BRAKFONTEIN THERMAL COAL MINE

FINAL SCOPING REPORT

NEMA REPORT

MDEDET Ref: 17/2/3 N-143

FINAL FOR MDEDETSUBMISSION AND PUBLIC REVIEW

18 JULY 2012

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This document has been prepared by **Digby Wells Environmental**.

Report Title: **BRAKFONTEIN THERMAL COAL MINE**

Project Number: **UNI1292**

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Steve Horak	Project Manager		18/04/2012
Danie Otto	Project Sponsor		18/04/2012

PROJECT CONTACT SHEET

Project:	**Proposed Brakfontein Coal Mine**
Location:	**Portions 6, 8, 9, 10, 20, 26, 30 and the Remaining Extent Of the Farm Brakfontein 264 IR.**
	(Near Delmas, Mpumalanga Province.
Applicant Name:	**Universal Coal Development IV (Proprietary) Limited**
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MDEDET Ref:	*17/2/3 N-143*
DMR Ref:	*MP30/5/1/1/2/10027MR*

(Water Use Licence and Waste Management Licence reference numbers still to be provided)

EXECUTIVE SUMMARY

Digby Wells Environmental (Digby Wells) has been appointed, by Universal Coal Plc, as the independent environmental consultant to conduct the Environmental Impact Assessment (EIA) and associated specialist studies in support of a Mining Right Application (MRA) for the mining of coal at the proposed Brakfontein Coal Mine. Universal Coal is currently following the necessary processes to obtain environmental authorisation in terms of the National Environmental Management Act, 1998 (NEMA) for associated listed activities as stipulated in the NEMA Regulations, a mining right in terms of the MPRDA, an IWULA in terms of the NWA and an integrated waste management license in terms of the NEMWA.

The proposed project is located within the Western margins of the Witbank Coalfields within the jurisdiction of the Victor Khanye local and Nkangala district municipalities in Mpumalanga Province approximately 16km from the town of Delmas.

The life of the mine is in excess of 20 years and the coal will be used for both local and export markets. The proposed Brakfontein Coal Mine project will be mined in two phases. Phase 1 will entail opencast mining of various pits, which will be undertaken during the continued exploration of the underground resources. This phase is proposed for 22 years. Phase 2 will entail underground mining methods and it is proposed for 8 years.

Vegetation in the area is dominated by the eastern Highveld grasslands. The general landscape typical of the Highveld grasslands is that of a gently undulating topography, with dispersed valley bottom wetlands. However, much of the landscape within the project boundary has been transformed with very little natural habitats remaining. Areas of ecological importance include five wetlands, one of which is associated with the perennial Wilge River, which flows in a north easterly direction across the project area. A second perennial river flows in an easterly direction in the northern section of the project area.

The following potential environmental risks have been identified during a Screening Study:

- *Wetland and river exclusion:* Streams and water courses, as well as wetlands and their feeding areas/catchments fragment the coal resource and may result in the requirement of various boxcuts. A significant impact will be as a result of the proposed opencast mining activities that are planned for the south eastern side of the project area. This will necessitate that a GN R 704 for exemption is applied for under the Integrated Water Use Licence Application (IWULA) for mining through a water resource.

  The wetlands would have to be delineated (they have been since) and classified carefully and in detail depending on the depth of the seams and geological conditions, it may be possible to apply for underground access under the streams with development that has a high safety factor by leaving enough overburden between the streams and the underground workings.

- *Rocky outcrops:* These can be seen as sensitive landscapes and may need to be left undisturbed.

The following potential social risks have been identified.

- *Physical resettlement:* as there are people living on the project site it is likely that Universal Coal will need to negotiate with land owners for the surface rights. There may be farm workers who are living on the farm owners land and these workers might need to be resettled. Similarly any families living in informal dwellings may also need to be resettled should they be within the mine footprint area or 500m from the open pit. Should resettlement be necessary it is Universal Coal's responsibility to ensure that it this is undertaken in accordance with best practice guidelines and in a socially responsible manner.
- *Growth of Informal settlements*: There are informal structures on Brakfontein 264 portion 6 and portion 20. It is possible that these settlements may grow either naturally or due to exploration and mining drawing people to the area. This may lead to encroachment of settlements on the Project Site and the requirement for physical resettlement.
- *Sites of Archaeological and heritage significance:* There are graves on the project site which will either need to be avoided or excavated. It is also possible that some of the dwelling structures on the project site are over 60 years and therefore these cannot be demolished without a permit from the South African Heritage Resources Agency (SAHRA).
- *Land Claims:* A land claims enquiry will need to be submitted for the project site. Should there be a land claim for any of the relevant properties this may delay or restrict development on the property until the outcome of the land claim process has been finalised.
- *Servitudes:* There are markers on the Brakfontein 277 IR Portion 9 which is likely to be a pipeline route. This pipeline may break up the project area and possibly the ore body. This may restrict mining or construction on certain sections of the property and should be investigated further.

With assessments and the necessary management plans and mitigation measures in place, there may be challenges to undertake the proposed development, but with the information available at the stage of this screening exercise no fatal flaws were identified.

Negotiations with land owners and neighbouring owners and residents will be critical from the onset and stakeholder engagement and communication is critical.

This report has been under public review as a draft report and has since been finalised for submission to MDEDET and will undergo additional public review. The conceptual mine plan has been amended as a result of the input provided during the scoping phase. The original plan included in the draft scoping report as well as the current plan have been included for comparative purposes (Plans 4A and 4B).

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GLOSSARY OF TERMS

AIA	Archaeological Impact Assessment
BID	Background Information Document
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
DTM	Digital Terrain Model
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMP	Environmental Management Programme
GIS	Geographic Information System
I&APs	Interested and Affected Parties
MDEDET	Mpumalanga Department of Economic Development, Environment and Tourism
MPRDA	Mineral and Petroleum Resources Development Act, 2002
MRA	Mining Rights Application
NEMA	National Environmental Management Act, 1998
NGO	Non-Governmental Organisation
NWA	National Water Act
PPP	Public Participation Process
RoM	Run of Mine
SAHRA	South African Heritage Resource Agency
SANS	South African National Standards

1 INTRODUCTION

Digby Wells Environmental (Digby Wells) has been appointed, by Universal Coal Plc, as the independent environmental consultant to conduct the Environmental Impact Assessment (EIA) and associated specialist studies in support of a Mining Right Application (MRA) for the mining of coal at the proposed Brakfontein Coal Mine. The application was lodged with the Department of Mineral Resources (DMR) in 2011 and acknowledgment and report request was received on the 28 March 2012. This scoping report is the first environmental report submitted, to comply with the required process in terms of the Mineral and Petroleum Resource Development Act, Act 28 of 2002 (MPRDA).

In addition, this scoping report will be submitted for public review and to the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET) for environmental authorisation of listed activities in terms of the National Environmental Management Act (NEMA), Act 108 of 1998.

The EIA for the proposed Brakfontein Coal Mine will be submitted to the Department of Water Affairs (DWA) in support of an integrated water use license application and to the national Department of Environmental Affairs (DEA) in support of a waste management license application in terms of the National Environmental Management Act (NEMWA).

The Scoping Report will be used as a guide for the compilation of the EIA Report and the Environmental Management Programme (EMPr). All registered I&APs will be afforded the opportunity to review these reports in due course.

1.1 Expertise of the Environmental Assessment Practitioner (EAP)

Digby Wells is experienced in environmental management and assessment and is familiar with the requirements for authorisation in terms of the MPRDA, NEMA, NWA and NEMWA. The company is well known for its integrity and independence and for its skill in assisting I&APs to participate in the EIA process.

Mr. Danie Otto of Digby Wells is the lead Environmental Assessment Practitioner (EAP) for this project. He is a registered Professional Natural Scientist (Reg. No. 400096/02) with seventeen years' experience as a consulting environmental scientist and EIA project manager.

Neither Digby Wells, nor Mr. Otto, has any vested interest in the proposed project or the applicant's company.

CVs of Digby Wells' project team are available on request.

1.2 Applicant Details

As can be seen in the organogram below (Figure 1-2), Universal Coal Development IV (Pty) Ltd is owned by Universal Coal and Energy (Pty) Ltd, a wholly owned subsidiary company of Universal Coal PLC.

Table 1-1: Applicant details

Applicant Name:	Universal Coal Development IV(Proprietary) Limited
Company Registration No	2007/032600/07
Contact Person	Mr Mike Seeger / Minah Moabi
Telephone	(012) 460 0805
Physical Address	Universal Coal Head Office 467 Fehrsen Street Brooklyn Pretoria 0181
Postal Address	P O Box 2423 Brooklyn Square 0075

Universal Coals' five potential operations are illustrated below in Figure 1-1.

