of all infrastructures will cause fugitive dust emissions.	Minimisation: Decommissioning areas should be limited to the demarcated construction area only, and vehicular movement must be limited to designated haul roads and construction areas only.	Closure Phase and Decommissioning Phase	Minimisation of air pollution, particularly windborne particles.	Impacts on aspects outside of the demarcated areas reduced. Compliance with National Dust Control Regulations (GNR 827).

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Closure Phase and Decommissioning Phase	Open pit backfill	Groundwater	aquifer contamination caused by backfill	Minimising and Monitoring, Implement a rigorous pollution prevention program as part of a comprehensive environmental management plan (EMP) and ensure that no pollution whatsoever enters local ground or surface water.	Closure Phase and Decommissioning Phase	Groundwater monitoring will be done post closure to monitor the water levels and quality	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.
Closure Phase and Decommissioning Phase	Open pit backfill	Groundwater	rebound water levels within backfill material may cause decant	Minimising and Monitoring, Implement a rigorous pollution prevention program as part of a comprehensive environmental management plan (EMP) and ensure that no pollution whatsoever enters local ground or surface water.	Closure Phase and Decommissioning Phase	Groundwater monitoring will be done post closure to monitor the water levels and quality	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Closure Phase and Decommissioning Phase	Rehabilitation (spreading of soil, revegetation & profiling/contouring)	Air Quality	. Topsoil can be imported to reconstruct the soil structure. There is less transfer of soil from one area to other therefore negligible chances of dust through wind erosion. Profiling of dumps and waste rock dump to enhance vegetation cover and reduce wind erosion from such surfaces post mining.	Rehabilitation- Re-vegetation of topsoil Minimisation: Working areas should be limited to the demarcated construction area only, and vehicular movement must be limited to designated haul roads and construction areas only Remediate: Disturbed areas should be rehabilitated as soon as possible to limit the development of erosion. Timeously completion of rehabilitation to reduce increased exposure time.	Closure Phase and Decommissioning Phase	Minimisation of air pollution, particularly windborne particles.	Impacts on aspects outside of the demarcated areas reduced. Compliance with National Dust Control Regulations (GNR 827).
Closure Phase and Decommissioning Phase	Rehabilitation of open pits and removal of infrastructure	Groundwater quality	salt load contribution towards the Brak river	Audits (internal and external)	Closure Phase and Decommissioning Phase	Install water monitoring boreholes closer to the decant points to monitor the water level and quality	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Closure Phase and Decommissioning Phase	Rehabilitation of stockpile areas, PCD's and discard dump	Surface Water	Acid mine drainage problems and problems associated with general waste disposal	Management and rehabilitation Implement phytoremediation measures to correct contamination of water resources. Employ new technologies which are recently being developed to treat acid mine drainage to usable water quality levels.	Closure Phase and Decommissioning Phase	Surface water monitoring, Implementation of the IWWMP. Employ new technologies which are recently being developed to treat acid mine drainage to usable water quality levels.	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.
Closure Phase and Decommissioning Phase	Rehabilitation: Covering of open pit with capping layer and top soil	Baseline Noise Levels	Increased noise levels on the proposed Site	Minimisation Rehabilitation activities will take place during between 07:00 and 15:00 on weekdays only to limit the impact on adjacent landowners.	Closure Phase and Decommissioning Phase	No noise impact after hours. Impacts on aspects outside of the demarcated areas reduced. Noise levels on site reduced	SABS 083, SANS 10083 Noise Induced Hearing Loss Regulations, Occupational Health and Safety Act, 1993); (Act No. 85 of 1993 and the Occupational Hygiene Regulations, MHSAct (29 of 1996)
Closure Phase and Decommissioning Phase	Rehabilitation: Covering of open pit with capping layer and top soil	Baseline Noise Levels	Increased noise levels off the proposed Site	Rehabilitation Rehabilitation activities will take place during between 07:00 and 15:00 on weekdays only to limit the impact on adjacent landowners.	Closure Phase and Decommissioning Phase	No noise impact after hours. Impacts on aspects outside of the demarcated areas reduced. Noise levels on site reduced	SABS 083, SANS 10083 Noise Induced Hearing Loss Regulations, Occupational Health and Safety Act, 1993); (Act No. 85 of 1993 and the Occupational Hygiene Regulations, MHSAct (29 of 1996)

Phase	Activity	Potential Impact	Aspect Affected	Mitigation measure	Time Period For Implementation	Standard to be achieved	Compliance With Standards
Closure Phase and Decommissioning Phase	Removal of buildings and infra-structure	Baseline Noise Levels	Increased noise levels along the feeder roads	Rehabilitation Rehabilitation activities will take place during between 07:00 and 15:00 on weekdays only to limit the impact on adjacent landowners.	Closure Phase and Decommissioning Phase	No noise impact after hours. Impacts on aspects outside of the demarcated areas reduced. Noise levels on site reduced	SABS 083, SANS 10083 Noise Induced Hearing Loss Regulations, Occupational Health and Safety Act, 1993); (Act No. 85 of 1993 and the Occupational Hygiene Regulations, MHSAct (29 of 1996)
Closure Phase and Decommissioning Phase	Vehicular movement of haulage vehicles ,passenger vehicles, workshops	Surface Water	Contamination from leakage and spillage of chemicals, oils and grease	Management and rehabilitation Implement phytoremediation measures to correct contamination of water resources.	Closure Phase and Decommissioning Phase	Employ new technologies which are recently being developed to treat acid mine drainage to usable water quality levels.	Compliance with the National Water Act (36 of 1998) as well as compliance with the conditions and requirements of the Water Use License.
Decommissioning Phase	Backfilling and profiling	Soil	Change in natural surface topography due to re-profiling of surface after stripping	Remediation Through the rehabilitation and backfilling of open pit will return to as close as possible, to pre-mining conditions	Closure Phase and Decommissioning Phase	Rehabilitation targets and closure objectives are met.	Conservation of Agricultural Resources Act (No 43 of 1983). Environment Conservation Act (No 73 of 1989).

2.8 Financial Provision
2.8.1 Determination of the amount of Financial Provision.

The financial provision to achieve the total quantum for rehabilitation and remediation of environmental impacts, damage as well as final mine Closure will be provided for by one or more of the following methods:

- A financial guarantee from a South African registered bank or any other bank or financial institution approved by the Minister guaranteeing the financial provision relating to the environmental management programme.
- A cash deposit to be deposited at the office of the Regional Manager in whose region the application was lodged.
- Approved contribution(s) to a dedicated trust fund as provided for in terms of Section 10(1)(cH) of the Income Tax Act, 1962.
- Any other manner the Minister may determine.

A breakdown of the costs for, including amongst others, dismantling of redundant infrastructure, rehabilitation, provision of Post Closure groundwater management measures etc., for the Berenice Project have been determined and included in the DEIR for consideration by the regulating authority. The determination of the financial provision calculation as well as the breakdown of the financial provision was done in terms of the requirements of the NEMA (1998) and the MPRDA (2002), as contained in the DMR Operational Guideline for Financial Provision Determination.

The Closure Cost Assessment will be reviewed in such a manner so that the quantum of the financial provision includes the requirements of Section 54 (1) of the MPRDR (2004), under the MPRDA (2002), which stipulates that "the quantum of the financial provision should include a detailed itemization of all actual costs required for –

(a) Premature closure regarding –
   (i) The rehabilitation of the surface of the area,
   (ii) The prevention and management of pollution of the atmosphere,
   (iii) The prevention and management of pollution of water and the soil,
   (iv) The prevention of leakage of water and minerals between subsurface formations and the surface.

(b) Decommissioning and final Closure of the operation, and post-closure management of residual and latent environmental impacts

The financial provision calculation and breakdown is annually revised and the required provision lodged with the DMR. A breakdown of the costs including but not limited to, dismantling of redundant infrastructure, rehabilitation, provision of post-closure groundwater management measures etc., for the project will also be included in the Final EMP Amendment (including public comment).

2.8.2 Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under Regulation 22 (2) (d) as described in 2.4 herein.

The objectives for mine closure for the UCDII Berenice project are all included in the impact tables in Section E of this EMP (above) and described as mitigation measures. The mitigation measures should all be implemented in order to limit the impacts the mining and mining-related activities may have on the environment, as well as to restore the environment as far as practicably possible to pre-mining conditions. Mitigation measures and rehabilitation work should be conducted throughout the life of mine.

Post-mining regeneration priorities for South Africa, in the light of the county's developmental context, include:

- restoration of land surface of sufficient quality to support pre-mining land use potential,
- restoration of the ecological function of mined land and in the case of previously degraded land, the ecological function must be improved,
- efficient alternative use of mine infrastructure should be encouraged where this can be economically justified; where no economic alternative uses exist, mine infrastructure must be removed and the site rehabilitated to pre-mining condition,
- Southern Africa in general, and South Africa in particular, experiences water shortages and therefore minimisation of current and potential future impacts on water quality and supply is imperative,
- job creation through education and stimulation of economic activity,
- development projects to enable equitable participation in post mining economies by all members of the community, especially marginalized groups,
- enhancement of leadership capacity within the community and local government may be required to ensure that development continues post closure,
- Skills and literacy training for community members, (Cooke & Limpitlaw, 2003).

The main objectives for the project in terms of mine closure are:

- To protect health and safety of any person and / or animal that enters the mine boundary area.
- To rehabilitation, alleviate and eliminate all environmental damage as far as practically

possible.

- ➢ To rehabilitate land to a level that would (at least) support gaming or grazing land use.
- ➢ To generate sustainable projects, such as the water treatment facility, that will continue to have benefits and supply jobs to the local community, but also provide a service as well as fund itself.

2.8.3 Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties.

This DEIAR includes details pertaining to the environmental objectives in relation to closure. As part of the Public Participation Process, this DEIAR has been made available for public review and comments. Details pertaining to the Public Participation Process is available under Part A of the DEIAR. Furthermore, the environmental objectives in relation to closure have been consulted with I&AP's as part of the public participation process

2.8.4 Provide a rehabilitation plan that describes and shows the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure.

2.8.4.1 Rehabilitation Plan

This rehabilitation plan includes an overall rehabilitation strategy for the UCDII Berenice Mine which provides reference to the planned rehabilitation of the final landforms related facilities and infrastructure. The areas to be rehabilitated include but not limited to Open Pit mining areas, Stockpile areas, Tailings Storage Facility (TSF and Related infrastructure areas (workshops, roads, etc.).

Key aspects relating to the UCDII Berenice Project open pit mine site rehabilitation:

- The control and management of mine waste (i.e. overburden, coarse rejects and fine tailings);
- Proposed rehabilitation methods;
- The management of topsoil resources for use in rehabilitation of the site;
- Description of the planned progressive re-vegetation of areas across the mine site;
- The integration with on-going and future rehabilitation activities across the wider mining area; and
- Rehabilitation monitoring and maintenance requirements which may apply.

Rehabilitation of the affected area due to the mining and related activities will proceed as soon as areas become available for rehabilitation. The rehabilitation of disturbed land at the mine site will be conducted so that:

- Suitable species of vegetation are sown/planted and established to achieve the nominated post-mine land uses;
- The potential for water and wind induced erosion is minimised, including the likelihood of environmental impacts being caused by the release of dust;
- The quality of surface water released from the site is such that releases of contaminants are not likely to cause environmental harm;
- The water quality of any residual water bodies (other than the final void) is suitable for the nominated use and does not have the potential to cause environmental harm; and
- The final landform is stable and not subject to slumping, subsidence, or erosion which will result in the agreed post mining landform not being achieved.

However in certain instances rehabilitation may be delayed due to interactions with other nearby areas that are unavailable for rehabilitation or activities that will negatively impact the area. Where this is the case, temporary rehabilitation methodologies may be applied to provide short-term stabilisation of the areas.

The mining reserves will be mined by utilising truck and shovel opencast method of mining due to the reserves being shallow. One box cut, located in the south and with an east to west orientation, has been designed in the mine layout for OC 1, with two proposed waste dump sites. This design has ensured that the hauling of overburden material over excessive distances, even during the start-up period, will be largely minimised. Rollover of overburden material will be implemented after the first strip has been mined. Drilling and blasting will be undertaken for hard material. Rehabilitation will form an integral part of the mining process.

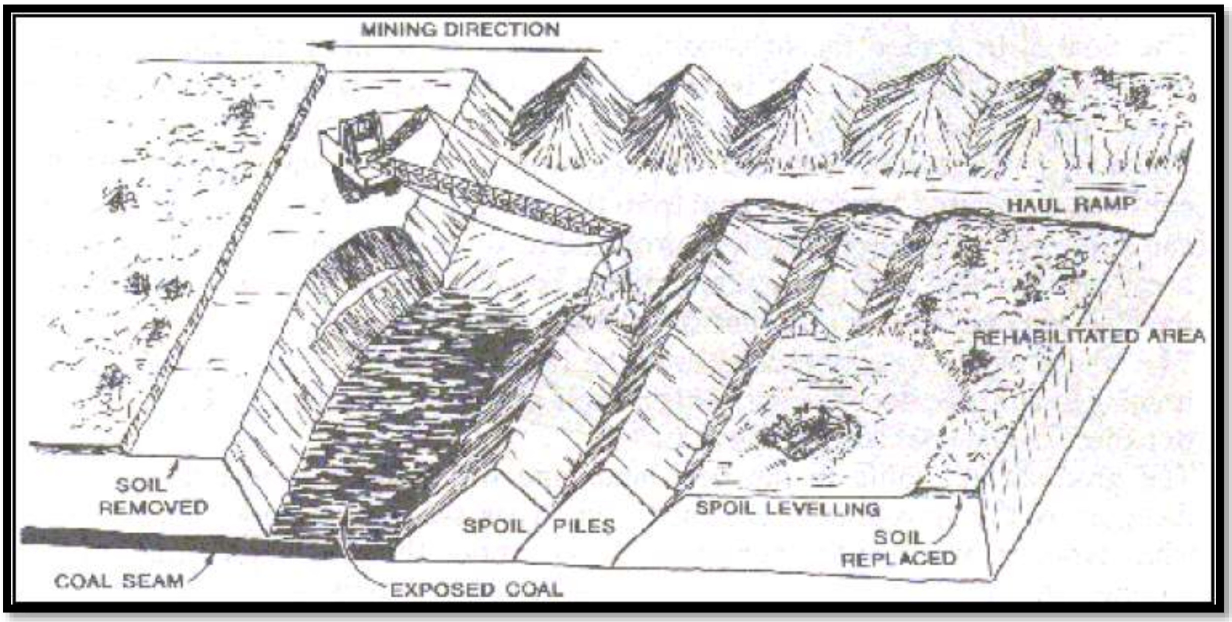


Figure 53: *Rollover Rehabilitation during Steady State (following initial Boxcut State)*

The stripping and stockpiling of topsoil is the most important step in any rehabilitation program and must commence before any minerals are extracted from the intended area of disturbance. Prior to the commencement of minerals extraction, the site will be cleared and grubbed. Then all topsoil located in the area of disturbance should be stripped from the site, avoiding mixing with trees, boulders and other discard materials, and should be stockpiled in berms located outside the boundaries of the proposed operations for use at later mining phases. Ideally, topsoil should not be worked when wet and prolonged storage should be avoided. In this way the valuable topsoil, an ideal medium for plant growth, will become available for rehabilitation purposes at the site as mining advances.