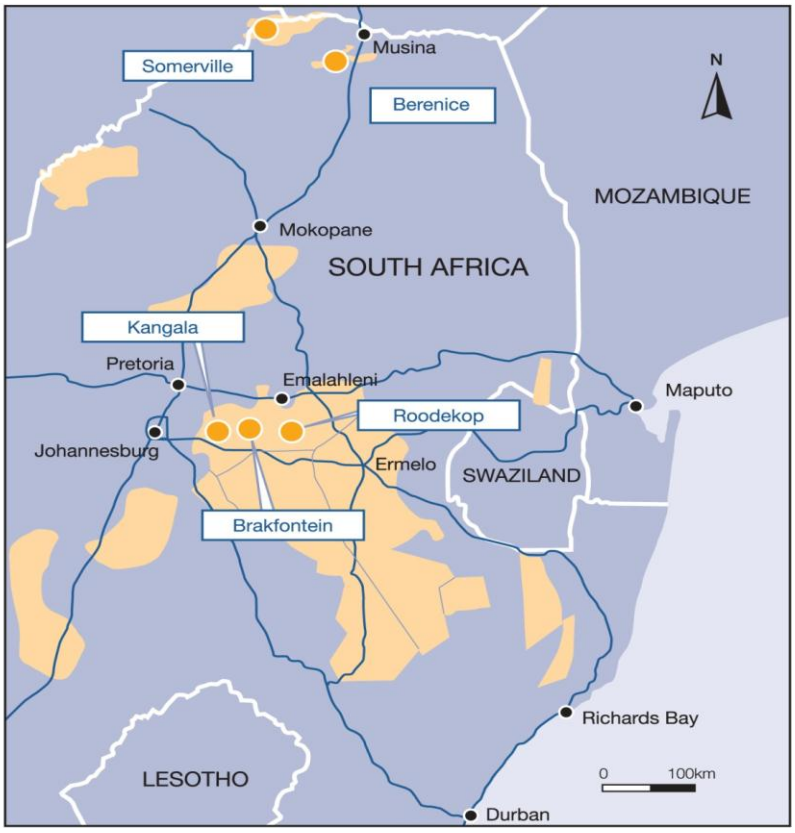
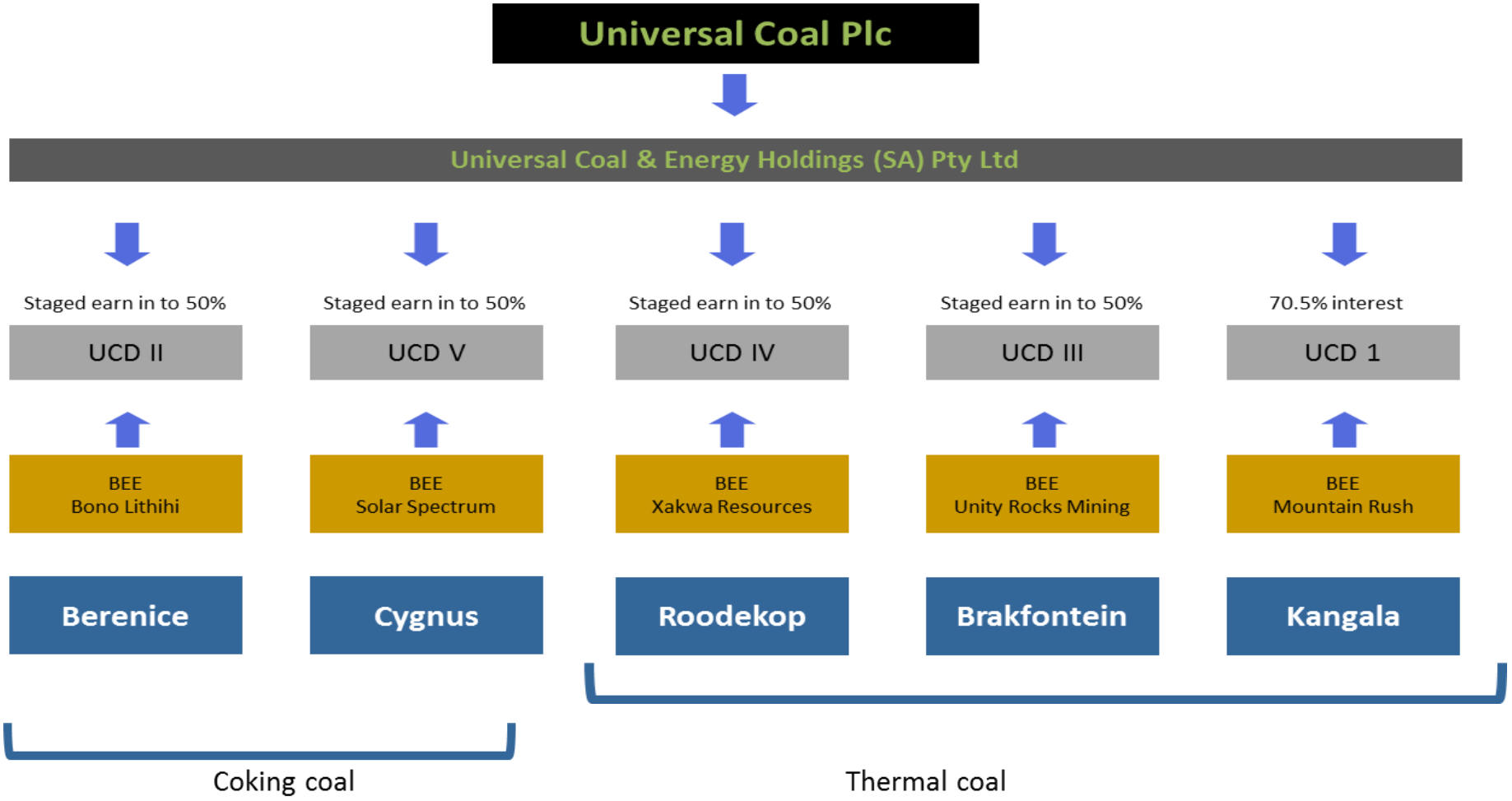


Figure 1-1: Universal Coal Operations

Figure 1-2 Organogram of the Universal Coal company structure



2 STATUTORY REQUIREMENTS

The following sections briefly introduce the South African principle legislation in terms of which the proposed project must be authorised before any construction activities may commence.

2.1 National Environmental Management Act, Act No. 107 of 1998 (NEMA)

The Environmental Management Act's (NEMA) as amended, EIA regulations GN R543 ("NEMA EIA Regulations") were published on the 18 June 2010 and came into effect on 2 August 2010. Together with the NEMA EIA Regulations, the Minister also published the following Regulations in terms of sections 24 and 24D of the NEMA:

- Regulation GN R544 - Listing Notice 1: This listing notice provides a list of various activities which require environmental authorisation and which must follow the basic assessment process as described in section 21 to 25 of the NEMA Regulations;
- Regulation GN R545 – Listing Notice 2: This listing notice provides a list of various activities which require environmental authorisation and which must follow an environmental impact assessment process as describer in section 26 to 35 of the NEMA Regulations; and
- Regulation GN R546 – Listing Notice 3: This notice provides a list of various environmental activities which have been identified by provincial governmental bodies which if undertaken within the stipulated provincial boundaries will require environmental authorisation. The basic assessment process as described in section 21 to 25 of the NEMA Regulations will need to be followed.

2.2 Mineral and Petroleum Resource Development Act, Act No.28 of 2002 (MPRDA)

Universal Coal must be in possession of an approved Mining Right for the mining of coal on the respective farms, before mining operations may commence. In terms of the MPRDA various supporting documentation is required for the proposed project as part of the application for a Mining Right. In accordance with Section 23(5) of the MPRDA, the Mining Right will only come into effect on approval of the Environmental Management Programme (EMPr). Following the submission of the Scoping Report, the EIA and EMPr will be submitted to the DMR, on which a decision is expected to be made.

2.3 National Water Act, Act No. 36 of 1998 (NWA)

In accordance with Section 21 and 40 of the NWA a water use licence application will be submitted to the Department of Water Affairs (DWA). Investigations have to be undertaken in order to determine what activities will take place, as well as the impacts thereof. It is likely a license will be required for the following uses:

- Section 21 b – Storage of water for both raw and potable water use;
- Section 21 c – Impeding or diverting the flow of water in a water course for crossing of streams via causeways as there is a stream crossing the mining area;
- Section 21 f – Discharging waste or water containing waste into a water resource through a pipe or canal for the disposal of sewage works effluent (if constructed);
- Section 21 g – Disposing waste or water containing waste in a manner which may detrimentally impact on a water resource for the pollution control dams, overburden dumps, coal stockpiles and discard dumps;
- Section 21 i – Altering the bed, banks, course or characteristics of a watercourse; and
- Section 21 j – Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity for the safety of the people for the dewatering of the mining pits to facilitate mining and to provide a safe mining environment.

Government Notice (GN) R. 704

Regulation 4 of this government notice states that no residue deposit, reservoir or dam may be located within the 1:100 year flood line, or less than a horizontal distance of 100 m from the nearest watercourse. Furthermore, person(s) may not dispose of any substance that may cause water pollution.

Regulation 5 states that no person(s) may use substances for the construction of a dam or impoundment if that substance will cause water pollution. Regulation 6 is concerned with the capacity requirements of clean and dirty water systems, while Regulation 7 details the requirements necessary for the protection of water resources.

Where any of GN 704 regulations are contravened, the user should apply for an exemption of regulations 4 and 5 from the Minister.

2.4 National Environmental Management: Waste Act, Act No. 59 of 2008 (NEMWA)

The waste management activities requiring a waste management licence in accordance with section 20(b) of the NEMWA are indicated in two separate categories. These activities are separated into two categories namely Category A and B;

- Category A describes waste management activities requiring a Basic Assessment process to be carried out in accordance with the EIA regulations supporting an application for a waste management licence; and
- Category B describes waste management activities requiring an Environmental Impact Assessment process to be conducted in accordance with the EIA regulations supporting a waste management licence application.

In addition to the environmental authorisation, the proposed Brakfontein Coal Mine will require a waste licence.

2.5 Additional Legislation

The EIA study is not only subject to the terms and regulations of the MPRDA, NEMA, NEMWA and the NWA, but must also comply with other applicable South African statutory requirements and guideline documents relevant to the project. Table 2-1 includes a non-exhaustive list of legislation and guidelines that will be considered during the EIA.

Table 2-1: Additional legislation and guidelines applicable to the proposed Brakfontein Coal Mine.

National Legislation and Associated Regulations:
Water
• Water Services Act, Act No. 108 of 1996; • DWAF: Best Practice Guideline G1: Storm Water Management; • DWAF: Best Practice Guideline G2: Water and Salt Balances; August 2006; • DWAF: Best Practice Guideline A4: Pollution Control Dams (PCD's); • DWAF: Best Practice Guideline GH: Water Reuse and Reclamation, June 2006; • DWAF: Minimum Requirements Guideline for the Handling, Classification and Disposal of Hazardous Waste, 1998; • DWAF: Minimum Requirements Guideline for the Water Monitoring at Waste Management Facilities; • SA Water Quality Guidelines – Aquatic Ecosystems, 1996, and • SA Water Quality Guidelines – Domestic Water Use, 1996.
Heritage Resources
• National Heritage Resources Act, Act No. 25 of 1999.
Fauna and Flora
• National Environment Management: Biodiversity Act, Act No. 10 of 2004; • National Forest Act, Act No. 84 of 1998; • Conservation of Agricultural Resources Act, Act No. 43 of 1983; and
Waste

National Legislation and Associated Regulations:
• DWAF: Minimum Requirements Guideline for the Handling, Classification and Disposal of Hazardous Waste, 1998; and • DWAF: Minimum Requirements Guideline for the Water Monitoring at Waste Management Facilities.
Atmospheric Emissions
• National Environmental Management: Air Quality Act, Act No. 36 of 2004 including Government Notice 220 of 26 March 2010; • DEAT Air Quality Guidelines; and • SANS 1929:2005 Edition 1.1 – Ambient Air Quality Limits for Common Pollutants.
Hazardous Materials
• Hazardous Substances Act, Act No. 15 of 1973; • Occupational Health and Safety Act, Act No. 85 of 1993; • Major Hazardous Installation Regulations (July 2001); and • Regulations for Hazardous Chemical Substances (GNR 1179 GG 16596 of 25 August 1995).
Noise
• National Environmental Management: Air Quality Act, Act No 39 of 2004; and • SANS 10103:2008 The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and to Speech Communication.
Roads & Rail
• National Road Traffic Act, Act No 93 of 1996; • National Road Traffic Act Regulations, GN R 225 of 2002; • SANS 10228; • SANS 10231; • SANS 10232-1; • SANS 10229:2005; • SANS10233;
Development
• Development Facilitation Act, Act 67 of 1995; • Electricity Act, Act 41 of 1987;

National Legislation and Associated Regulations:
• Electricity Regulations Act, Act 4 of 2006; and • National Building Regulations and Building Standards Act, Act No. 103 of 1977.

2.6 Decision-making Authority

Authorisation of the Environmental Management Programme (EMPr), in support of a MRA will be provided by the Mpumalanga Department of Mineral Resources (DMR) while the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET) will have jurisdiction on the consideration of the application for environmental authorisation under NEMA. The IWULA will be submitted to the DWA and the integrated waste management license application to the DEA.

2.7 Methodology for scoping

Digby Wells has been appointed as an independent consultant to investigate all environmental and social aspects related to mining at the proposed Brakfontein Coal Mine. This Scoping Report provides a description of the current status of the environmental and social aspects in terms of the proposed project. These descriptions are based on desktop studies which are carried out on the project area.

This description will include all aspects such as the physical, biological and social environment and will include a general evaluation of the status of the pre-mining environment. The information in the Scoping Report has been compiled from various sources, including consultation with the client, site visits, interviews and meetings, literature reviews and existing documentation.

The proposed project description and alternatives to the project have been described. This enables readers to gain an idea of what alternatives have been considered for the project and what the potential impacts on the environment may be.

The Public Participation Process (PPP) is valuable as it provides I&APs the opportunity to identify issues relevant to them and to ensure that local knowledge and values are understood and utilised. Their views will be taken into account when deciding between alternative actions, in exploring the importance of issues and management plans.

The PPP that has been undertaken will be further expanded on in the EIA. In addition to the earlier public consultation that has taken place, feedback meetings will be held with the public to update them with the project progress and with additional available information.

Potential positive and negative impacts that the proposed Brakfontein Coal Mine operations may have on the environment have been identified and discussed. A description of further investigations required for the impact assessment studies is given. This includes all the issues that require more in-depth investigation to gather the information needed for the compilation of an appropriate mitigation plan.

This Scoping Report will provide the framework for the EIA Report. The EMPr will follow from the EIA Report with regard to implementation and monitoring of these mitigation measures.

This report will address the Scoping Phase requirements as outlined by the NEMA and the MPRDA. The intention of this report is to document the issues and concerns raised during the scoping phase, and to highlight potential impacts that may be generated by the proposed mining.

The aims of the Scoping Report are to:

- Provide information to the authorities and to other interested and affected parties (I&APs)/stakeholders on the proposed expansion project to allow them to comment and raise issues of concern;
- Demonstrate that alternatives are being considered;
- Indicate how stakeholders are being afforded the opportunity to contribute to the project, and to allow them to verify that the issues they have raised have been recorded and considered;
- Provide a brief description of the baseline receiving environment; and
- Highlight potential impacts that should be investigated further during the EIA process.

Once this final Scoping Report has been accepted by MDEDET the project will procedd into the EIA phase.

3 PROJECT DESCRIPTION

3.1 Introduction

Universal Coal Plc has submitted a Mining Right Application to the Department of Mineral Resources (DMR) in November 2011 for proposed coal mining on Portions 6, 8, 9, 10, 20, 26, 30 and the Remaining Extent of the Farm Brakfontein 264 IR. The Prospecting Right for the proposed Brakfontein Project was granted to Unity Rocks Mining (Pty) Ltd on 10 July 2008; the Prospecting Right was issued under the Permit Number MP30/5/1/1/2/1879 PR. Universal Coal has entered into an agreement with Unity Rocks Mining and applied for an extension to the Prospecting Permit in July 2011.

3.2 Regional Setting

The proposed project is located within the Western margins of the Witbank Coalfields within the jurisdiction of the Victor Khanye local and Nkangala district municipalities in Mpumalanga Province (Regional Setting – Plan 1). The site is located approximately 16km north-east of Delmas town, 14km and 17km north of Devon and Leandra respectively (Local Setting - Plan 2). The centre co-ordinate of the largest part of the project area is located at:

28°51'39.698"E: 26°12'31.237"S.