Subsoil and overburden should be stockpiled in berms for use at later mining phases. As mining advances, topsoil, subsoil and overburden will initially be shifted and stockpiled outside the boundaries of the pit and will then subsequently be shifted to mined-out areas.

Rehabilitation will form an integral part of the mining process and final rehabilitated land will not be further than four mining strips behind the mining face. The movement and stockpiling of topsoil at the UCDII Berenice project will take place as follows to ensure that progressive rehabilitation takes place during all phases of mining.

2.8.4.1.1 Initial box cut to be mined

All identified topsoil, to a minimum depth of 300mm, will be removed from the area identified as the initial box cut and stockpiled at the areas marked as Topsoil Stockpile, adjacent to the pits before the next phase of mining is initiated. This soil will subsequently be spread back over the pit area marked for the initial box cut to a depth of at least 300mm after the area has been mined.

The following basic principles of rehabilitation form the basis of the roll-over mining method:

- Prepare a rehabilitation plan prior to the commencement of mining;
- Agree on the long-term post - mining land use objective for the area with the relevant government departments, local government councils and private landowners. The land use must be compatible with the climate, soil, topography of the final landform and the degree of the management available after rehabilitation;
- Progressively rehabilitate the site, where possible, so that the rate of rehabilitation is similar to the rate of mining;
- Prevent the introduction of noxious weeds and pests;
- Minimise the area cleared for mining and associated facilities to that absolutely necessary for the safe operation of the mine;
- Reshape the land disturbed by mining so that it is stable, adequately drained and suitable for the desired long-term land use;
- Minimise the long-term visual impact by creating landforms which are compatible with the surrounding landscape;
- Reinstate natural drainage patterns disrupted by mining wherever possible;
- Minimise the potential for erosion by wind and water both during and following mining;
- Characterise the topsoil and retain it for use in rehabilitation. It is preferable to reuse the topsoil immediately rather than storing it in stockpiles. Only discard if it is physically or chemically undesirable, or if it contains high levels of weed seeds or plant pathogens;
- Consider spreading the cleared vegetation on disturbed areas;
- Deep rip compacted surfaces to encourage infiltration, allow plant root growth and key the topsoil to the subsoil, unless subsurface conditions dictate otherwise;
- Ensure that the surface one or two metres of soil is capable of supporting plant growth;
- If topsoil is unsuitable or absent, identify and test alternatives substrates, e.g. overburden may be a suitable substitute after addition of soil improving substances;
- Re-vegetate the area with plant species consistent with the post mining land use; and

- Monitor and manage rehabilitation areas until the vegetation is self-sustaining.

Rehabilitation activities during the decommissioning phase should adhere to the following guidelines:

2.8.4.1.2 Site grading

The local environment in un-rehabilitated disturbed mining areas is unfavourable to vegetation establishment. Lack of topsoil, combined with uneven and often quite steep slopes hinders plant germination and establishment. While the disturbed slopes are being graded, care must be taken to ensure proper drainage of the site. Consideration should at this time be given to the creation of berms at the pit entrance, to screen the site and to prevent further unauthorized access.

2.8.4.1.3 Spreading of stored topsoil

Once the disturbed area's – box cuts as well as the new pit area - backfilling, grading and sloping is complete, subsoil and topsoil from storage berms located outside the mining area should be spread on the slopes as evenly as possible. When this has been completed, the next stage in the rehabilitation program should immediately commence to prevent erosion and topsoil loss.
Decommissioning and closure will entail the following:

- Slope and whaleback the slopes of both the old box cuts as well as the new pits to a gradient of at least 1:6, in order to accommodate any future agricultural activities within the area;
- The topsoil will be stockpiled as detailed in the previous section;
- Topsoil will be spread out over prepared areas to a depth of no less than 300mm, unless otherwise stated (see the 'topsoil stockpiling' section above);
- Neat stockpiling of oversized rock in the one corner of the pit or alternatively clustering rocks on long slopes with gradients of 1:6 to reduce erosion through water run-off and facilitate plant growth by providing seedlings and seeding of the disturbed area;
- Remove the concrete/impermeable floor where refuelling occurred;
- Remove all containers;
- Decontaminate any hydrocarbon spills by removing the soil and disposing of it at a licensed disposal facility;
- Remove the temporary fencing;

- Maintain the area by doing regular site inspections ensuring the establishment of vegetation and the eradication of alien invader species; and
- Reinstate natural drainage patterns disrupted by mining wherever possible.

All of the topsoil must be utilised as a growing medium in the rehabilitation process of the site, in other words it must be spread over all prepared areas (ripped to a depth of 300mm and sloped) and be re-vegetated with seeds found within the area or prepared in such a way as to satisfy the agricultural requirements of the area and/or the land owner.

It is imperative that rehabilitation occurs concurrently with mining activities, as topsoil, containing seeds from plants within the area, degrades over time with the result that the soil environment becomes unfavourable for germinating seeds.

2.8.4.2 Final Closure

The closure objective is to ensure that all the significant impacts have been mitigated against. All rehabilitated areas will be left in a stable, self-sustainable state. Proof of this will be submitted at closure.

The closure objectives for the UCDII Berenice mine can be summarised as follows:

- Make all areas safe for both humans and animals;
- Make all areas stable and sustainable;
- Ensure impact on any water bodies, water courses and catchment areas have been avoided or minimised;
- Rehabilitate disturbed areas as soon as possible; and
- Minimise the impact on the local community.

With specific reference to the ground water environment, the following closure objectives should be pursued:

- Rehabilitation of the surface infrastructure where necessary to minimize infiltration into the underground water regime (the philosophy of concentration and containment); and
- Rehabilitation to minimise contamination of surface water resources (the philosophy of dilution and dispersion).

When and if necessary suitable structures and or systems are to be put and kept in place to limit contamination of water resources, and to limit parameter concentrations in accordance with the Target Water Quality Ranges for human consumption.

The goals upon decommissioning and closing of the coal mine will include that all significant impacts have been mitigated and that there are no alterations to the environment that are apparent as far as is practically possible. All land will be rehabilitated to a state that facilitates compliance with current national environmental quality objectives including air quality objectives and water quality guidelines.

2.8.4.2.1 Closure vision statement

To demonstrate UCDII's values where we as a team strive to render a safe, stable and non-polluting environment aligned to regulatory and regional requirements, and ultimately provides a sustained post-closure ecosystem service or livelihood, leaving behind a positive post-mining legacy for the receiving community.

2.8.4.2.2 Principles in support of the vision

The mine closure principles that will govern the process are derived from the mine closure policy of the Department of Minerals Resources, namely:

- The safety and health of humans and animals are safeguarded from hazards resulting from mining operations.
- Environmental damage or residual environmental impacts are minimised to such an extent that it is acceptable to all involved parties.
- The land is rehabilitated to, as far as is practicable, it's natural state, or to a predetermined and agreed standard or land use which conforms to the concept of sustainable development.
- The physical and chemical stability of the remaining structures should be such that risk to the environment is not increased by naturally occurring forces to the extent that such increased risk cannot be contended with by the installed measures.
- The optimal exploitation and utilisation of South Africa's mineral resources are not adversely affected.
- Mines are closed efficiently and cost effectively.
- Mines are not abandoned but closed in accordance with this policy.

The closure plan has been compiled keeping the above-mentioned principles in mind.

2.8.4.2.3 Plans in support of the vision

The following plans are compiled in order to achieve the closure vision and objectives:

- Final Closure and decommissioning plan;
- Financial provisioning; and
- Rehabilitation plan (annual and 10-years).

The information presented in these respective plans is included in the closure plan where relevant. The rehabilitation plan focuses the actions to ensure that the closure vision and closure objectives are achieved. Detailed project plans will be developed by the respective responsible persons to ensure that the closure objectives can be achieved.

The financial provisioning report continuously reviews the mine's operations, in terms of the cost associated with the physical and bio-physical components on site. Financial provisioning ensures the availability of adequate funds to achieve the closure vision and closure objectives.

2.8.4.2.4 Closure Outcomes

The closure outcomes/alternatives for each proposed activity that forms part of the open casts and infrastructure is described in the table below.

Table 33: Closure options for proposed activities

Aspect	Closure action
OC1, OC2 and OC3	Open pit In-fill the void by means of dragline and dozer and slope the final void to 1:5 while creating a free draining surface over the remainder of the backfilled open pit; Apply minimum of 300 mm growth medium or as per end land use for wildlife and grazing purposes; Rip area to alleviate compaction; and Establish vegetation by applying suitable seed mix. Ramp Shape ramp scars by means of dragline and dozer to slopes of 1:5; and Apply minimum of 300 mm growth medium

Haul roads	Rip and shape footprint area to be free-draining (aligned to site-wide routing), to ensure sufficient usable soil; and Establish vegetation by applying suitable seed mix.
Pollution Control Dams and Infrastructure	Rip and shape footprint area to be free-draining (aligned to site-wide routing), to ensure sufficient usable soil; and Establish vegetation by applying suitable seed mix. Apply minimum of 300 mm growth medium or as per end land use for wildlife and grazing purposes; Rip area to alleviate compaction; and Establish vegetation by applying suitable seed mix.

2.8.4.3 Closure objectives

In order to guide identification of key biophysical and socio-economic drivers, and aligned to the mine's current EMPR commitments, the following general closure objectives have been formulated:

- To rehabilitate mining-related disturbed areas to a land capability that will support and sustain a predetermined mix of post closure land uses;
- To reinstate a self-sustaining system over the rehabilitated mined and infrastructure areas, requiring minimum maintenance to facilitate a walk away situation;
- To ensure that the plans and actions put in place will meet specific closure-related performance objectives;
- To maximise surface runoff from the rehabilitated mine site to the nearby Brak River;
- To prevent acid mine drainage;
- To limit decant from the open water bodies, as well as the amount of contaminated water seeping from the rehabilitated pits;
- To remove all surface infrastructure that cannot be beneficially re-used and return the associate disturbed land to the planned final land use;
- To in-fill and slope ramps and voids to be free draining;

To limit adverse effect on local catchment yield; and

- To limit the recharge of rainfall to the rehabilitated pits to reduce the amount of water to be abstracted to maintain the in-pit water levels to prevent surface and/or near surface contaminated excess mine water decant.

All alternatives have been reviewed but none are practical therefore the mine has selected the following closure objectives:

2.8.4.3.1 Physical stability

To remove and/or stabilise surface infrastructure, unavoidable mining residue and open pits which are present on the mine to facilitate the implementation of the planned land use, by:

- Closing, dismantling, removing and disposing of all surface infrastructure that has no beneficial post closure use;
- Ensuring remaining water treatment plant and associated facilities are fully functional and operating in line with design specifications; and
- Ripping, shaping, and vegetating of access and/or haul roads with no beneficial post-closure use and integrating these into the surrounding surface topography.

2.8.4.3.2 Environmental quality

To ensure that local environmental quality is not adversely affected by possible physical effects and chemical contamination arising from the mine site as well as to sustain catchment yield as far as possible after closure, by:

- Ensuring that the rehabilitated mine site is free-draining with limited recharge to rehabilitated spoils and run-off is routed to local/natural drainage lines as far as possible;
- Maintaining on-going treatment of contaminated decant water arising after pit in-filling, and discharge of this water into the Brak River;
- Cleaning up of the sources of possible surface water contamination still present on the mine site and along the conveyor route (fugitive coal spillages) to protect the downstream receiving environment;
- Removing off-site hazardous material and disposing of it at the closest hazardous waste disposal facility. As removal is an on-going process, no hazardous waste build-up on-site should occur; and
- Limiting dust generation on the rehabilitated mine site that could cause nuisance and/or health effects to surrounding landowners/communities.

2.8.4.3.3 Health and safety

To limit the possible health and safety threats to humans and animals using the rehabilitated mine site as it becomes available, by:

- In-filling mining voids by ensuring that proper material balances and associated movement analyses are conducted to make material for this purpose available during open pit rehabilitation;
- Planning land use/s such that the rehabilitated pits can be integrated within surrounding land use/s;
- Demonstrating by means of suitable sampling and analysis that the threshold levels of salts, metals and other potential contaminants over the rehabilitated sites allocated in terms of the land use planning for human habitation are acceptable;
- Removing, for safe disposal, all potential process-related contaminants to ensure that no hazardous waste is present on the respective sites once these have been rehabilitated; and Demonstrating through a review of monitoring data that no possible surface and/or groundwater contaminant sources remain on the rehabilitated mine site that could compromise the planned land use and/or pose health and safety threats.