Plan 1: Regional Setting:

Plan 2: Local Setting

3.3 Land Ownership

The property under consideration is the farm Brakfontein 264IR, consisting of Portions 6, 8, 9, 10, 20, 26, 30 and the remaining extend (RE). (Land Tenure - Plan 3). The landowners of these portions are listed in Table 3-1.

Table 3-1: Brakfontein Farm Landowners

Portion	Affected	Owners
20	Directly affected	Abundant Development PTY LTD
10	Directly affected	Andries Schoeman (Brakfontein Boerdery Pty Ltd)
30	Directly affected	Andries Schoeman Brakfontein Boerdery PTY LTD
RE	Directly affected	Andries Schoeman Brakfontein Boerdery PTY LTD
8	Directly affected	Confident Concept PTY LTD
9	Directly affected	Koos UYS & Seun Boerdery CC
26	Directly affected	Koos UYS & Seun Boerdery CC
6	Directly affected	Norwesco INV PTY LTD

Plan 3: Land Tenure

3.4 Project Description

The proposed Brakfontein Coal Mine project will be mined in two phases. Phase 1 will entail opencast mining, which will be undertaken during the continued exploration of the underground resources. This phase is proposed for 22 years. Phase 2 will entail underground mining methods and it is proposed for 8 years. The project site consists of four seams for open pit mining and two seams for underground mining.

3.4.1 Mineral resources

Based on the criteria defined by SAMREC and JORC, the Brakfontein coal resource is classified as Indicated and Inferred. The coal resources are tabulated in Table 3-2 below:

Table 3-2: Brakfontein Mineral Resource

Seam	Density (g/cm^3)	Tonnage (GTIS)	Geological Losses (%)	Tonnage (MTIS)	Classification
5 Seam West	1.5	483,542	15%	411,011	Inferred
5 Seam East	1.5	40,967	15%	34,822	Inferred
5 Seam 02	1.5	871,917	15%	741,129	Inferred
5 Seam 03	1.5	1,403,871	15%	1,193,290	Inferred
4 Seam NC 01	1.68	19,873,772	15%	16,892,706	Indicated
4 Seam NC 01	1.68	17,294,484	15%	14,700,312	Indicated
4 Seam SE 01	1.68	4,559,976	15%	3,875,980	Indicated
4 Seam SE 01	1.68	688,771	15%	585,456	Indicated
4 Seam W 01	1.68	4,246,144	15%	3,609,222	Indicated
4 Seam W 01	1.68	6,489,230	15%	5,515,845	Inferred
4 Seam 02	1.68	1,255,306	15%	1,067,010	Indicated
4 Seam 02	1.68	3,624,841	15%	3,081,114	Inferred
4 Seam 03	1.68	7,219,048	15%	6,136,191	Indicated
2 Seam W 01	1.59	3,569,378	15%	3,033,971	Inferred
2 Seam W 01	1.59	12,041,611	15%	10,235,369	Inferred
2 Seam E 01	1.59	42,347,355	15%	35,995,251	Indicated
2 Seam E 01	1.59	1,546,202	15%	1,314,271	Indicated
2 Seam 02	1.59	1,237,715	15%	1,052,058	Indicated
2 Seam 02	1.59	3,900,260	15%	3,315,221	Indicated
Block 2 03	1.59	5,591,436	15%	4,752,721	Inferred
1 Seam	1.69	9,511,351	15%	8,084,648	Indicated
Total		**147,797,176**		**125,627,599**	

3.4.2 Coal seams

The proposed Brakfontein project may be classified as a multiple deposit type and hosts 4 seams for Open Cast mining namely No. 5, 4L, 2U. Seams 4 and 2 are for Underground Mining. The Seam No. 5 has an average thickness of 1.8m being between 0.5m and 2m thick. The Seam No. 4 varies in thickness from 2.5m to 6.5 m. The seam is divided into the No. 4 Lower, No. 4 Upper and No. 4 A zones, separated by sandstone and siltstone/mudstone partings. The mining horizon is restricted to the No. 4 Lower Seam because of the poor quality of the No. 4 Upper Seam where the coal is suitable as power station feedstock. The Seam No. 2 contains some of the best quality coal and can average 3 to 6.5m in thickness and is suitable for the local Eskom market.

The seams are contained in a 100 m thick succession of sandstone and minor siltstone within the Vryheid Formation, Karoo Supergroup.

3.4.3 Mining method

It is proposed that the Brakfontein reserves will be accessed with two open mini-pits and two underground sections. The annual run-of-mine (ROM) production rate is 1.44 Mtpa to give 0.8 Mtpa of sales.

Opencast Phase

Open pit mining will focus on mining 2 and 1 seams, at an average stripping ratio of 2.48:1.

An initial boxcut will be established during the construction phase of the Project (located in Opencast 1 and followed by Opencast 2 on Plan 4A). Topsoil and overburden from the initial boxcut area will be stockpiled at the positions indicated in the plan.

Opencast mining will take place using a conventional truck and shovel operation, assisted by roll-over dozing, to allow for continuous backfilling and rehabilitation of the mined out area. The expected mining conditions are good, due to the favourable geology and good stormwater drainage.

The final void will be backfilled with the overburden from the initial boxcut. Rehabilitation and final closure will be as specified in the EMPr to the DMR. It is planned to use an openpit mining contractor for the mining operations.

Underground

The underground mining section will be developed via the highwall of the openpit operations. This will enable a shorter lead time to get the underground sections started, eliminate hoisting requirements, as well as reduce upfront capital costs.

The mining schedule entails mining 5.6 million ROM tons from 2 sections.

As the openpit reserves are mined, the underground mining operation commences, there will be an overlap of underground and openpit mining, allowing for a 1 year ramp-up period.

The geological characteristics, namely depth and seam height indicate that bord and pillar mining can achieve a high extraction ratio. Total extraction methods include shortwalling and pillar extraction. The section will consist of 9 to 11 roadways 6.5 m wide with an average pillar width of 8m. The mining process will include cutting, drilling charges, blasting, loading and support.

3.4.4 Coal Beneficiation

Brakfontein Colliery would supply 50mm crushed and screened ROM coal to the neighbouring Kangala Colliery (Universal Coal operation) which in turn will produce 2 coal products:

1) C - grade steam coal for export purposes; and
2) D - grade coal for Eskom (power station).

A new coal preparation plant (for crushing and screening) will be constructed. The ROM feed will be crushed to minus 50 mm, and stockpiled on a plant feed stockpile before being transported to Kangala Coal Mine. The Kangala plant will use a conventional dense medium cyclone circuit to beneficiate the –50 mm +1.5 mm material. The minus 1.5 mm +0.1 mm fraction will be beneficiated using spirals. The minus 0.1 mm slimes fraction will report to the co-disposal site. The plant has been designed to process 360 t/h, and up to 1 980 000 ROM tons per annum. A ramp-up of 4 months has been allowed to achieve full production.

Kangala Coal Mine is a multiproduct mine, producing a minus 50 mm B-grade steam coal for export through the Phase 5 expansion of RBCT and a minus 50mm D grade coal for Eskom. The plant has been designed to produce this multigrade product.

3.4.5 Coal Market

The marketing surveys show that there is a strong demand for C-grade coal on the international market. The current price, FOT (free on truck) is R500 /ton for the C grade coal and R120/ton for the Eskom grade coal. Universal Coal has used the average coal price of R 450/ton and R120/ton (in real terms) for the financial evaluation of the Project. Universal Coal will sell its coal free on truck to coal trading houses, who in turn will use their export allocation in the allocations as well as Eskom supply contracts to feed the coal to the current markets.

The market per Seam is as follows:

- The No. 5 Seam will yield coal suitable for the metallurgical market.
- The No. 4 Seam will need beneficiation to make an Eskom product.
- The No. 2 Seam would make a raw Eskom product and could possibly have an export fraction after beneficiation.
- No. 1 Seam could possibly be low in phosphorus and be suitable for the metallurgical market.

Brakfontein's position could be improved by changes to Kangala Colliery's downstream crushing circuit to generate more Peas (25 × 8 mm) and less Small Nuts (45 × 25 mm). Peas

are currently attracting a ZAR25 to ZAR50 per tonne premium over Small Nuts and are more sought after by the markets.

3.4.6 Employment opportunities

Mining will take place on a 2 shift, 6-day week basis, for which the required authorisation will be applied for.

When fully operational, the mine will have a workforce of approximately 209 persons. Of these, 16 will be directly employed by the mine, and the remainder by contractors. The proposed employment structure for the mine can be seen below in Figure 3-1.

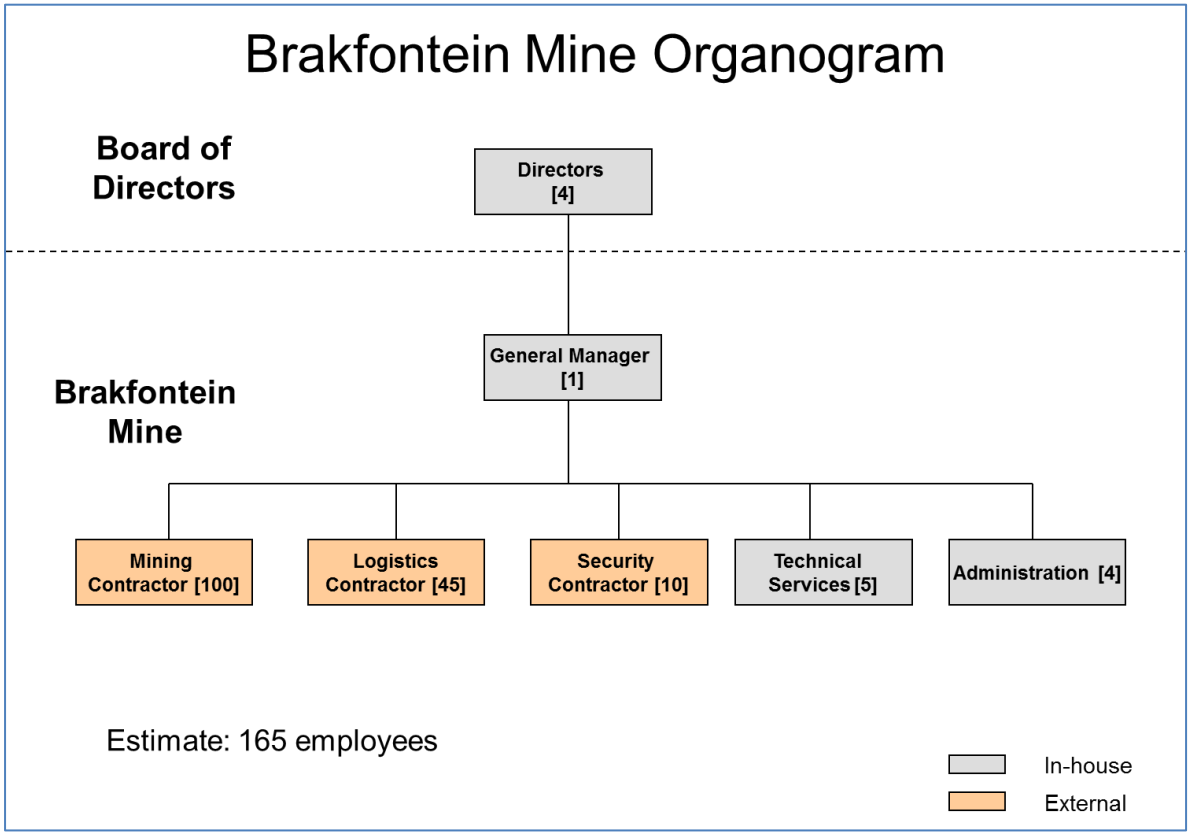


Figure 3-1: Employment structure for Brakfontein

3.4.7 Transport routes

Brakfontein is approximately 80 km due east of Johannesburg and 16 km from the town of Delmas on the R555. The R 555 tarred road is passing the proposed mine merely 500m from its border. Minor changes and upgrades to the existing R 555 is therefore all that is required in order to link the proposed mine with Delmas and the markets.

Provision has been made for the following roads and upgrades:

- Access roads: The existing turnoff from the R 544 onto the Kangala road is only a farm dirt road. This T-Junction will be upgraded to the applicable standards which will entails tarred slip lanes and a tarred T-road onto the Kangala road. The transporting

of the coal with trucks on a dirt road from the loading area to the entrance of the mine will not be viable due to the volume of material to be transported. Therefore provision has been made for a tarred road from the entrance gate to the coal loading area as well at the loading area.

- Plant roads: Provision has been made for gravel roads to link the plant, co- disposal site and infrastructure with each other. These roads will be 8m wide and 400mm thick with proper stormwater drainage.
- Haul roads: The haul road from the pit to the tip bin is to be a 21m wide and 0.8m thick gravel road. Provision for 1.2km of this standard of road has been made. Haul roads in the pit and other haul roads are not included and will be dealt with during the development of the pit.

From the plant at Kangala the product will be transported either 12 km by road to the Leeuwpan siding or the 14km to Eloff siding, using a road transport contractor, who will report to the coal trading company. The Department of Transport has given approval for the use of this public road for the transportation of the coal. At either the Leeuwpan siding or Eloff siding, the coal will be loaded using front-end loaders, and transported by COALlink to RBCT. Currently a traffic impact study is being undertaken to assess the condition of the existing roads and to make recommendations with regards to the transport route to Kangala. These results will be made available during the EIA phase. It is understood that this issue has been raised as a concern from the public.

3.4.8 Water Use and Resources

Boreholes will be drilled for potable water at Brakfontein. The Wilgerivier River passes through the Brakfontein farm and the possibility to withdraw water from the river is being investigated at present.

Coal will only be crushed and screened on site before being transported to Kangala for washing and processing therefore water use on site will be minimal and will be primarily for dust control and potable use.

Dirty water separation and stormwater drainage system will be required as well as water storage (PCD) if water is pumped out of the opencast pit.

3.4.9 Mine infrastructure

This section covers the on and off-site infrastructure proposed for the mine and excludes plant-related infrastructure. The proposed infrastructure includes:

- Parking and offices;
- A sewage treatment plant (which will require a Waste Management Licence);
- Weighbridge;

- Mine Equipment Workshop and Stores; and
- Washbay facility.

3.4.10 Project Timing

The planned life-of-mine is one year for the construction phase followed by a 30-year operational (production) phase.

The 30-year life-of-mine (production phase) is calculated as follows:

- OC Mineable Resource (31.4 Mt ROM)/1.44 MTpa ROM = 21.8 years
- UC Mineable Resource (5.6 Mt ROM)/0.72 MTpa ROM = 7.8 years
- Total Life of Mine = 29.6 years

3.5 PROJECT MOTIVATION

Coal is one of the major primary energy sources in the world, principally because it is affordable to mine and there are large resources available. In South Africa, our most abundant source of energy used for electricity generation is coal. Eskom, South Africa's electricity utility, generates, transmits and distributes electricity to industrial, mining, commercial, agricultural and residential customers and redistributors (www.eskom.co.za).

Eskom relies on coal fired power stations to produce approximately 95% of its electricity used in South Africa. Eskom uses over 90 million tons of coal per annum, and is therefore totally dependent on the South African coal mining industry to supply it with coal. Coal mining in South Africa is relatively cheap compared to the rest of the world. These low costs have had an important effect on the nation's prosperity and potential for development.

<u>The Future of the Industry</u>

Coal will have a major role in meeting the future energy needs. Demand for coal and its vital role in the world's energy system is set to continue. Over the next 30 years it is estimated that global energy demand will increase by almost 60%. Two thirds of the increase will come from third world countries, and by 2030 they would account for almost half of the total energy demand (www.bp.com).

The changes in the global market are placing Eskom under increasing risk in terms of securing future supplies from the local market, in which the production capacity has not kept pace with increases in both local and international demand. It is critical that local production be facilitated to ensure long term security of supply for electricity production. Additional power stations and major power lines are being built to meet rising electricity demand in South Africa (Eskom Annual Report, 2008). Until such time as alternative sources of energy are successfully implemented, coal will remain the primary source in South Africa.

The proposed Brakfontein Coal Mine has a gross *in situ* resource of 78 million tonnes (mt), *in situ* before losses, that can be classified as multi-product coal that would yield a significant portion of export steam coal. The planned LoM is in excess of 20 years.

The benefits of the proposed Brakfontein Coal Mine project are as follows:

- Coal will be directly supplied to Eskom where it will be burnt to generate electricity which is distributed throughout Southern Africa. Due to increased development and demand for electricity, there is an ever increasing need for coal mines to continue to produce coal for supply to Eskom;
- Approximately 200 jobs on the mine will be created, as well as multiplier effect;
- Training will be provided to employees resulting in an improvement of the local skills base;
- The mine will invest in social capital by undertaking a Social and Labour Plan, and promote sustainable local economic development in the surrounding areas;
- Support will be given to the local and national economy by the purchase of goods and services;
- The export of coal will contribute towards:
    - South Africa's foreign revenue;
    - The generation of export income; and
    - The expenditure by employees.