2.8.4.3.4 Land capability/land-use

To re-instate suitable land capabilities over the various portions of the mine site to facilitate the progressive implementation the planned land use/s, by:

- Upfront zoning of the overall mine site and obtaining agreement with stakeholders on this;
- Ensuring that the rehabilitated portions of the mine site are safe and stable in the long-term;
- -up and rehabilitating of contaminated soil areas, if applicable; and
- Limiting the possible loss of topsoil by committing the available topsoil to suitable concurrent rehabilitation practices.

2.8.4.3.5 Landscape viability

To create a landscape that is self-sustaining and over time will converge to the desired ecosystem structure, function and composition, by:

- Establishing rehabilitated slopes and drainage lines that will preserve vital resources such as growth medium and nutrients as far as possible;
- Ensuring that drainage lines created on the rehabilitated surfaces will not scour and be sources of head cuts;
- Ensuring that pre-mining drainage lines that formed an integral part of wetland and pan systems are recreated towards reinstating the functionality of these systems;
- Placing suitable growth medium of sufficient depths to sustain croplands (cultivation), pastures and/or indigenous vegetation growth in line with identified end land uses; and
- Ensuring that the growth medium has the required organic content and the potential to sustain microbial activity to ensure infiltration, limit runoff and improved soil stability.

2.8.4.3.6 Aesthetic quality

To leave behind a rehabilitated mine site that, in general, is not only neat and tidy giving an acceptable overall aesthetic appearance, but which in terms of this attribute is also aligned to the respective land use/s, by:

- Tidying-up the rehabilitated mine sites by removing demolition waste, rubble, etc.;
- Shaping and levelling rehabilitated areas to create landforms that emulate the surroundings and would facilitate surface drainage;
- Ensuring that the rehabilitated mine site is free draining and disturbed areas are suitably vegetated where feasible;
- Shaping of haul roads and hard stand (compacted) areas to roughly emulate the surrounding surface topography; and
- Vegetating the above rehabilitated areas, as required, to be aesthetically pleasing.

2.8.4.3.7 Biodiversity

To encourage, where appropriate, the re-establishment of indigenous vegetation on the rehabilitated mine sites such that the ecological integrity of the surrounding terrestrial and aquatic environments are enhanced, by:

- Stabilising disturbed areas to prevent erosion in the short- to medium-term until a suitable vegetation cover has established;
- Establishing viable self-sustaining vegetation communities that will encourage the re-introduction of local fauna, as far as possible; and
- Assessing whether the rehabilitated facilities, with limited intervention and change, could be adapted to provide suitable habitats for small mammals, improving the overall biodiversity; and
- Identifying those aspects/obstacles, once site rehabilitation has been completed, which could inhibit and/or deter animal life from returning to the rehabilitated mine site and removing/correcting where possible.

2.8.4.3.8 Social

To ensure that measures and/or contributions made by the mine towards the long-term socio-economic benefit of both employees and local communities are sustainable, by:

- Ensuring a lasting net socio-economic benefit to host communities over the project lifestyle and beyond through the operation of our core business in addition to social investment;
- Communicating and negotiating with local communities, farmers and related civil structures on the closure of the mine and the possible land use/s options available for re-instatement post-closure;

- Identifying services/utilities to local farmers and/or the land claimants that are dependent on the mine that would need to be addressed prior to decommissioning; and
- Transferring appropriate skills to employees and inhabitants to enable them to sustain alternative post-mining livelihoods.

2.8.4.3.9 Mine Post Closure:

It is predicted that the pit will start decanting post closure and allowance has been made in the capital and operating costs for a water treatment plant. Any water that decants from the rehabilitated mining pits will be treated in the water treatment plant prior to release into a natural watercourse.

The location of the water treatment plant has not been determined at this point, as it is considered that water treatment will only be required towards the end of the life of mine (LOM).

2.8.4.4 Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives.

The rehabilitation plan is in alignment of the closure objectives targeting the decommissioning and rehabilitation of the mining area (opencast pits), and the decommissioning of the plant area (including all remaining disturbed areas within the site).

Table 34: Rehabilitation of mining areas at Berenice

No	Activity	Description	NEMA 1998
1	Decommissioning and rehabilitation of the mining area.	Removal of any infrastructure no longer required.	R. 983 (2014) Listed activity 22 (ii)
		Backfilling of the opencast pit with remaining overburden.	
		Shaping and compaction of the surface area to ensure that it is free draining.	
		Placement of topsoil over the backfilled void.	
		Monitoring and maintenance of all environmental aspects to ensure effective rehabilitation.	

2.8.4.4.1 Rehabilitation of the plant and associated infrastructure

The final decommissioning that will take place during the Decommissioning Phase of the Berenice Project is the rehabilitation of the plant area and related infrastructure, including all remaining disturbed areas, this phase is detailed in the table below. Only infrastructure that is intended to form part of the long term end land use will be left intact.

Table 35: Decommissioning of the remaining surface infrastructure at Berenice

No	Activity	Description	NEMA listed activity
1	Decommissioning and rehabilitation of remaining infrastructure.	Removal of infrastructure (processing plant, process water dam, workshop, weighbridge, waste yard, salvage yard, haul roads, one PCD, etc.)	R. 983 (2014) Listed activity 31
		Removal and appropriate disposal of any contaminated land.	
		Shaping of the land to ensure it is free draining (if necessary).	
		Placement of topsoil over the remaining area to be rehabilitated.	
		Monitoring and maintenance of all environmental	

2.8.4.5 Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline.

Table 36: Financial Provision

No	Description	Unit	A	B	C	D	E=A*B*C*D
			Quantity	Master Rate	Multiplication Factor	Weighting Factor 1	Amount (ZAR)
			Step 4.5	Step 4.3	Step 4.3	Step 4.4	
1	Dismantling of processing plant and related structures (Including overland conveyors and power lines)	m^3	32,198.00	12.98	1.00	1.10	459,882
2(A)	Demolition of steel buildings and structures	m^2	2,473.45	180.90	1.00	1.10	492,210
2(B)	Demolition of reinforced concrete buildings and structures	m^2	448.83	266.60	1.00	1.10	131,623
3	Rehabilitation of access roads	m^2	81,000.00	32.37	1.00	1.1	2,884,461
4(A)	Demolition and rehabilitation of electrified railway lines	m	5.00	314.20	1.00	1.1	1,728
4(B)	Demolition and rehabilitation of non- electrified railway lines	m	-	171.38	1.00	1.1	-
5	Demolition of housing and/or administration facilities	m^2	1,112.00	361.81	1.00	1.1	442,570
6	Opencast rehabilitation including final voids and ramps	ha	5.00	189,665.10	1.00	1.1	1,042,426
7	Sealing of shafts, adits and inclines	m^3	-	97.11	1.00	1.1	-
8(A)	Rehabilitation of overburden and spoils	ha	4.50	126,443.39	1.00	1.1	625,895
8(B)	Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste)	ha	-	157,482.96	1.00	1.1	-
8(C)	Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste)	ha	5.85	457,405.19	1.00	1.1	2,809,611
9	Rehabilitation of subsided areas	ha	-	105,877.30	1.00	1.1	-
10	General surface rehabilitation	ha	5.00	100,164.50	1.00	1.1	550,905
11	River diversions	ha	-	100,164.50	1.00	1.1	-
12	Fencing	m	10,578.00	114.26	1.00	1.1	1,329,469
13	Water Management		-	38,085.36	1.00	1.1	-

No	Description	Unit	A	B	C	D	E=A*B*C*D
			Quantity	Master Rate	Multiplication Factor	Weighting Factor 1	Amount (ZAR)
			Step 4.5	Step 4.3	Step 4.3	Step 4.4	
14	2 to 3 Years of Maintenance and Aftercare	ha	42.90	13,329.87	1.00	1.1	629,094
15 (A)	Specialist study	Sum	-	-	-	1.1	-
15 (B)	Specialist study	Sum	-	-	-	1.1	-
Sub Total 1							**11,399,873**
(Sum of items 1 to 15 above)							
1	Preliminary and General	12.5% of Sub-Total 1	**Weighting factor 2 (Step 4.4)**			1.05	1,196,987
2	Administration and supervision costs	6.0% of Sub-total 1					683,992
3	Engineering drawings and specifications	2.0% of Sub-total 1					227,997
4	Engineering and procurement of specialist work	2.5% of Sub-total 1					284,997
5	Development of a closure plan	2.5% of Sub-total 1					284,997
6	Final groundwater modelling						
Sub-Total 2							**14,078,843**
(Sub-total 1 plus sum of management and administrative items, 1 to 6 above)							
VAT (14%)							1,971,038
Grand Total (Subtotal 3 plus VAT)							**16,049,881**

2.8.4.6 *Calculate and state the financial liability for the life of mine in accordance with the applicable guideline*

Table 37: Environmental Liability for the life of mine

Category	Budget Year 01	Budget Year 02	Budget Year 03	Budget Year 04	Budget Year 05	Budget Year 06	Budget Year 07	Budget Year 08	Budget Year 09	Budget Year 10
Environmental Liability (Reg 11 (1) (g) (iv))										
Quantum Rehab Guarantee	14,078,843	-	-	-	-	-	-	-	-	-
Mine Closure Provision	3,750,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000
Total Rehab Funds Available	**17,828,843**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**
Water Treatment Plant Provision	-	-	-	-	-	-	-	-	-	-
Total Environmental Provision	**17,828,843**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**
Cost to Mitigate Socio-Eco Conditions of DAP[4]	1,500,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Total Environmental Related	**19,328,843**	**7,000,000**	**7,000,000**	**7,000,000**	**7,000,000**	**7,000,000**	**7,000,000**	**7,000,000**	**7,000,000**	**7,000,000**
Category	**Budget Year 11**	**Budget Year 12**	**Budget Year 13**	**Budget Year 14**	**Budget Year 15**	**Budget Year 16**	**Budget Year 17**	**Budget Year 18**	**Budget Year 19**	**Budget Year 20**
Environmental Liability (Reg 11 (1) (g) (iv))										
Quantum Rehab Guarantee	-	-	-	-	-	-	-	-	-	-
Mine Closure Provision	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000
Total Rehab Funds Available	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**
Water Treatment Plant Provision	-	-	-	-	-	-	-	-	-	-
Total Environmental Provision	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**
Cost to Mitigate Socio-Eco Conditions of DAP	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Total Environmental Related	**7,000,000**	**7,000,000**	**7,000,000**	**7,000,000**	**7,000,000**	**7,000,000**	**7,000,000**	**7,000,000**	**7,000,000**	**7,000,000**

[4] Directly Affected Persons

Category	Budget Year 21	Budget Year 22	Budget Year 23	Budget Year 24	Budget Year 25	Budget Year 26	Budget Year 27	Budget Year 28	Budget Year 29	Budget Year 30	Total
Environmental Liability (Reg 11 (1) (g) (iv))											
Quantum Rehab Guarantee	-	-	-	-	-	-	-	-	-	-	**14,078,843**
Mine Closure Provision	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	**148,750,000**
Total Rehab Funds Available	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**162,828,843**
Water Treatment Plant Provision	-	-	-	-	-	-	-	-	-	-	**-**
Total Environmental Provision	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**5,000,000**	**162,828,843**
Cost to Mitigate Socio-Eco Conditions of DAP	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	59,500,000
Total Environmental Related	**7,000,000**	**7,000,000**	**7,000,000**	**7,000,000**	**7,000,000**	**7,000,000**	**7,000,000**	**7,000,000**	**7,000,000**	**7,000,000**	**222,328,843**

2.8.4.7 Summary of Estimated Environmental liability, Rehabilitation Costs and socio-economic conditions

Category	Cost Estimate
a) Progressive total for rehabilitation	R162,828,843
b) Cost to mitigate socio-economic conditions of directly affected persons	R 59,500,000
Total Costs	R222,328,843

2.8.4.8 Confirm that the financial provision will be provided as determined.

The Financial Provision for the closure liability will be provided for over the life of the mine as required by DMR. The application will submit a bank guarantee to the Department of Mineral Resources. The financial provision and the closure cost is also updated on an annual basis and submitted to the DMR for approval.

2.9 Mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon, including:

Monitoring of Impact Management Actions, Monitoring and reporting frequency, Responsible persons; Time period for implementing impact management actions and Mechanism for monitoring compliance

The existing management team at Universal Coal Development II will oversee the proposed coal mining operations. The key personnel to ensure compliance with this EMP report will be the operations executive, the environmental manager and the stakeholder development manager. As a minimum, these roles as they relate to the implementation of monitoring programmes and management activities will include:

- Environmental site manager:
  - ensure that the monitoring programmes and audits are scoped and included in the annual mine budget;
  - identify and appoint appropriately qualified specialists/engineers to undertake the programmes;
  - appoint specialists in a timeously manner to ensure work can be carried out to acceptable standards;
- Human Resource department:
  - manage labour-related aspects for the mine;
  - liaise with the relevant structures in terms of the commitments in the SLP;
  - ensure that commitments in the SLP are developed and implemented in a timeously fashion;
  - establish and maintain good working relations with surrounding communities and landowners;
  - facilitate stakeholder communication and information-sharing mechanisms (quarterly stakeholder meetings will be held as a minimum); and
  - Facilitate grievance mechanisms.