3.6 PROJECT ALTERNATIVES

3.6.1 Mining method

The nature of the coal seams determines the preferred mining method and the location of the feasible coal determines the location of the mining operation. These two factors limit mining alternatives that are available. The only possible alternative available for mining methods will be the no mining option.

3.6.2 Land use alternatives

When considering the allocation of land for development and in deciding applications for planning permission affecting agricultural land, the agricultural implications must be considered together with the environmental, cultural and socio-economic aspects. In particular, prime quality land should normally be protected against permanent development or irreversible damage.

Consideration of land use alternatives is one of the cornerstones of community planning. Land use decisions must be evaluated in terms of sustainability, broadly defined as balancing environmental, economic and social equity concerns. The primary land use categories that encompass basic functions are residential, commercial, industrial, recreational, institutional, and agricultural uses. Land use is determined by a number of factors. These include climate, resources, population growth, economic activity and topography. When considering a new development for an area, it is required that other land

use alternatives are considered to ensure that the development is justified and viable. In the project area, present land use includes agriculture, residential, and mining. Alternative land use of the area that could also be viable is low cost housing.

Agriculture is the only current viable land use alternative and currently involves the production of maize. The land may also be used for additional agricultural purposes such as grazing. Alternatively the land may be returned to its natural status which may hold possible eco-tourism benefits, however due to the adjacent land predominantly being used for agricultural purposes, eco-tourism in the area is an unlikely option.

Further investigation regarding the impacts of each of the alternative land use activities will be undertaken in the EIA.

3.6.3 Mine Plan and Infrastructure Layout

The current proposed mine layout (Amended Mine Plan – Plan 4A) is a result of the original plan being re-worked during the scoping phase to reduce the impact on wetlands as well as on surrounding farm owners. The original plan submitted with the draft scoping report has been included as Plan 4B for comparative purposes. The amended plan (Plan 4A) illustrates how the opencast areas have been moved out of the wetland and buffer zones and the two isolated farm portions towards the west are no longer to be mined.

3.6.4 No mining option

The current land use is one of agriculture, where land is planted to crops. The no-mining option will result in the continuation of such land use. Although economically viable, the continuation of agriculture may not provide the level of short-term economic growth to the area that mining would offer, such as increased employment of residents in the area, greater economic input into the area allowing better development of the towns and surrounding areas, and greater socio-economic stability in the area. After mine closure and rehabilitation of mined areas, the land capability may return to a state which would allow the continuance of agricultural practices. The mine will also promote sustainable local economic development, to give communities the skills required to remain economically viable and successful after mine closure.

Not mining the coal reserves available on Brakfontein will prevent the use of a coal reserve for the generation of electricity at a time where a much-publicised inability to generate enough electricity to sustain economic growth exists.

Plan 4A: Amended Mine Plan

Plan 4B: Original Mine Plan

4 DESCRIPTION OF PRE-MINING ENVIRONMENT

To date no detailed specialist work has been done on the site, these will be discussed in the terms of reference section where additional work is proposed for the EIA phase.

4.1 Geology

The proposed Brakfontein project area is situated at the edge of the Witbank coal field, which forms part of the Karoo basin extensively covering the central areas of South Africa. (Geology Map - Plan 5).

4.1.1 Stratigraphy

The basement rocks within the Karoo Basin are overlain by the Karoo Super Group. The pre-Karoo basement in the proposed Brakfontein project area consists of Transvaal Group rocks. Plan 5 shows the surface geological map of the Brakfontein study area (1:250 000 geological maps 2628 East Rand).

The lowermost part of the basement consists of Malmani dolomites and Cherts, which are overlain by ferruginous shale and ferruginous quartzites of the Timeball Hill Formation. Andesite of the Hekpoort Formation rests on the Timeball Hill Formation. Vaalian age diabase later intruded the Transvaal Sequence in the project area.

The basement of the Karoo Super Group, the Dwyka tillites, overlies the pre-Karoo basement. Dwyka tillites are fairly regularly deposited over the basin with the exception of paleo-topographical highs. The Dwyka tillites are overlain by the Vryheid formation which hosts the coal seams. The Vryheid formation consists of various sequences of sandstones, shales and siltstones with the various coal seams located within them. Higher units of the Karoo Super Group are not present within the study area. Recent sedimentary deposits are found wherever surface water features occur. The stratigraphy of the Brakfontein study area is shown in Table 4-1.

Table 4-1 Stratigraphy of Brakfontein

Age	Supergroup / Group	Formation	Lithology
Quatenary, Tertiary			Alluvium
Jurassic			Dolerite
Permian	Karoo	Vryheid	Sandstone, shale, coal beds
Carboniferous	Karoo	Dwyka	Diamictite, shale
Vaalian			Diabase
Vaalian	Transvaal	Hekpoort	Andesite
Vaalian	Transvaal	Timeball Hill	Ferruginous shale; ferruginous quartzite
Vaalian	Transvaal	Malmani	Dolomite, chert

Plan 5: Geology Map

4.1.2 Structural geology

During the Jurassic period, a large number of dolerite dykes and sills intruded into the Karoo formation acting as important geological structures diverting and impeding groundwater movements.

Dolerite intrusives (dykes and sills) are extensively developed south and east of the project area. The sediments in contact with the intrusion have been altered by contact metamorphism. These altered sediments are of great importance to the geohydrologist, due to their favourable water bearing properties.

4.2 Climate

Climate data for the Witbank Weather station (station number 0515320 8) was sourced from the South African Weather Bureau, as there is no climate station located in the Delmas area.

4.2.1 Description of the Regional Climate

The area falls under the Highveld climatic zone and is characterised by warm summers with rainfall. Winters tend to be mild to warm during the day to cold at night with sharp frosts.

Delmas has an annual average of between 8 and 10 hours of sunshine per day and is 1553 m above sea level.

4.2.2 Mean Monthly and Annual Rainfall and Precipitation

Precipitation occurs as showers and thunderstorms and falls mainly from October to March with the maximum falls occurring in November, December and January. Rainstorms are often violent (up to 242 mm can occur in one day) with severe lightning and strong winds, sometimes accompanied by hail. The winter months are droughty with the combined rainfall in June, July and August making up only 2.3 % of the annual total (661.2 mm).

4.2.3 Mean Monthly Maximum and Minimum Temperatures

The average daily maximum temperature in February (the hottest month) is 26.6 °C and in July (the coldest month) is 18.4 °C. The mean daily minimum in February is 15 °C and July 4.2 °C but extremes of 3.3 °C have occurred.

4.2.4 Mean Monthly Wind Direction and Speed

Data for 1997 to 2008 from the Witbank weather station was used. Wind speeds, averaged over a one hour period, ranged from 0m/s to 9.8m/s with a period average wind speed of between 1.6 and 3.5 m/s having been recorded. The wind speeds fluctuate from season to season with the strongest winds during the months of September to November. The predominant wind direction is East to East, South East.

4.3 Topography

The elevation of the project area ranges from 1540 – 1580 metres above mean sea level (m.a.m.s.l) which equates to a range of 40 metres between the lowest and highest points of elevation within the project area. The difference in elevation between these points gives rise to a slope percentage of between 0 and 5.5 (at isolated steeper areas). The average slope percentage for the entire project area is approximately 2.5. (Topography Map – Plan 6)

4.4 Soil

Existing Land Type data was used to obtain generalised soil patterns and terrain types for the proposed Brakfontein project site. Land Type data exists in the form of published 1:250 000 maps. These maps indicate delineated areas of similar terrain types, pedosystems (uniform terrain and soil pattern) and climate (Land Type Survey Staff, 1989).

The soils present in the Brakfontein project area are represented by two regional land types namely the Ab9 and Bb3 Land Types of the 2628 East Rand and 2528 Pretoria Land Type Maps (Agis website, National Department of Agriculture, Land Type Survey Staff, 1989). These land types indicate the underlying geology to consist mainly of sandstone, siltstone and shale. The size of the Ab Land Type is 45022 ha while the Bb3 Land Type occupies 3640 ha. The Ab Land Type is dominated by 30% crest and 55% mid-slope terrain unit positions in the landscape. Other positions in the landscape are foot-slope and valley bottom positions occupying 10% and 5% of the landscape positions respectively. The Bb Land Type is also dominated by similar landscape positions.

4.4.1 Dominant soil forms contained in Land Type Ab9

According to the land type data 85% of the landscape is dominated by crest and mid slope landscape positions. 65% of the dominant soils occurring in these landscape positions are deep red well drained red and yellow soils occurring in these upper landscape positions. The soils are predominantly sandy and are apedal (non-structured) in both the A and B horizons. Rooting depth can be limited by a clay layer underneath the yellow soils or parent rock occurring below the B soil horizon. The A horizon is likely to contain 12-20% clay due to the influence of the dominant sandstone parent material. The texture represents a sandy loamy textured soil.