Table 38: Impacts requiring monitoring programmes and reporting frequency

IMPACTS REQUIRING MONITORING PROGRAMMES	ASPECT TO BE AFFECTED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY
SOURCE ACTIVITY: Construction, Operation and decommissioning of the proposed open pit mining and related activities.				
• Constructions Phase: The clearance of vegetation and establishment of the pits will alter drainage patterns of the surface water runoff. • Operational phase: The operation and utilisation of diversion berms and trenches (around the plant area, the opencast area and the workshop area) will redirect surface water either to dirty water management or clean water management area. Oil and hydrocarbon spillages may pollute the surface water runoff. The pan on OC1 will be destroyed by the mining activity. Offset mitigation measures should be implemented. • Decommissioning phase: As the water management infrastructure will only be decommissioned after all the other infrastructure has been decommissioned.	Surface water and pans	Surface water monitoring: Sampling Upstream and downstream of the Brak River (since its non-perennial sediment analysis should also be done). The PES of the pans on site should be monitored as and when they have water	Hydrology and Ecology specialists should be appointed to undertake the monitoring and result of such monitoring should be submitted to the Environmental Manager	Monitoring & Sampling Frequency: During the operational and construction phase, the Brak River will be sampled on a monthly basis. Sampling for Aquatic Ecological Monitoring of the pans not destroyed during the mining will occur twice per annum Reporting: Monthly: Internal data report. Quarterly: Data report to authorities (DWS). Annually: Annual status report.

IMPACTS REQUIRING MONITORING PROGRAMMES	ASPECT TO BE AFFECTED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY
• Construction Phase: The clearance of vegetation and establishment of the pits will alter drainage patterns, runoff and infiltration. The removal of soils and hard's will affect the water table. • Operational phase: The groundwater table will be lowered due to water ingress in the opencast pit. Surface water runoff that may come into contact with hydrocarbon material or any unattended to spillage may infiltrate and contaminate groundwater resources, in the event of any spillages. The ingress water in pits will be treated at the water plant prior to release into the environment. • Decommissioning phase: Oils and hydrocarbons from vehicles will act as pollutants which may infiltrate and pollute the groundwater. Rehabilitation of the open pits can lead to decanting of water into the pits. Seepage from backfilled material can affect the water quality as well as increase the risk of acid mine drainage	Groundwater	Ground water monitoring: Sampling of boreholes (quality and quantity). There are a number of boreholes on and off the site. It is recommended that since the pollution plume will have 2km radius from the pits UCDII should liaise with farmers of the affected areas and add their boreholes to the monitoring program	A groundwater specialist should be appointed to conduct the water monitoring as well as use of an accredited lab. Result of the water monitoring will be submitted to the Environmental Manager	Monitoring & Sampling Frequency: Quarterly sampling of boreholes. Additional specifications will be added as conditions from the WULA. In terms of flow, all water uses and discharges will be measured on an on-going basis and the total calculated on the last day of every month. Reporting: Quarterly: Ground water monitoring report to UCDII from the appointed specialist and UCDII will report the findings to DWS. Annually: An annual report with evaluated results from the cumulative monitoring result on groundwater quality and quantity should be submitted.
• Construction Phase: There will be extensive vegetation clearance, dust generation from the construction activities and increased vehicle movement on grave roads will affect the indigenous vegetation on site. Cleared areas will be prone to alien invasive species • Operational & Decommissioning phase: Dust may be generated from the utilisation of the haul roads and during the backfilling- and decommissioning process, which may settle on the vegetation and affect the natural plant functions.	Flora	Prior to construction a tree removal permit will be required. Flora monitoring: monitoring and inspections of undisturbed indigenous flora, vegetation cover on disturbed areas, growth of invasive species and weeds, Endangered & Red data species.	Ecology specialist to be appointed to undertake the permit application. An alien invasive management plan should be designed and implemented by the ECO and Environmental Manager	Monitoring Frequency: ECO to monitor tree removal including illegal tree removal by employees, vegetation clearances and alien invasive plant growth. This should be done monthly during construction and after that quarterly or on a seasonal basis. Reporting: Annually: Internal reporting on the status of the vegetation cover. Internal audits to be included in the EMP performance assessment conducted every two years.

IMPACTS REQUIRING MONITORING PROGRAMMES	ASPECT TO BE AFFECTED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY
• Construction phase: The increase in human activities, site clearances, construction vehicles and machinery will destroy habitats as well as cause displacement of animals due. Poaching is also highly likely dude to the increase in population of construction workers and job seekers. It is expected that most of the game animals will be relocated from the site. • Operational phase: The increased human activity, noise generation and lighting from the processing plant may frighten the fauna on the farms. Poaching is also highly likely dude to the increase in population of workers and job seekers. • Decommissioning phase: Human activities including poaching and decommissioning activities on site may frighten fauna.	Fauna	Animal monitoring: Field assessments to investigate displacement of fauna, a record of accidental animal killings and poaching, investigate and record unauthorised snares and traps. Relocation, catch and release for injured fauna as well as relocation to conservation areas and habitat reconstruction where possible	Suitably qualified personnel must assist in the relocation of the game animals to areas of conservation. The ECO and employees will be responsible for the safety of fauna on the site and reporting will be done to the Environmental Manager	Monitoring: an Ecologist should be appointed to conduct regular surveys throughout the life of mine. Daily siting's must be recorded on an incident basis. Reporting: Annually: The ecology survey report will be used in conjunction with the faunal reports and submitted to management. Internal audits and incident reports should be included in the EMP performance assessment conducted every two years.

IMPACTS REQUIRING MONITORING PROGRAMMES	ASPECT TO BE AFFECTED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY
• Construction: During sit establishment soils will be stripped and soil stockpiles, these stockpiles will be vulnerable to alien invasive species, oil and hydrocarbon spillages will pollute the soils and alter the structure and functioning of the soils. • Operational phase: As mining progresses and more soil stockpiles are created, the soil will be prone to weeds establishing which will compromise the integrity of the soil, even when replaced for rehabilitation. Vehicles and machinery may leak or spill hydrocarbons in areas of use. This will pollute the soils and alter the structure and functioning of the soils. • Decommissioning phase: The topsoil will be places after the open pit areas have been backfilled. Rehabilitation activities will result in compaction due to the movement of vehicles and machinery dismantling which will lead to the degradation of soils and the land capability if not monitored and properly managed. A soil specialist must be appointed post rehabilitation to monitor the rehabilitation efforts.	Soil	Soil monitoring: Visual inspection of soils on roads, topsoil stockpiles and construction sites. Revegetation of topsoil's should be done immediately to avoid loses due to wind and water erosion as the area is prone to flash floods.	ECO and Environmental Manager	Monitoring: Inspections of soil for spillages, signs of erosion and alien invasive and weed encroachment should be conducted on a weekly basis. Reporting: Monthly: SHEQ Inspection reports. Internal audits to be included in the EMP performance assessment conducted every two years.
• Construction Phase: there will be extensive vegetation clearance, dust generation from the construction activities and increased vehicle movement on grave roads will affect the indigenous vegetation on site • Operational phase: Blasting, coal stripping and haulage will generate dust at the open pit which on windy days will migrate from the pit to the surrounding areas. • Decommissioning phase: Dust may be generated as a result of the decommissioning (removal of redundant infrastructure) and rehabilitation activities and may migrate to surrounding areas.	Air Quality	Air Quality Monitoring: Dust Monitoring on the site using dust buckets and PM10 monitoring, regular internal monitoring by SHEQ. Fallout dust should be tested for particulates at an accredited laboratory	Air Quality Specialist who will submit the reports to the Environmental Manager. The SHEQ team will also conduct regular internal checks	Sampling and Monitoring Frequency: Dust samples will be taken on a monthly basis. Reporting: Monthly: Internal reporting. External submissions: Audit Report and Data report submitted to DMR as part of the EMP performance assessment conducted every two years.

IMPACTS REQUIRING MONITORING PROGRAMMES	ASPECT TO BE AFFECTED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY
• Construction Phase: Increased noise levels due to vehicle movement and hauling of material. • Operational phase: The major sources of noise relating to mining including blasting of the overburden, conveying of the coal and traffic within and off the site. • Decommissioning phase: Activities anticipated to cause noise impacts during the decommissioning phase include the demolishing of infrastructure, loading, hauling, placing and shaping of any remaining waste and discard dumps; loading, hauling, placing and shaping of topsoil (all disturbed areas, including stockpile sites and demolished infrastructure).	Noise	Noise monitoring at the open pit areas and baseline noise measurement of the whole area as all activities within the mining area will add to the cumulative increase in noise levels	SHEQ and a specialist who will assess the nose levels at the plant will submit their report to the Environmental Manager	Monitoring: Noise sampling will be conducted on a monthly basis. Reporting: The results and findings should be documented in monthly reports and be utilised for the annual internal EMP PA and the EMP performance assessment conducted every two years.
• Operational phase: Removal and construction of temporary overburden stockpiles as mining progresses (this may include the drilling and blasting of hard overburden to expose the coal).	Geology	Blasting: Ground vibrations monitoring	Environmental Manager	Monitoring: Ground vibrations will be measured annually. Reporting: Results must be included external EMP performance assessment conducted every two years
	Geology	Subsidence and earth movement monitoring.	Environmental Manager	Monitoring: Concurrently with mining activities throughout the entire LOM until closure has been obtained. Reporting: Results must be included in external EMP performance assessment conducted every two year
SOURCE ACTIVITY: Construction, operation and decommissioning of the Processing Plant				

IMPACTS REQUIRING MONITORING PROGRAMMES	ASPECT TO BE AFFECTED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY
• Construction phase: Potential Spillages, leakages of hydrocarbon materials from construction vehicles and machinery, loosening of soil and dust will increase sedimentation into the Brak River as well as the pans on site. • Operational phase: The Brak River and pans can be polluted by dirty water runoff from the processing plant if the water is adequately contained and channelled through dirty water channels or berms into the pollution control dam. • Decommissioning phase: Due to spillages of oils and hydrocarbons surface water runoff might be contaminated. Should surface water runoff become contaminated with spillages resulting from decommissioning activities, it should be directed to the PCD.	Surface water and pans	Surface water monitoring: Sampling Upstream and downstream of the Brak River (since its non-perennial sediment analysis should also be done). The PES of the pans on site should be monitored as and when they have water	Hydrology and Ecology specialists should be appointed to undertake the monitoring and result of such monitoring should be submitted to the Environmental Manager	Monitoring & Sampling Frequency: During the operational and construction phase, the Brak River will be sampled on a monthly basis. Sampling for Aquatic Ecological Monitoring of the pans not destroyed during the mining will occur twice per annum Reporting: Monthly: Internal data report. Quarterly: Data report to authorities (DWS). Annually: Annual status report.
• Construction phase: Oils and hydrocarbon spillages from construction vehicles or machinery (should they occur) will affect the groundwater quality. The removal of vegetation and increased soil compaction will impact on infiltration rates and increased runoff. • Operational phase: Groundwater may become contaminated in cases where polluted surface water is not remediated immediately and left to pond for extended periods of time • Decommissioning phase: Oil and hydrocarbon Spillages from vehicles and machinery utilised during decommissioning may contaminate groundwater through seepage	Groundwater	Ground water monitoring: Sampling of boreholes (quality and quantity). There are a number of boreholes on and off the site. It is recommended that since the pollution plume will have 2km radius from the pits UCDII should liaise with farmers of the affected areas and add their boreholes to the monitoring program	A groundwater specialist should be appointed to conduct the water monitoring as well as use of an accredited lab. Result of the water monitoring will be submitted to the Environmental Manager	Monitoring & Sampling Frequency: Quarterly sampling of boreholes. Additional specifications will be added as conditions from the WULA Reporting: Quarterly: Ground water monitoring report to UCDII from the appointed specialist and UCDII will report the findings to DWS. Annually: An annual report with evaluated results from the cumulative monitoring result on groundwater quality and quantity should be submitted.

IMPACTS REQUIRING MONITORING PROGRAMMES	ASPECT TO BE AFFECTED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY
• Construction phase: Vegetation clearance, dust generation from the construction activities and increased vehicle movement on grave roads will affect the indigenous vegetation on site. Cleared areas will be prone to alien invasive species • Operational phase: Increased alien invasive species growth in the disturbed surface areas and via transportation of seeds on clothing etc. if not appropriately managed or prevented alien invasive vegetation may thrive in the cleared areas impacting on the natural vegetation. • Decommissioning phase: Rehabilitated if not properly managed and monitored areas will be vulnerable to the establishment of alien invasive vegetation	Flora	Prior to construction a tree removal permit will be required. Flora monitoring: monitoring and visual inspections of undisturbed indigenous flora, vegetation cover on disturbed areas, growth of invasive species and weeds, Endangered & Red data species.	Ecology specialist to be appointed to undertake the permit application. An alien invasive management plan should be designed and implemented by the ECO and Environmental Manager	Monitoring Frequency: ECO to monitor tree removal including illegal tree removal by employees, vegetation clearances and alien invasive plant growth. This should be done monthly during construction and after that quarterly or on a seasonal basis. Reporting: Annually: Internal reporting on the status of the vegetation cover. Internal audits to be included in the EMP performance assessment conducted every two years.
• Construction phase: The increase in human activities, site clearances, construction vehicles and machinery will destroy habitats as well as cause displacement of animals due. Poaching is also highly likely dude to the increase in population of construction workers and job seekers. It is expected that most of the game animals will be relocated from the site. • Operational phase: The increased human activity, noise generation and lighting from the processing plant may frighten the fauna on the farms. Poaching is also highly likely dude to the increase in population of workers and job seekers. • Decommissioning phase: Human activities including poaching and decommissioning activities on site may frighten fauna.	Fauna	Animal monitoring: Field assessments to investigate displacement of fauna, a record of accidental animal killings and poaching, investigate and record unauthorised snares and traps. Relocation, catch and release for injured fauna as well as relocation to conservation areas and habitat reconstruction where possible	Suitably qualified personnel must assist in the relocation of the game animals to areas of conservation. The ECO and employees will be responsible for the safety of fauna on the site and reporting will be done to the Environmental Manager	Monitoring: an Ecologist should be appointed to conduct regular surveys throughout the life of mine. Daily siting's must be recorded on an incident basis. Reporting: Annually: The ecology survey report will be used in conjunction with the faunal reports and submitted to management. Internal audits and incident reports should be included in the EMP performance assessment conducted every two years.

IMPACTS REQUIRING MONITORING PROGRAMMES	ASPECT TO BE AFFECTED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY
• Construction phase: Soil stripped to clear land for the construction of the plant will be removed and stockpiled. Operational phase: Soils may be affected by spillages from the plant. Oils and Hydrocarbon spillages from operational vehicles may contaminate the soils if not removed and bio-remediated timeously. It is crucial to bio remediate soils to minimise top soil loss. Contamination of soils may also occur during regular standard maintenance of the plant • Decommissioning phase: Soils may be contaminated by spillages from the plant as the water will contain carbon material from the coal washing and sulphides. Rehabilitation activities will result in compaction due to the movement of vehicles and machinery dismantling which will lead to the degradation of soils and the land capability if not monitored and properly managed. A soil specialist must be appointed post rehabilitation to monitor the rehabilitation efforts	Soil	Soil monitoring: Visual inspection of soils on roads, topsoil stockpiles and construction sites. Revegetation of topsoil's should be done immediately to avoid loses due to wind and water erosion as the area is prone to flash floods.	ECO and Environmental Manager	Monitoring: Inspections of soil for spillages, signs of erosion and alien invasive and weed encroachment should be conducted on a weekly basis. Reporting: Monthly: SHEQ Inspection reports. Internal audits to be included in the EMP performance assessment conducted every two years.

IMPACTS REQUIRING MONITORING PROGRAMMES	ASPECT TO BE AFFECTED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY
• Construction phase: Construction activities including movement of vehicles on gravel roads, site clearances will expose surfaces through the removal of vegetation will increase the rates of erosion, dust generation and vulnerability to natural forces like wind and surface water runoff. • Operational phase: Vehicles movement and coal dust from conveyor belt to the plant as well as the operation of the plant will generate dust. Intensive dust suppression on gravel roads should be implemented and haul vehicles should follow designated pathways. • Decommissioning phase: Dust will be generated by the operation of vehicles and machinery used for the rehabilitation and decommissioning activities. Un-vegetated soils in rehabilitated areas will be vulnerable to wind and water erosion, reducing their potential through loss of minerals. Re-Vegetation should be implemented immediately after rehabilitation.	Air Quality	Air Quality Monitoring: Dust Monitoring on the site using dust buckets and PM10 monitoring, regular internal monitoring by SHEQ. Fallout dust should be tested for particulates at an accredited laboratory	Air Quality Specialist who will submit the reports to the Environmental Manager. The SHEQ team will also conduct regular internal checks	Sampling and Monitoring Frequency: Dust samples will be taken on a monthly basis. Reporting: Monthly: Internal reporting. External submissions: Audit Report and Data report submitted to DMR as part of the EMP performance assessment conducted every two year
• Construction phase: Construction vehicles will generate noise, and the noise generated may pose a nuisance to nearby farm owners and surrounding land occupants. • Operational phase: Noise levels will increase at the plant and due to operation of the plant which will increase ambient noise levels in the area. The increase in noise levels at the plant can pose health issues for the employees working at the plant should proper PPE not be used and the increase in noise level may pose as a nuisance to surrounding community and residents. • Decommissioning phase: Noise will be generated by the operation of vehicles and machinery used for the rehabilitation and decommissioning activities	Noise	Noise monitoring at the plant and baseline noise measurement of the whole area as all activities within the mining area will add to the cumulative increase in noise levels	SHEQ and a specialist who will assess the nose levels at the plant will submit their report to the Environmental Manager	Monitoring: Noise sampling will be conducted on a monthly basis. Reporting: The results and findings should be documented in monthly reports and be utilised for the annual internal EMP PA and the EMP performance assessment conducted every two years.

IMPACTS REQUIRING MONITORING PROGRAMMES	ASPECT TO BE AFFECTED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY
SOURCE ACTIVITY: Construction, operation and decommissioning of the PCD and water management infrastructure				
• Construction phase: Site clearance of vegetation and levelling of land for the construction of the PCD may alter drainage patterns of the surface water runoff. Surface water quality may also be impacted on through the spillages and leakages of hydrocarbon materials from construction vehicles and machinery. • Operational phase: Surface water may be polluted should there be an incident where PCD spillage from the dam is not contained within the stormwater management infrastructure	Surface water and pans	Surface water monitoring: Sampling Upstream and downstream of the Brak River (since its non-perennial sediment analysis should also be done). The PES of the pans on site should be monitored as and when they have water	Hydrology and Ecology specialists should be appointed to undertake the monitoring and result of such monitoring should be submitted to the Environmental Manager	Monitoring & Sampling Frequency: During the operational and construction phase, the Brak River will be sampled on a monthly basis. Sampling for Aquatic Ecological Monitoring of the pans not destroyed during the mining will occur twice per annum. The water levels of the proposed PCDs will also be surveyed on a monthly basis, once they become operational Reporting: Monthly: Internal data report. Quarterly: Data report to authorities (DWS). Annually: Annual status report.
• Construction phase: Oils and hydrocarbon spillages from construction vehicles or machinery (should they occur) will affect the groundwater quality. The removal of vegetation and increased soil compaction will impact on infiltration rates and increased runoff. Operational phase: Should the PCD 1 not be HDPE lined with the appropriate lining materials or should a breach in the lining occur, seepage from the PCDs may contaminate the groundwater regime. Seepage to groundwater may also occur in the unlikely event of a spillage from one or both of the PCD.	Groundwater	Ground water monitoring: Sampling of boreholes (quality and quantity). There are a number of boreholes on and off the site. It is recommended that since the pollution plume will have 2km radius from the pits UCDII should liaise with farmers of the affected areas and add their boreholes to the monitoring program	A groundwater specialist should be appointed to conduct the water monitoring as well as use of an accredited lab. Result of the water monitoring will be submitted to the Environmental Manager	Monitoring & Sampling Frequency: Quarterly sampling of boreholes. Additional specifications will be added as conditions from the WULA. In terms of flow, all water uses and discharges will be measured on an on-going basis and the total calculated on the last day of every month. Reporting: Quarterly: Ground water monitoring report to UCDII from the appointed specialist and UCDII will report the findings to DWS. Annually: An annual report with evaluated results from the cumulative monitoring result on groundwater quality and quantity should be submitted.

IMPACTS REQUIRING MONITORING PROGRAMMES	ASPECT TO BE AFFECTED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY
• Construction phase: Vegetation clearance, dust generation from the construction activities and increased vehicle movement on grave roads will affect the indigenous vegetation on site. Cleared areas will be prone to alien invasive species • Operational phase: Increased alien invasive species growth in the disturbed surface areas and via transportation of seeds on clothing etc. if not appropriately managed or prevented alien invasive vegetation may thrive in the cleared areas impacting on the natural vegetation. • Decommissioning phase: Rehabilitated if not properly managed and monitored areas will be vulnerable to the establishment of alien invasive vegetation	Flora	Prior to construction a tree removal permit will be required. Flora monitoring: monitoring and visual inspections of undisturbed indigenous flora, vegetation cover on disturbed areas, growth of invasive species and weeds, Endangered & Red data species.	Ecology specialist to be appointed to undertake the permit application. An alien invasive management plan should be designed and implemented by the ECO and Environmental Manager	Monitoring Frequency: ECO to monitor tree removal including illegal tree removal by employees, vegetation clearances and alien invasive plant growth. This should be done monthly during construction and after that quarterly or on a seasonal basis. Reporting: Annually: Internal reporting on the status of the vegetation cover. Internal audits to be included in the EMP performance assessment conducted every two years.
• Construction phase: The increase in human activities, site clearances, construction vehicles and machinery will destroy habitats as well as cause displacement of animals due. Poaching is also highly likely dude to the increase in population of construction workers and job seekers. It is expected that most of the game animals will be relocated from the site. Operational phase: .Poaching is also highly likely dude to the increase in population of workers and job seekers. Decommissioning phase: Human activities including poaching and decommissioning activities on site may frighten fauna.	Fauna	Animal monitoring: Field assessments to investigate displacement of fauna, a record of accidental animal killings and poaching, investigate and record unauthorised snares and traps. Relocation, catch and release for injured fauna as well as relocation to conservation areas and habitat reconstruction where possible	Suitably qualified personnel must assist in the relocation of the game animals to areas of conservation. The ECO and employees will be responsible for the safety of fauna on the site and reporting will be done to the Environmental Manager	Monitoring: an Ecologist should be appointed to conduct regular surveys throughout the life of mine. Daily siting's must be recorded on an incident basis. Reporting: Annually: The ecology survey report will be used in conjunction with the faunal reports and submitted to management. Internal audits and incident reports should be included in the EMP performance assessment conducted every two year

IMPACTS REQUIRING MONITORING PROGRAMMES	ASPECT TO BE AFFECTED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY
• Construction phase: Soil stripped to clear land for the construction of the pollution control dam will be removed and stockpiled. • Operational phase: Soils may be affected should a spillage occur from PCD 1. Soils may be affected by spillages from the plant. Oils and Hydrocarbon spillages from operational vehicles may contaminate the soils if not removed and bio-remediated timeously • Decommissioning phase: Soils may be contaminated by spillages from the plant as the water will contain carbon material from the coal washing and sulphides. Rehabilitation activities will result in compaction due to the movement of vehicles and machinery dismantling which will lead to the degradation of soils and the land capability if not monitored and properly managed.	Soil	Soil monitoring: Visual inspection of soils on roads, topsoil stockpiles and construction sites. Revegetation of topsoil's should be done immediately to avoid loses due to wind and water erosion as the area is prone to flash floods.	ECO and Environmental Manager	Monitoring: Inspections of soil for spillages, signs of erosion and alien invasive and weed encroachment should be conducted on a weekly basis. Reporting: Monthly: SHEQ Inspection reports. Internal audits to be included in the EMP performance assessment conducted every two years.
• Construction phase: Construction activities including movement of vehicles on gravel roads, site clearances will expose surfaces through the removal of vegetation will increase the rates of erosion, dust generation and vulnerability to natural forces like wind and surface water runoff. • Operational phase: Vehicles accessing the PCD may generate dust, intensive dust suppression on gravel roads should be implemented and haul vehicles should follow designated pathways. • Decommissioning phase: Dust will be generated by the operation of vehicles and machinery used for the rehabilitation and decommissioning activities. Un-vegetated soils in rehabilitated areas will be vulnerable to wind and water erosion, reducing their potential through loss of minerals. Re-Vegetation should be implemented immediately after rehabilitation.	Air Quality	Air Quality Monitoring: Dust Monitoring on the site using dust buckets and PM10 monitoring, regular internal monitoring by SHEQ. Fallout dust should be tested for particulates at an accredited laboratory	Air Quality Specialist who will submit the reports to the Environmental Manager. The SHEQ team will also conduct regular internal checks	Sampling and Monitoring Frequency: Dust samples will be taken on a monthly basis. Reporting: Monthly: Internal reporting. External submissions: Audit Report and Data report submitted to DMR as part of the EMP performance assessment conducted every two years.

IMPACTS REQUIRING MONITORING PROGRAMMES	ASPECT TO BE AFFECTED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY
• Construction phase: Construction vehicles will generate noise, and the noise generated may pose a nuisance to nearby farm owners and surrounding land occupants. Decommissioning phase: Noise will be generated by the operation of vehicles and machinery used for the rehabilitation and decommissioning activities	Noise	Noise monitoring at the plant and baseline noise measurement of the whole area as all activities within the mining area will add to the cumulative increase in noise levels	SHEQ and a specialist who will assess the nose levels at the plant will submit their report to the Environmental Manager	Monitoring: Noise sampling will be conducted on a monthly basis. Reporting: The results and findings should be documented in monthly reports and be utilised for the annual internal EMP PA and the external EMP performance assessment conducted every two year
SOURCE ACTIVITY: Construction, operation and decommissioning of the water treatment plant and sewage treatment plant				
• Construction phase: The Brak River may be impacted on through the spillages and leakages of hydrocarbon materials from construction vehicles and machinery. The pans on site may be impacted on by the construction of the water treatment plant and sewage plant through contaminated water seepage. • Operational phase: The Brak River and pans may be polluted should any polluted water spillages occur from the water treatment plant or sewage treatment plant if the channels and berms designed to transport and contain dirty water to the water treatment plant are compromised. The bunding at the sewage treatment plant should be designed to contain 110% capacity should there be a malfunction the plant • Decommissioning phase: Should surface water runoff come into contact with oil and hydrocarbon spillages resulting from decommissioning activities and is not contained contamination of the Brak River and the Pans will be affected	Surface water & Pans	Surface water monitoring: Sampling Upstream and downstream of the Brak River (since its non-perennial sediment analysis should also be done). The PES of the pans on site should be monitored as and when they have water	Hydrology and Ecology specialists should be appointed to undertake the monitoring and result of such monitoring should be submitted to the Environmental Manager	Monitoring & Sampling Frequency: During the operational and construction phase, the Brak River will be sampled on a monthly basis. Sampling for Aquatic Ecological Monitoring of the pans not destroyed during the mining will occur twice per annum Reporting: Monthly: Internal data report. Quarterly: Data report to authorities (DWS). Annually: Annual status report.