Foot slope and valley bottom positions occupy only 15% of the landscape. Soils present in these landscape positions are dominated by high clay content soils. The clay content in the A horizon can be in the order of 50-70%.

4.4.2 Dominant soil forms contained in Land Type Bb3

Similar to Land Type Ab9 90% of this land type consists of crest and mid slope landscape positions. The dominant soils present in crest and mid slope positions are red and to a lesser extent yellow well drained soils. The influence of parent rock (sandstone parent material) influenced the formation of very sandy non structured (apedal) soil. The clay content in the A horizon is in the order of 8 – 12%. Soil texture is expected to represent a sandy loam soil.

Smaller areas in the foot slope and valley bottom positions of both the land types present in the proposed Brakfontein project area might contain waterlogged high clay content soils. These soils owing to their position in the landscape are seasonally or permanently wet. Where lateral drainage is forced by slope steepness and the presence of underlying impermeable layers on these landscape positions, soils containing an E horizon (evidence of lateral drainage) can occur. The occurrence of the G and E subsoil horizons in this landscape, prove that seasonally wet conditions prevail.

4.4.3 Fertility

The natural fertility status of the dominant soil in the crest and mid slope landscape positions is expected to be low. Fertility is mainly determined by the clay content of the A horizon in soils because most active roots grow in the A horizon. The fertility status is therefore low because the clay content is expected to be in the order of 10 – 25% in the A horizon.

Soil pH is expected to be low. Sandy soil has a low buffering capacity to inhibit acidification through cultivation processes. Any cultivation of sandy soils needs to take cognisance of the natural acidification process through monitoring and subsequent neutralisation of acidity through liming. Nutrients (bases) are lost through the acidification process further deteriorating the already low fertility status of these soils. Well drained sandy soil is a good candidate for increased natural acidification through loss of nutrients by drainage water in this high rainfall region.

4.4.4 Land capability and Land use

Land capability is determined by a combination of soil, terrain and climate features. Land capability is defined by the most intensive long term sustainable use of land under rain-fed conditions. At the same time an indication is given about the permanent limitations associated with the different land use classes.

The dominant soil and land capability of the proposed Brakfontein project site is expected to be arable commercial agriculture.

The predominant present land use in the Brakfontein region is expected to be agriculture, dominated by commercial dry land farming. This can be attributed to the high agricultural potential of the dominant soils found in the Brakfontain area. It is expected that several wetlands are also present in the project area. Usually wetland areas are too wet for arable agriculture but can be used for grazing cattle. The proposed Brakfontein project area is well serviced by tar roads as well as dirt access roads.

Plan 6 – Topography Plan

4.5 Surface Water

The proposed Brakfontein project site is located in the Nkangala District Municipality, Mpumalanga Province. This is located within the B20 Drainage Catchment of the Olifants Water Management Area (WMA 02). The quaternary catchment of the site is B20E (Catchments – Plan 7).

The economic activities in the area include mining (predominantly coal mining), agriculture (crop irrigation and livestock watering) as well as subsistence farming. There are signs of historic mining within the project area as there is an old dump located on the site which is used by the local people as a source of energy. Some farm homesteads occur with some labourers that live on the properties. There is also an informal housing settlement (with the potential to expand) located on the south western extremity of the project site.

There are portions of the project site that are traversed by water resources which are tributaries of the Wilge River. The water resources traversing the site form two distinct sub-catchments on the site one to the north-west and the other to the south-east. The upper north-west catchment has two streams flowing towards the east, which form a confluence that becomes the tributary of the Wilge River. In the south-eastern catchment, there is flow from a tributary of the Wilge River flowing in a northerly direction and a flow of the Wilge River also flowing in the northerly direction.

Plan 7: Catchments

4.6 Groundwater

No site specific information for the proposed Brakfontein project was available at the time of writing this report. The Witbank coal field is the subject of many academic and research projects and information given in this report is derived from such research projects done previously. The natural hydrogeological system within the Witbank coal field consists of three superimposed aquifers namely a shallow weathered aquifer, a fractured Karoo aquifer and a fractured pre-Karoo aquifer. The percentage recharge to this aquifer is estimated to be in the order of 1-3% of rainfall (Hodgson & Krantz, 1998).

4.6.1 Shallow Weathered Aquifer

The weathered material in the shallow weathered aquifer consists mostly of decomposed and highly weathered coarse grained sandstones, with shales and siltstones in some areas. The sustainability of the shallow weathered aquifer is dependent on seasonal recharge from rainfall. The rainwater infiltrates the soil and a portion of it (effective recharge) eventually reaches the saturated zone. The aquifer transmissivity of the weathered material is estimated between 0.5 and 1.5m²/day (Hodgson & Krantz, 1998).

4.6.2 Fractured Aquifer

The fractured aquifer consists of unweathered interlaminated sequence of sandstone and shales, fresh sandstone, carbonaceous shale, and coal. The pores within these sediments are too well cemented to allow any significant permeation of water. The intrusion of dolerite into these sediments, and other tectonic events may cause fractures and joints in the host rock, and these secondary interstices may have large water holding potential. Dolerite sills and dykes are generally impermeable to water movement, except in a weathered state. The occurrence of dolerite outcrops south and east of the project area depicts the presence of dolerite intrusion within the fractured aquifer system, in Brakfontein. Due to the relative impermeability of these Karoo sediments, fracturing of sediments is essential for a constant water supply. All groundwater movement is therefore along secondary structures in the sediments. However, not all secondary structures within the fractured aquifer are water-bearing. The apertures, of water-bearing structures, open to flow are very small, and have characteristic low hydraulic conductivities.

Of all unweathered sediments in the fractured aquifer, the coal seam often has the highest hydraulic conductivity. Seepage of groundwater through the No.2 seam is possible (Hodgson & Krantz, 1998). Mining will also result to enhanced secondary porosity in un-mined seam areas, resulting to a much higher transmissivity value than the layers above and below it.

4.6.3 Dwyka Tillite

The Dwyka tillite forms a hydraulic barrier between the overlying mining activities and the basement aquifer, due to its low hydraulic conductivity. The aquifer permeability of the dwyka tillite is estimated between 0.0002 and 0.0148m/d, with mean value of 0.0034 m/d (Hodgson & Krantz, 1998).

4.6.4 Basement Aquifer

Generally, the basement aquifer is characterised by low recharge because of the overlying Dwyka Tillite. Higher recharge to the basement aquifer is possible in areas where basement rocks outcrop, especially in dolomitic outcrops. Aquifer yields in the basement aquifer may vary depending on the rock type intersected by a borehole. High yields are expected in areas where the pre-Karoo diabase intersects the low yielding basements rocks.

The top section of the dolomitic basement aquifer in the project area may be chert rich. This chert layer acts as a paleo-channel, and serves as a conduit for water. Due to the high piezometric pressure of this system, where it is not overlaid by tillite, it forces water upwards into and above the coal seam.

4.7 Aquatic & Wetland Environments

The proposed project area is situated within the Olifants Water Management Area. The quaternary catchment area in which the proposed site is located is B20E. This catchment area is known as the Wilge River catchment which is drained by the Wilge River. The Wilge River is a tributary of the Olifants River. A number a wetland areas have also been identified within the project area. These wetlands are located on the upper reaches of the Wilge River as well as the Wilge River tributaries. These wetlands cover approximately one third of the project area and are characterised as valley bottom and hillslope seepage wetlands connected to the Wilge River and respective tributaries.

There are a number of water courses flowing through the proposed project sites. The water course type's present vary from non-perennial tributaries and perennial rivers to wetlands. The Wilger River and two of its perennial tributaries flow through the proposed site in a Northerly and North-Easterly direction eventually entering into the Olifants River approximately 10 km further downstream. The water supply of the Wilge River is sustained by groundwater aquifers and water flow from its tributaries. Where groundwater meets the land surface a number of wetlands exist. No desktop evidence for the presence of springs is available.

The Olifants River system is regarded as one of the most polluted systems in southern Africa, this is largely attributed to the high number of anthropogenic stressors that are present, particularly in the upper catchment, and the changes to water quality that have resulted from these activities (Oberholster, et al., 2011). According to Oberholster et al. (2011) these stressors consist of intensive coal mining activity, coal-fired power generation, industrial activities and agriculture, combined with a general decline in the operation and management of waste water treatment infrastructure, especially sewage treatment. Oberholster et al. (2011) indicated that two main sets of stressors are present in the upper Olifants River catchment. These are acidic water containing heavy and trace metal ions and sulphate that is attributable to abandoned mining and industrial activities, as well as excessive nutrient concentrations and microbial organisms originating from inflows of untreated or poorly treated sewage. In light of this, recommendations were made to direct attention towards the protection (and rehabilitation) of natural wetlands in the upper Olifants

River catchment in order to alleviate some of the identified stressors, as well as to provide important ecological services which may improve the overall state of these systems.