IMPACTS REQUIRING MONITORING PROGRAMMES	ASPECT TO BE AFFECTED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY
• Construction phase: Oils and hydrocarbon spillages from construction vehicles or machinery (should they occur) will affect the groundwater quality. The removal of vegetation and increased soil compaction will impact on infiltration rates and increased runoff. • Operational phase: Groundwater may become contaminated in cases where polluted surface water is not remediated immediately and left to pond for extended periods of time • Decommissioning phase: Oil and hydrocarbon Spillages from vehicles and machinery utilised during decommissioning may contaminate groundwater through seepage	Groundwater	Ground water monitoring: Sampling of boreholes (quality and quantity). There are a number of boreholes on and off the site. It is recommended that since the pollution plume will have 2km radius from the pits UCDII should liaise with farmers of the affected areas and add their boreholes to the monitoring program	A groundwater specialist should be appointed to conduct the water monitoring as well as use of an accredited lab. Result of the water monitoring will be submitted to the Environmental Manager	Monitoring & Sampling Frequency: Quarterly sampling of boreholes. Additional specifications will be added as conditions from the WULA. In terms the water balance all flows to the plant, all water uses and discharges will be measured on an ongoing basis and the total calculated on the last day of every month. The water quality at the water plant will also be tested prior to release into the environment Reporting: Quarterly: Ground water monitoring report to UCDII from the appointed specialist and UCDII will report the findings to DWS. Annually: An annual report with evaluated results from the cumulative monitoring result on groundwater quality and quantity should be submitted.

IMPACTS REQUIRING MONITORING PROGRAMMES	ASPECT TO BE AFFECTED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY
• Construction phase: Vegetation clearance, dust generation from the construction activities and increased vehicle movement on grave roads will affect the indigenous vegetation on site. Cleared areas will be prone to alien invasive species • Operational phase: Increased alien invasive species growth in the disturbed surface areas and via transportation of seeds on clothing etc. if not appropriately managed or prevented alien invasive vegetation may thrive in the cleared areas impacting on the natural vegetation. • Decommissioning phase: Rehabilitated if not properly managed and monitored areas will be vulnerable to the establishment of alien invasive vegetation	Flora	Prior to construction a tree removal permit will be required. Flora monitoring: monitoring and visual inspections of undisturbed indigenous flora, vegetation cover on disturbed areas, growth of invasive species and weeds, Endangered & Red data species.	Ecology specialist to be appointed to undertake the permit application. An alien invasive management plan should be designed and implemented by the ECO and Environmental Manager	Monitoring Frequency: ECO to monitor tree removal including illegal tree removal by employees, vegetation clearances and alien invasive plant growth. This should be done monthly during construction and after that quarterly or on a seasonal basis. Reporting: Annually: Internal reporting on the status of the vegetation cover. Internal audits to be included in the EMP performance assessment conducted every two years.
• Construction phase: The increase in human activities, site clearances, construction vehicles and machinery will destroy habitats as well as cause displacement of animals due. Poaching is also highly likely dude to the increase in population of construction workers and job seekers. It is expected that most of the game animals will be relocated from the site. • Operational phase: The increased human activity, noise generation and lighting from the plants may frighten the fauna on the farms. Poaching is also highly likely dude to the increase in population of workers and job seekers. • Decommissioning phase: Human activities including poaching and decommissioning activities on site may frighten fauna.	Fauna	Animal monitoring: Field assessments to investigate displacement of fauna, a record of accidental animal killings and poaching, investigate and record unauthorised snares and traps. Relocation, catch and release for injured fauna as well as relocation to conservation areas and habitat reconstruction where possible	Suitably qualified personnel must assist in the relocation of the game animals to areas of conservation. The ECO and employees will be responsible for the safety of fauna on the site and reporting will be done to the Environmental Manager	Monitoring: an Ecologist should be appointed to conduct regular surveys throughout the life of mine. Daily siting's must be recorded on an incident basis. Reporting: Annually: The ecology survey report will be used in conjunction with the faunal reports and submitted to management. Internal audits and incident reports should be included in the EMP performance assessment conducted every two years.

IMPACTS REQUIRING MONITORING PROGRAMMES	ASPECT TO BE AFFECTED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY
• Construction phase: Soil stripped to clear land for the construction of the plant will be removed and stockpiled. • Operational phase: Soils may be affected should any polluted water spillages occur from the water treatment plant and sewage treatment plant or through breaches in channels to transport dirty water to the plant. Hydrocarbon spillages from operational vehicles may contaminate the soils if not removed timeously. • Decommissioning phase: Soils on surface may be contaminated through polluted water spillages from the pilot water treatment plant. Rehabilitation activities may result in some erosion of, compaction of and / or degradation of soils, if not managed.	Soil	Soil monitoring: Visual inspection of soils on roads, topsoil stockpiles and construction sites. Revegetation of topsoil's should be done immediately to avoid loses due to wind and water erosion as the area is prone to flash floods.	ECO and Environmental Manager	Monitoring: Inspections of soil for spillages, signs of erosion and alien invasive and weed encroachment should be conducted on a weekly basis. Reporting: Monthly: SHEQ Inspection reports. Internal audits to be included in the EMP performance assessment conducted every two years.
• Construction phase: Construction activities including movement of vehicles on gravel roads, site clearances will expose surfaces through the removal of vegetation will increase the rates of erosion, dust generation and vulnerability to natural forces like wind and surface water runoff. • Operational phase: Vehicles movement and coal dust from conveyor belt to the plant as well as the operation of the plant will generate dust. Intensive dust suppression on gravel roads should be implemented and haul vehicles should follow designated pathways. • Decommissioning phase: Dust will be generated by the operation of vehicles and machinery used for the rehabilitation and decommissioning activities. Un-vegetated soils in rehabilitated areas will be vulnerable to wind and water erosion, reducing their potential through loss of minerals. Re-Vegetation should be implemented immediately after rehabilitation.	Air Quality	Air Quality Monitoring: Dust Monitoring on the site using dust buckets and PM10 monitoring, regular internal monitoring by SHEQ. Fallout dust should be tested for particulates at an accredited laboratory.	Air Quality Specialist who will submit the reports to the Environmental Manager. The SHEQ team will also conduct regular internal checks	Sampling and Monitoring Frequency: Dust samples will be taken on a monthly basis. Reporting: Monthly: Internal reporting. External submissions: Audit Report and Data report submitted to DMR as part of the EMP performance assessment conducted every two years.

IMPACTS REQUIRING MONITORING PROGRAMMES	ASPECT TO BE AFFECTED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY
• Construction phase: Construction vehicles will generate noise, and the noise generated may pose a nuisance to nearby farm owners and surrounding land occupants. • Operational phase: Noise levels will increase at the water and waste plants and due to operation of the plants which will increase ambient noise levels in the area. The increase in noise levels at the plant can pose health issues for the employees working at the plants should proper PPE not be used and the increase in noise level may pose as a nuisance to surrounding community and residents. • Decommissioning phase: Noise will be generated by the operation of vehicles and machinery used for the rehabilitation and decommissioning activities	Noise	Noise monitoring at the plant and baseline noise measurement of the whole area as all activities within the mining area will add to the cumulative increase in noise levels	SHEQ and a specialist who will assess the nose levels at the plant will submit their report to the Environmental Manager	Monitoring: Noise sampling will be conducted on a monthly basis. Reporting: The results and findings should be documented in monthly reports and be utilised for the annual internal EMP PA and the EMP performance assessment conducted every two years.
Source Activity: Concurrent Rehabilitation				
• Concurrent rehabilitation: Potential Spillages, leakages of hydrocarbon materials from construction vehicles and machinery, loosening of soil and dust will increase sedimentation into the Brak River as well as the pans on site.	Surface water and Pans	Surface water monitoring: Sampling Upstream and downstream of the Brak River (since its non-perennial sediment analysis should also be done). The PES of the pans on site should be monitored as and when they have water	Hydrology and Ecology specialists should be appointed to undertake the monitoring and result of such monitoring should be submitted to the Environmental Manager	Monitoring & Sampling Frequency: During the operational and construction phase, the Brak River will be sampled on a monthly basis. Sampling for Aquatic Ecological Monitoring of the pans not destroyed during the mining will occur twice per annum Reporting: Monthly: Internal data report. Quarterly: Data report to authorities (DWS). Annually: Annual status report.

IMPACTS REQUIRING MONITORING PROGRAMMES	ASPECT TO BE AFFECTED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY
• Concurrent Rehabilitation: The backfilling of the open cast areas will see an increase in the potential for seepage contamination into the groundwater regime and possible decanting in the pits. This may impact on / add to the development of a pollution plume. Oil spillages and hydrocarbon spillages from vehicles and machinery used to backfill the pits may contaminate groundwater through seepage.	Groundwater	Ground water monitoring: Sampling of boreholes (quality and quantity). There are a number of boreholes on and off the site. It is recommended that since the pollution plume will have 2km radius from the pits UCDII should liaise with farmers of the affected areas and add their boreholes to the monitoring program	A groundwater specialist should be appointed to conduct the water monitoring as well as use of an accredited lab. Result of the water monitoring will be submitted to the Environmental Manager	Monitoring & Sampling Frequency: Quarterly sampling of boreholes. Additional specifications will be added as conditions from the WULA Reporting: Quarterly: Ground water monitoring report to UCDII from the appointed specialist and UCDII will report the findings to DWS. Annually: An annual report with evaluated results from the cumulative monitoring result on groundwater quality and quantity should be submitted.
• Concurrent rehabilitation: The mined areas in the open cast pits may be susceptible to alien invasive species growth. Dust generated by the rehabilitation activities (vehicle and machinery movement), as well as the backfilling and placing of soils in rehabilitated areas may impact vegetation growth by settling on plants.	Flora	Prior to construction a tree removal permit will be required. Flora monitoring: monitoring and visual inspections of undisturbed indigenous flora, vegetation cover on disturbed areas, growth of invasive species and weeds, Endangered & Red data species.	Ecology specialist to be appointed to undertake the revegetation process. An alien invasive management plan should be designed and implemented by the ECO and Environmental Manager	Monitoring Frequency: ECO to monitor tree removal including illegal tree removal by employees, vegetation clearances and alien invasive plant growth. This should be done monthly during construction and after that quarterly or on a seasonal basis. Reporting: Annually: Internal reporting on the status of the vegetation cover. Internal audits to be included in the EMP performance assessment conducted every two years.

IMPACTS REQUIRING MONITORING PROGRAMMES	ASPECT TO BE AFFECTED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY
• Concurrent rehabilitation: Increase in vehicle movement and human activity during the backfilling and rehabilitation activities on site may frighten and displace fauna. Animals can also fall into voids not fully rehabilitated. The areas should be properly demarcated and temporary fencing might be implemented.	Fauna	Animal monitoring: Field assessments to investigate displacement of fauna, a record of accidental animal killings and poaching, investigate and record unauthorised snares and traps. Relocation, catch and release for injured fauna as well as relocation to conservation areas and habitat reconstruction where possible	Suitably qualified personnel must assist in the relocation of the game animals to areas of conservation. The ECO and employees will be responsible for the safety of fauna on the site and reporting will be done to the Environmental Manager	Monitoring: an Ecologist should be appointed to conduct regular surveys throughout the life of mine. Daily siting's must be recorded on an incident basis. Reporting: Annually: The ecology survey report will be used in conjunction with the faunal reports and submitted to management. Internal audits and incident reports should be included in the EMP performance assessment conducted every two years.
Concurrent rehabilitation: Hydrocarbon leakages from vehicles and machinery used to backfill the open cast pits may contaminate the surrounding soils. Soil in the vicinity of the backfilled open cast areas can be compacted by rehabilitation activities.	Soil	Soil monitoring: Visual inspection of soils on roads, topsoil stockpiles and construction sites. Revegetation of topsoil's should be done immediately to avoid loses due to wind and water erosion as the area is prone to flash floods.	ECO and Environmental Manager	Monitoring: Success of indigenous revegetation and alien invasive and weed encroachment should be conducted on a weekly basis. Reporting: Monthly: SHEQ Inspection reports. Internal audits to be included in the EMP performance assessment conducted every two years.

IMPACTS REQUIRING MONITORING PROGRAMMES	ASPECT TO BE AFFECTED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY
Concurrent Rehabilitation: Dust will be generated by the operation of vehicles and machinery used for the rehabilitation and backfilling of the pits. Soil in the backfilled areas under rehabilitation will be vulnerable to erosions due the elements (wind). The soil is placed in rehabilitation areas will need to be re-vegetated immediately.	Air Quality	Air Quality Monitoring: Dust Monitoring on the site using dust buckets and PM10 monitoring, regular internal monitoring by SHEQ. Fallout dust should be tested for particulates at an accredited laboratory	Air Quality Specialist who will submit the reports to the Environmental Manager. The SHEQ team will also conduct regular internal checks	Sampling and Monitoring Frequency: Dust samples will be taken on a monthly basis. Reporting: Monthly: Internal reporting. External submissions: Audit Report and Data report submitted to DMR as part of the EMP performance assessment conducted every two year
Decommissioning phase: Noise from vehicles and machinery operations used for the rehabilitation and decommissioning activities.	Noise	Noise monitoring	Environmental Manager	Monitoring: Noise sampling will be conducted on a monthly basis. Reporting: The results and findings should be documented in monthly reports and be utilised for the annual internal EMP PA and the EMP performance assessment conducted every two years.

2.9.1 Quantitative Monitoring Parameters

2.9.1.1 Water Monitoring Parameters

Water Quality Parameters	**Unit of Measurements**	**Timeframes for Measurement**
Monthly	**Quarterly**	**Annually**
pH	pH scale	□
Electric Conductivity (EC)	mS/m	□
Turbidity	NTU	□
Total Dissolved Solid (TDS)	mg/l	□
Calcium (Ca)	mg/l	□
Magnesium (Mg)	mg/l	□
Sodium (Na)	mg/l	□
Potassium (K)	mg/l	□
Iron (Fe)	mg/l	□
Lead (Pb)	mg/l	□
Manganese (Mn)	mg/l	□
Chlorine (Cl)	mg/l	□
Sulphate (SO4)	mg/l	□
Fluoride (F)	mg/l	□
Nitrate (NO3)	mg/l	□
Phosphate (PO4)	mg/l	□
Carbonate (CO3)	mg/l	□

Chemical Oxygen Demand (COD)	mg/l	□
Bicarbonate (HCO3)	mg/l	□

2.9.1.2 Bio Monitoring

Terrestrial habitats should also be included in the bio-monitoring programme. As a minimum the indicator species, site or aspects of the following will be included in the bio-monitoring programme:

- Water quality;
- Aquatic macro-invertebrates;
- Sediments
- Terrestrial fauna (Avifauna, mammalian, terrestrial entomology, amphibian, and reptilian)
- Terrestrial flora;
- GIS analysis (Aerial Imagery)

2.9.1.3 Air Quality

Gravimetrical Dust Fallout – (milligram/square meter/day) or (mg/m2/day) (monthly 8 samples)

Site layout for the sampling points must be carried out according to the eight main compass directions; the site layout and equipment placement must be done in accordance with the ASTM standard, D 1739 – 2010, thereafter relevant sampling reference numbers will be allocated to the receptors accordingly. At each gravimetric dust fallout gauge/receptor point there is a stand built according to specification containing the dust sample collection bucket. Samples will be collected after a 1 month running period (+-30days exposure). After sample collection the samples are taken to the relevant SANAS accredited laboratory as required. A visual site investigation is done where after correlations and drawn and findings are identified and reported on.

Dust buckets of a standard size and shape are prepared and set up at locations related to the eight main compass points (currently limited to six sampling points due to sampling site in process of obtaining two more monitoring gauges) on the borders of the property so that dust can settle in them for periods of 30+/-2 days. The dust buckets are then sealed and replaced with new empty ones and send away to the SANAS accredited laboratory for analysis. The masses of the water- soluble and –insoluble components of the material collected are then determined and results are reported as mg/m2/day. This methodology is described according to South African National Standards 1929:2004 and the American Society for Testing and Materials (ASTM) Designation: D 1739-98 (2010). The results for this method of testing are obtained by gravimetrical weighing. The apparatus required include open top buckets/containers not less than 150mm in diameter with a height not less than twice its diameter. The buckets must be placed on a stand at a height of 2+/-0.2m above the ground. **Particulate matter PM10 (monthly 8 samples)**

2.10 Indicate the frequency of the submission of the performance assessment report.

UCDII's environmental management team will conduct internal performance assessments of the EMP on an annual basis and they will appoint an independent suitably qualified specialist to conduct an EMP performance assessment and compile a report, every two years.

The performance assessment will include the following:

- A desktop assessment of the approved EMP.
- Site inspection.
- Evaluation of management measures.
- Information gathering and collation.
- Verification of compliance status.
- Compilation of a performance assessment report.

The performance assessment report will include:

- Method and procedure statement.
- Qualifications and experience of audit team.
- Percentage compliance with EMP measures.
- Motivation of findings.
- Recommendations pertaining to major non-compliances noted.

The performance assessment report will provide:

- Provision of appropriate information to the management of the mine.
- The establishment and updating of the financial provision.
- Recommendations for the initiation of corrective action plans.

The independently compiled performance assessment report will be reviewed by the environment management team and once finalised a copy of the report will be submitted to the DMR and proof of submission should be received. The environmental manager should ensure corrective actions are implemented in order to rectify areas of non- compliance.

2.11 Environmental Awareness Plan

1st) Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work.

This section includes an environmental awareness plan for the mine. The plan describes how employees will be informed of environmental risks which may result from their work, the manner in which the risk must be dealt with in order to avoid pollution or degradation of the environment and the training required for general environmental awareness and the dealing of emergency situations and remediation measures for such emergencies.

All contractors that conduct work on behalf of Universal Coal Development II are bound by the content of the EMP and a contractual condition to this effect will be included in all such contracts entered into by the mine. If contractors are used, the responsibility for ensuring compliance with the EMP will remain with Universal Coal Development II.

The purpose of the environmental awareness plan is to ensure that all personnel and management understand the general environmental requirements of the site. In addition, greater environmental awareness must be communicated to personnel involved in specific activities which can have a significant impact on the environment and ensure that they are competent to carry out their tasks on the basis of appropriate education, training and/or experience. The environmental awareness plan should enable Universal Coal Development II to achieve the objectives of the environmental policy.

- On a regular basis, all aspects of the operation will be checked against the prescripts of the EMP and its supporting procedures and, if established that certain of the aspects are not addressed or impacts on the environment are not mitigated properly, it will be immediately communicated to the operational team by management.
- Should the mitigation measure not be in line with the prescripts, amendments will be made and the employees will be made aware of the changes and encouraged to adhere to such.
- All site personnel will be inducted at the site and will be taken through the EMP and other relevant legal requirements to familiarize them with same.
- Simplified signalling will be placed on site to sensitize the workers of the legal requirements attached to this EMP.

Table 39: Awareness Training Plan

Item	Aspects / Content	Timeframes
Induction & refresher training (Basic awareness training for all prior to granting access to site (e.g. short video presentation requiring registration once completed). Employees and contractors	EMP document Legal requirements First Aid Safety	Before commencement of works Upon return to work after more than a 3-week vacation

Item	Aspects / Content	Timeframes
who have not attended the training will not be allowed on site;		
Task briefings and weekly review meetings.	Allocation of tasks with environmental-related themes Review of achievement and implementation	Daily and weekly
SHE induction (Safety, Health and Environment)	personnel who will be on site for more than five days must undergo the SHE induction training; and	Before commencement of works Upon return to work after more than a 3-week vacation
Signage awareness (aide memoire)	Manual / List of signs Newsletters	Monthly
specific environmental awareness training	Procedures and standards: Training will be provided to personnel whose work activities can have a significant impact on the environment (e.g. workshops, waste handling and disposal, sanitation, etc.).	Once every quarter

To achieve the objectives of the environmental awareness plan the general contents of the training plans are as follows:

- Module 1 – Basic training plan applicable to all personnel entering the site:
    - short (15min) presentation to indicate the site layout and activities at specific business units together with their environmental aspects and potential impacts; and
    - Individuals to sign off with site security on completion in order to gain access to the site.
- Module 2 – General training plan applicable to all personnel at the site for longer than five days:
    - general understanding of the environmental setting of the mine (e.g. fauna and flora);

- Understanding the environmental impact of individuals activities on site (e.g. excessive production of waste, poor housekeeping, energy consumption, water use, noise, etc.);
- indicate potential site-specific environmental aspects and their impacts;
- Universal Coal Development II's environmental management strategy;
- identifying poor environmental management and stopping work which presents significant risks;
- reporting incidents;
- examples of poor environmental management and environmental incidents; and
- Procedures for emergency response and cleaning up minor leaks and spills.

- Module 3 – Specific training plan:
  - Environmental setting of the workplace (e.g. proximity of watercourses, vulnerability of groundwater, proximity of local communities and industries, etc.);
  - specific environmental aspects such as:
    - ✓ spillage of hydrocarbons at workshops;
    - ✓ spillage of explosive liquids in the open pits;
    - ✓ poor waste management such as mixing hazardous and general wastes, inappropriate storage and stockpiling large amounts of waste;
    - ✓ poor housekeeping practices;
    - ✓ poor working practices (e.g. not carrying out oil changes in designated bunded areas);
    - ✓ excessive noise generation and unnecessary use of hooters; and
    - ✓ Protection of heritage resources (including palaeontological resources).
  - impact of environmental aspects, for example:
    - ✓ hydrocarbon contamination resulting in loss of resource (soil, water) to downstream users;
    - ✓ groundwater contamination also resulting in loss of resource due to potential adverse aesthetic, taste and health effects; and
    - ✓ Dust impacts on local communities (nuisance and health implications).
  - Universal Coal Development II's duty of care (specifically with respect to waste management); and purpose and function of Universal Coal Development II's environmental management system

Individuals required to complete Module 3 (Specific training module) will need to complete Modules 1 and 2 first. On completion of the Module 3, individuals will be subject to a short test (written or verbal) to ensure the level of competence has been achieved. Individuals who fail the test will be allowed to re-sit the test after further training by the training department. The actual contents of the training modules will be developed based on a training needs analysis.

Key personnel will be required to undergo formal, external environmental management training (e.g. how to operate the environmental management system, waste management and legal compliance). In addition to the above Universal Coal Development II will:

- conduct refresher training/presentations on environmental issues for mine employees (permanent and contractors) at regular intervals;
- Promote environmental awareness using relevant environmental topic posters displayed at strategic locations on the mine. These topics will be changed monthly, and will be reviewed annually by the Environmental Manager to ensure relevance; and
- Participate and organise events which promote environmental awareness, some of which will be tied to national initiatives e.g. National Arbour Week, World Environment Day and National Water Week.

2.11.1 Environmental awareness training

This training will be provided to the various sections of the mine including processors and operators during the safety toolbox sessions and hence it will be on-going. The training programme and subsequently the training will be updated as and when necessary to keep everyone informed of latest developments.

Table 40:Training Targets & Standards

Type of training	Training Targets	Standards
• Induction programme – legal aspects • Specific environmental aspects: waste, water, hydro carbons, dust, material handling rehabilitation • Competency • Health and safety – dust management, emergency preparedness, first aid. • Fauna and flora protection	• Management • Supervisors • Operators • Visitors • Contractors	• Records • Standard operating procedures • Signage • Personal Protection Equipment

2.11.1.1 The Induction Programme

The mine will develop an induction programme that will include the EAP. Various topics will be covered during the training sessions/induction e.g. Environmental housekeeping, Dust minimisation, etc. It will be the responsibility of the mine manager to ensure that all employees are inducted and this will include *inter alia*;

- Administrative requirements and procedures including environmental emergency procedure
- Resource conservation and environmental reporting including other general environmental issues that require awareness raising

All new employees joining the mine after operations have started shall undergo induction as well. The induction programme (including the environmental section) shall be updated on an annual basis to ensure that trends are followed and latest developments e.g. policies are also included.

2.11.1.2 Description of solutions to risks

The above-mentioned management measures will be adhered to and all necessary action will be taken to immediately implement corrective action when an incident occurs. Each activity and associated risks are linked in aspect and impact register to relevant procedure to prevent incidental impacts. Compliance to these procedures should be seen as the duty of all staff and contractors. Management will monitor that these procedures are adhered to and the EMP is implemented.

Table 41: Risk and Mitigation

Risk	Cause	Controls / Mitigation Action
Veld fires	Smoking and discarding matches in the field	Maintain visual awareness of surroundings; smoking only in designated areas; keep a fire extinguisher on site
Property damage	Reckless driving; driving over vegetation;	Follow designated routes / pathways Awareness training Proper signage
Damage to field equipment and tools	Vehicles getting stuck in loose sands Improper use of equipment	Follow designated routes / pathways Awareness training Proper signage Training on use of equipment
Stock / agricultural produce theft/ illegal hunting by employees	Trespassing of employees onto agricultural land	Constant supervision of staff Staff will not live on site Also prevent access by public
Soil erosion on site	Trampling by employees and vehicles	Personnel will be restricted to 25m radius of borehole, away from gullies, wetlands or river banks
Damage to vegetation	Off-road driving to camp and borehole sites	Where off road driving is necessary, attempts will be made to follow existing fence lines and animal track at every possible opportunity
Flooding	Times of high runoff Climate change	Establish camp on high ground away from river or water courses
Illnesses	Contaminated water	Supply to safe drinking water

2.11.1.3 Training Records

Environmental awareness and training records will be kept at a safe and accessible place within the mine.

2.11.1.4 Review of Awareness and Training Material

The contents of all awareness and training material shall be reviewed and updated at least ones a year**.**

2.11.2 Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment.

Health, safety, environmental and community issues were considered as part of the development of the emergency and remediation procedures:

- Health issues: Water pollution, creation of dust, gases, chemicals, radiation and noise, as well any ergonomic problems associated with the equipment used at the mine.
- Safety issues: Revealing hazards, which may be present in the equipment, operating procedures, and work systems which could result in physical harm to mine employees or visitors.
- Environmental issues: Identification of all hazardous substances, hydrocarbon spillage and contamination, uncontrolled discharge, pollution, soil erosion, poor water management, overloading of trucks, poor maintenance of equipment and infrastructure.
- Community issues: Any adverse effects that site operations may have on the surrounding communities e.g. water quality, water quantity, noise, dust, erosion, etc**.**

The objectives of the Emergency Procedures are:

- To ensure emergency preparedness and a quick response in case of any emergency (the emergency and remediation procedures should be followed immediately after an unforeseen event to minimise any additional damage to the environment).
- To provide guidance to UCDII’s operations in order to meet the minimum legal framework to ensure effective environmental management whereby environmental impacts are minimised and environmental obligations are met.
- To co-ordinate the activities of all persons that have duties to perform during the emergency.
- To ensure compliance with all applicable environmental legislation.

2.11.2.1 Legal Requirements

The legal requirements represent the relevant legislation applicable, at the time of compilation of this EMPR, to the formation of this emergency procedures plan. The content of this section of the EMPR will be reviewed in terms of its applicability to legislation and changes thereto, every two (2) years.

Table 42: Applicable legislation to the emergency preparedness and response procedure.

Act / Regulation	Descript
NEMA (1998) as amended in December 2014	Section 28 of the NEMA (1998) describes the duty of care of individuals and the remediation of environmental damages.
NEMA (1998) as amended in December 2014	Section 30 of the NEMA (1998) stipulates specific requirements with regards to the control of emergency incidents.
NWA (1998)	Section 19 of the NWA (1998) describes pollution prevention and remedying the effects of pollution.
NWA (1998)	Section 20 of the NWA (1998) stipulates specific requirements with regards to the control of emergency incidents.
GN 704 under the NWA (1998)	Regulation 2 of GN 704 describes the actions to be undertaken in the event of an environmental incident.
Part IV of the MPRDA (2004) under the MPRDA (2002)	Part IV of the MPRDR (2004) details the pollution control and waste management Regulations under the MPRDA (2002) in terms of: • Pollution control and waste management. • Fire prevention. • Soil pollution and erosion control.

Possible Environmental Emergency Situations

An environmental incident can be defined as an unexpected sudden occurrence, including a major emission, fire or explosion leading to serious danger to employees, the public or potentially serious pollution which may impact on the environment.

Possible emergency scenarios that may occur at UCDII Berenice Project and lead to evacuation include but not limited to the following:

- Uncontrolled / controlled fires.
- Damage or threat of damage to buildings, plant and / or workshops.
- Any threat to property or persons.
- Natural disaster (including heavy rainfall event).
- Evacuation drills.
- Bomb and bomb threat.
- Possible hazardous chemical spill (including hydrocarbons).
- Blasting incidents.

Any other occupational SHE hazard. Several possible occupational SHE hazards that may affect the environment that may occur at UCDII's Berenice Project have been identified and include, but are not limited to:

- Transport related spillage of carbonaceous materials.
- Slope instability / collapse of high walls.
- Contamination of drinking water.
- Failure of water and / or waste management infrastructure.
- Dusty conditions.
- Blockages of clean water diversion berms / trenches resulting in clean water entering the dirty
- Water management areas, or not allowed to freely leave the mine boundary area.

Response to, and Managing of, Environmental Emergency Situations Environmental emergency situations, such as those mentioned above, are effectively managed through:

- Annual safety induction training.
- On-going safety representative training.
- Annual revision of safety induction programme.
- Annual revision of standard operating procedures.
- Immediate reporting of emergency situations.
- Immediate action to contain or minimise the effects of an incident.
- Quality of remediation actions.
- Accurate reporting and data management.

To avoid injury in the event of an emergency UCDII will establish an exit orderly procedure which all personnel will be inducted on.

2.11.2.2 Response to Emergencies

UCDII standard operating procedure should describe the procedure to be followed by the emergency coordinator, in response to an emergency, and is detailed below:

Diary of events:

- ➢ Note down all calls made / received, as well as the time;
- ➢ Note down all instructions given and time; and
- ➢ Note sequence of events.

The nature and extent of every emergency may differ and minor adaptations, changes, or additions will have to be made, as the situation dictates.

Response to identified possible emergencies has been described below.

- Fire and emergency:

  - Establish risk to life and property;
  - Receive and evaluate the situation;
  - Decide on the shutdown of the building and order the evacuation of key operational personnel;
  - Keep in constant contact with the environmental Co-ordinator in order to establish mechanical and electrical shutdown procedures;
  - Advise and maintain contact with management;
  - Be responsible for notification to law enforcement agencies;
  - Notify and direct the activities of emergency officials and teams;
  - Maintain a status list showing each area of the plant, and record the current status of each area;
  - Despatch support services as required;
  - Where possible, arrange for a nominated company photographer to record photographs of the damage caused;
  - Hand in diary of events; and
  - When deemed safe, have employees resume their normal duties.

- Uncontrolled / Controlled fires

In the event of a fire (including veld-fires), the following procedure should be followed by personnel on site:

  - Sound the emergency alarms - location of the emergency alarms should be included in the induction program;
  - If it is a small non electrical fire, try to put it out by use water or the nearest fire extinguisher or water. If it is an electrical fire, turn of the power and use the nearest fire extinguisher;
  - Advise and maintain contact with management;
  - Identify injuries and / or a risk to life / property (Risk Assessment should form part of safety induction);
  - Contact emergency services, if required;
  - In the case of a fire inside a building close all windows and office doors; and
  - Exit the building quickly via the nearest exit point to the nearest assembly point.

- Bomb and bomb threat:
  - Stop all machines;
  - Open all doors and windows;
  - Proceed to designated assembly point;
  - Do not run;
  - Do not shout;
  - Do not push past other personnel;
  - Report to the designated assembly point; and
  - Do not return to the office / plant until instructed by the emergency co-ordinator.

- Natural disaster / heavy rainfall event (larger than the design capacity of related infrastructure)

The following preparations may be put in place in case of heavy rainfall events:

  - Sound the emergency alarms;
  - Advise and maintain contact with management;
  - Identify injuries and / or a risk to life / property;
  - Contact emergency services, if required;
  - Inform downstream / downslope users;
  - Proceed to the nearest assembly point; and
  - Should an emergency develop at the pollution control dam, report the emergency to the DWS. A written report shall be provided to the DWS within 14 days (as per GN 704).

It is however important to note that should an emergency (spill from a PCD or PCD wall failure) occur, all contaminated water will remain within the dirty water management area and flow towards the opencast pit areas.

- Possible hazardous chemical spills.

The following procedure should be followed as an initial (immediate) response to any spill:

  - Sound the emergency alarms;
  - Advise and maintain contact with management;
  - Identify injuries and / or a risk to life / property;
  - Contact emergency services, if required;
  - Identify areas likely to be affected by the spill;
  - Evacuate the area; and
  - Proceed to the nearest assembly point.

The following procedure must be followed by an appropriately trained and designated person to manage and remediate the spill as soon as such a person becomes available:

- o Remove as much of the spill as possible;
- o Prevent further movement of the spill;
- o Utilise bioremediation agents and spill kits to remediate the area;
- o Dispose of contaminated soils, in accordance with the EMP Amendment and other legislative requirements; and
- o Never rinse any hydrocarbons, or any other chemicals that will contribute to pollution of resources, into a natural drainage systems.

- Blasting incidents.

The following procedure must be followed in case of a Blasting incident:

- ➢ Sound the emergency alarms;
- ➢ Advise and maintain contact with management;
- ➢ Identify injuries and / or a risk to life / property;
- ➢ Contact emergency services, if required; and
- ➢ Proceed to the nearest assembly point.

- Blockages of clean water management infrastructure

The following Procedure must be followed in the initial (immediate) response to the identified blockage:

- ➢ Advise and maintain contact with management;
- ➢ Identify a risk to life / property;
- ➢ Sound the emergency alarm, if required; and
- ➢ Proceed to the nearest assembly point, if required.

The following procedure should be followed by an appropriately trained and designated person to manage and remediate the blockage, as soon as such a person becomes available to assist:

- o Identify the material causing the blockage;
- o Remove as much of the blockage as possible; and
- o Inspect clean and dirty water management infrastructure to ensure that there are no further blockages exist.

- Transport related spillage of carbonaceous materials

The following procedure should be followed as an initial (immediate) response to a transport related spillage of carbonaceous materials:

- Advise and maintain contact with management;
- Identify injuries and / or a risk to life / property;
- Contact emergency services, if required; and
- Proceed to the nearest assembly point, if required

The following procedure must be followed by an appropriately trained and designated person to manage and remediate the spill as soon as such a person becomes available:

- Prevent further movement of the spill;
- Remove and recover as much of the spill as possible;
- Dispose of contaminated soils, in accordance with the Amendment and other legislative requirements; and
- Never rinse any carbonaceous materials, or any other substances that will contribute to pollution of resources, into a water system.

- Slope instability / collapse of high walls

Procedure to be followed in the initial (immediate) response to the identified instability / collapse:

- Advise and maintain contact with management;
- Identify a risk to life / property;
- Sound the emergency alarm, if required; and
- Proceed to the nearest assembly point, if required.

Procedure to be followed by an appropriately trained and designated person to manage instability / collapse, as soon as such a person becomes available to assist (external specialist assistance may be required, depending on the nature of the incident):

- Identify the instable area / collapsed area;
- Prevent unauthorised access to this area; and
- Initiate the appropriate techniques to make this area safe.

- Contamination of drinking water

Procedure to be followed in the initial (immediate) response to contamination of drinking water at the site:

- Advise and maintain contact with management;
- Identify injuries and / or a risk to life; and
- Contact emergency services, if required.

Procedure to be followed by an appropriately trained and designated person to manage the contamination of drinking water:

- Advise employees not to utilise the contaminated drinking water;
- Ensure notices are placed at each location where such contaminated water might be available;
- Supply an additional source of clean drinking water;
- Initiate an emergency sampling and analysis of the contaminated drinking water;
- Inform employees of water sampling results; and
- Advise employees when it is safe to continue to utilise the drinking water.

- Failure of water and / or waste management infrastructure

Procedure to be followed in the event that water and / waste management infrastructure fails:

- Sound the emergency alarms;
- Advise and maintain contact with management;
- Identify injuries and / or a risk to life / property;
- Contact emergency services, if required;
- Inform downstream / downslope users;
- Proceed to the nearest assembly point; and
- Should an emergency develop at a PCD, report the emergency to the DWS. A written report shall be provided to the DWS within 14 days (as per GN 704).

- Dusty conditions

Procedure to be followed in severely dusty conditions:

- Advise and maintain contact with management;
- Sound the emergency alarms;
- Identify injuries and / or a risk to life / property;
- Contact emergency services, if required; and
- Management to advise employees on the safety of continuing with duties.

- Damage or any threat to property or persons

The mine may, in the case of damage or any threat to property or persons:

- Sound the emergency alarms;
- Advise and maintain contact with management;
- Identify injuries and / or a risk to life / property;
- Contact emergency services, if required;
- Leave the building quickly via the nearest exit point; and
- Proceed to the nearest assembly point.

2.11.2.3 Communication of Environmental Emergencies

- **Internal Communication of Environmental Emergencies**

Each emergency incident will be reported immediately, clearly, objectively and has its own route of communication. The general communication systems to be implemented:

- Two-way radios that are situated at the workshop and all supervisor vehicles.
- Telephones, as well as, cell phones that are situated in designated areas or on persons.

- **External Communication of Environmental Emergencies**

Information regarding environmental emergencies at UCDII's Berenice Project, should they occur, is disclosed to various external bodies, and includes:

- Relevant authorities (e.g. DMR, DWS, LEDET)
- I&AP's :
- Landowners and adjacent landowners.
- Registered I&AP's (if applicable).
- Stakeholders.

- **Communication of environmental emergencies with relevant authorities**

In the event of an environmental emergency, the appropriate procedures will be followed. The SHE manager will report to the mine management and identify whether or not the DMR (in the event of serious injury or fatality) or the DWS (in the event of serious spillages or pollution) are required to be notified. The SHE manager will then conduct an in situ investigation to gather all the relevant detail and an enquiry will be held to compile an accident / incident report, which will be provided to the DMR / DWS if required.

- **Communication of environmental emergencies with I&AP's**

As mentioned above, information regarding environmental emergency situations is made available to I&AP's should the environmental emergency have an impact on the said I&AP's. This information made available includes, but not limited to:

- The type of environmental emergency (e.g. serious spillages).
- The duration of the environmental emergency.
- Impacts related to the environmental emergency.
- Anticipated duration of the impacts.
- Remediation actions to be undertaken.
- Anticipated remediation completion

2.12 Specific information required by the Competent Authority

(Among others, confirm that the financial provision will be reviewed annually).

- No additional / specific information has been requested by the Competent Authority to date.
- It is noted that the Financial Provision will be updated on an Annual Basis
- EAP specific recommendations
  - Pre Blast Surveys

Cracks occur in most structures but the owners are usually unaware of them. The purpose of the pre-blast survey is to document the crack damage in the various structures located around the mine that fall within a specified distance of the perimeter of the quarry. The mine should generate a survey plan, which should be reviewed with the explosive supply company and the person carrying out the house inspections.

A decision relating to the required inspection distance must be agreed on. A recommended distance of one thousand metres (1,000 m) should be considered. All structures within this area should be examined internally and externally.

Any damage identified should be quantified using an engineering reference framework and digitally photographed. A report describing the damage and linking it to a photo database should be produced. Despite this information it is likely that future claims could still arise as a number of houses in the area are poorly constructed and show signs of ongoing deterioration.

Bear in mind that cracks in structures are dynamic in nature. They change with time in response to variations in temperature, humidity, rainfall, wind, soil conditions and structural integrity. Despite these ongoing environmental stresses when blasting starts it may well be blamed as the cause of all of the damage. The pre-blast crack information is useful but it should only be regarded as a means to an end. It is important to have this baseline data available but more importantly blast disturbances must be monitored on an ongoing basis.

- Vibration amplitudes at houses occupied by people should not exceed 7 mm/s.
- Normally houses can withstand much higher amplitudes, but the response of people to vibration is a conservative limiting criterion to apply.
- At houses occupied by people, air blast amplitudes should not exceed 125 dB.
- There is no limit to how close blasting can come to houses, as long as fly rock, vibration and air blast levels are contained to the required limits. This would mean very stringent mitigation measures to achieve these limits. However, with correctly designed decked charges in 200 mm blastholes, blasting can safely come to within 200 m of houses. Any blasting that occurs closer than 500 m to houses will require evacuation of the houses.

2.13 Undertaking

The EAP herewith confirms

b) the correctness of the information provided in the reports ☒

c) the inclusion of comments and inputs from stakeholders and I&AP's ; ☒

d) the inclusion of inputs and recommendations from the specialist reports where relevant; ☒and

e) the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed; ☒

-END-

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All the specialist impact assessment report mentioned below were reviewed during the EIR phase, except for the Climate Impact Assessment report attached as Appendix 1.

Specialist:

Appendix 3 - Berenice Air Quality Assessment
Appendix 4- Berenice Flora Assessment Report
Appendix 5- Berenice Faunal Assessment Report
Appendix 6- Berenice Heritage Impact Assessment
Appendix 7- Berenice Soil and Land Capability Assessment
Appendix 8- Berenice Traffic impact Assessment
Appendix 9- Berenice Baseline Noise
Appendix 10- Berenice Visual Impact Assessment
Appendix 11- Berenice Social Impact Assessment
Appendix 12- Berenice Wetlands Impact Assessment Draft Report
Appendix 13- Groundwater Specialist Study Berenice _Draft 1