The Wilge River is classified as a largely modified (Class D) system in terms of conservation status. Wetlands associated with the upper reaches of the Wilge River have been described as important and necessary according to the Mpumalanga Conservation Plan. The biodiversity of the water courses flowing through the proposed sites can be described as endangered.

Upstream as well as on the periphery of the project site a variety of anthropogenic activities occur. These activities include residential activities (Informal/formal housing), agricultural activities (chicken, maize, cattle and dairy farming as well as farm infrastructure), mining activities (Umbeko Mining, Keaton Mining), as well as recreational areas such as lodges. It can also be noted that water impoundments exist along the tributaries of the Wilge River in two locations. An aquatic sensitivity plan has been mapped for the area (Plan 8) and potential wetlands (Plan 9).

The mine plan has been amended as a result of recent wetland delineations taking into account soils as well as flora and fauna.

Plan 8: Aquatic Sensitivity

Plan 9: Potential Wetlands

4.8 Flora

4.8.1 Description of biome

The area falls in the Grassland Biome of South Africa (Rutherford & Westfall, 1986). The Grassland Biome is found on the high central plateau of South Africa, and the inland areas of Kwazulu-Natal and the Eastern Cape. The topography is mainly flat and rolling, but includes the escarpment itself. The altitude covered by this biome varies from near sea level to 2 850 m above sea level. The vegetation type consists of a simple, single-layered herbaceous community of mainly tussocked grasses. High rainfall on the cold, frosty, eastern Mpumalanga highveld, together with sandy soils, controls the distribution of this vegetation type.

Grasslands are dominated by a single layer of grasses (Rutherford & Westfall, 1986). The amount of cover depends on rainfall and the degree of grazing. Trees are absent, except in a few localized habitats. Geophytes are often abundant. Frost, fire and grazing maintain the grass dominance and prevent the establishment of trees (Rutherford & Westfall, 1986).

Between 60% and 80% of South Africa's grassland Veld Types (Acocks, 1975) have been irreversibly transformed (MacDonald, 1989). Less than 2% of South Africa's grasslands are formally conserved (Rutherford & Westfall, 1986). Of the 115 859 km² of grasslands in Gauteng, Mpumalanga and the Orange Free State: 56 782 km² was under cultivation by 1987 (MacDonald, 1989); more than 7 000 km² was under plantations by the early 1990s (Cowling & Olivier) and a further 5 000 km² is scheduled for tree planting by 2020 (van der Zel, 1989); 2 000 km² of the Mpumalanga Highveld is taken up by South Africa's major gold and coal deposits, much of which are mined in opencast pits (Huntley et al, 1989).

Pollution levels on the Mpumalanga Highveld area are among the highest in the world (Huntley et al, 1989) largely as a result of Eskom Power Stations producing 70% of South Africa's power requirements (Huntley, 1989), pulp and paper mills (a further 8 have been proposed within the biome as a whole) (van der Zel, 1989), petrol-from-coal plants and many large industries with a high potential for causing major pollution disasters (e.g. A multitude of steel, gold, chrome and other metallurgical processing industries).

The conservation status of the grassland type (a vegetation type that includes many habitats such as wetlands and seeps, seen as particularly important to the biome, as well as limited areas of rocky outcrops) within which Brakfontein is situated is rated as endangered with only a very small portion conserved in statutory reserves and private reserves. Some 44% has been transformed primarily by cultivation, plantations, mines and urban development (Mucina & Rutherford, 2007).

4.8.2 Description of Vegetation type

According to Acocks (1988) the area of interest falls within the Bankenveld vegetation type (Type no. 61) of the grassland biome. Three variations are recognised, namely: the Central, Eastern and Western Variations. The area of interest falls within the Eastern Variation which has sandy plains and is wetter than the Western Variation. A more recent classification of the vegetation types of South Africa by Low and Rebelo (1996) refers to the vegetation type

as the "Moist Sandy Highveld Grassland" (Type no. 38) and lists "North-eastern Sandy Highveld" (A57) and "Eastern Bankenveld" (A61c) as synonyms.

The vegetation type consists of a simple, single-layered herbaceous community of mainly tussocked grasses. High rainfall on the cold, frosty, eastern Mpumalanga highveld, together with sandy soils, controls the distribution of this vegetation type. Species associated with this vegetation type have been listed in Table 4-2 (Acocks, 1988).

Despite the fact that the province of Mpumalanga is regarded as having a high degree of biological diversity and includes three centres of endemism and one proposed centre of endemism, less than a quarter of the land falls within formally protected areas (Emery et al, 2002). Although significant areas of the province are protected in private game and nature reserves, the level of protection and the appropriateness of management applied varies widely from property to property and from owner to owner.

Grasslands collect rain water by reducing immediate runoff and thus erosion, they hold the water as ground water or in wetlands and release it slowly throughout the year (including the dry season) through seepage zones.

The southern grasslands of Mpumalanga, for example, provide a year-round supply of good quality water essential for the cooling of the power generators of the Highveld power stations (DWAF, 1986) - power stations that produce 70% of South Africa's electricity requirements. Without this readily available and suitable water the coal fields of Mpumalanga would be unable to generate this power.

Table 4-2: Species associated with this vegetation type (Acocks, 1988).

Species of general occurrence		
Andropogon schirensis	*Aristida aequiglumis*	*Aristida congesta congesta*
Bewsia biflora	*Brachiaria serrata*	*Cymbopogon excavatus*
Dicoma anomala	*Digitaria tricholaenoides*	*Diheteropogon amplectens*
Elionurus muticus	*Eragrostis chloromelas*	*Eragrostis gummiflua*
Eragrostis plana	*Eragrostis racemosa*	*Erelytrum agropyroides*
Helichrysum coriaceum	*Heteropogon contortus*	*Hyparrhenia hirta*
Microchloa caffra	*Monocymbium ceresiiforme*	*Panicum natalense*
Schizachyrium sanguineum	*Stoebe vulgaris*	*Themeda triandra*
Trachypogon spicatus	*Tristachya leucothrix*	*Tristachya rehmannii*
Species of less general occurrence		
Acalypha angustus glabra	*Alloteropsis semialata eckloniana*	*Aristida junciformis*
Ctenium concinnum	*Cynodon dactylon*	*Digitaria monodactyla*
Diheteropogon filifolius	*Eragrostis capensis*	*Eragrostis curvula*
Eragrostis sclerantha	*Ficinia spp.*	*Harpochloa falx*
Loudetia simplex	*Parinari capensis*	*Schizachyrium ursulus*
Senecio coronatus	*Setaria flabellate*	*Setaria nigrirostris*
Sporobolus centrifugus	*Vernonia oligocephala*	

4.8.3 Red Data species

Floristically, Mpumalanga is diverse, with an estimated 4946 plant species occurring within the province, including 350 proposed threatened plant species. Although Mpumalanga only covers approximately 3% of southern Africa, the province supports approximately 21% of the plant life within the southern African region (Emery et al, 2002). However, this high diversity of plant species is not evenly distributed within the province, instead being concentrated within the centres of endemism located within the province.

4.8.4 Exotic and invasive plant species

The Conservation of Agricultural Resources Act regards weeds as alien plants with no known useful economic purpose that should be eradicated. Invader plants, also considered by the Act, are also of alien origin but may serve useful purposes as ornamentals, as sources of timber, or may have other benefits. These plants need to be managed and prevented from spreading.

Category 1 plants are weeds that serve no useful economic purpose and possess characteristics that are harmful to humans, animals or the environment. These plants need to be eradicated using the control methods stipulated in regulation 15.D of the Conservation of Agricultural Resources Act. Category 2 plants are plants that are useful for commercial plant production purposes but are proven plant invaders under uncontrolled conditions outside demarcated areas. Category 3 plants are mainly used for ornamental purposes in demarcated areas but are proven plant invaders under uncontrolled conditions outside demarcated areas. The planting of Category 2 and 3 plants should be confined to demarcated areas under controlled conditions of cultivation. Table 4-3 lists the exotic and alien invasive species that may occur on the site, according to the Precis list.

Table 4-3: Exotic and Invasive plant species

Scientific Name	**English Name**	**Ecological Status**	**Form**
Cirsium vulgare	Scotch Thistle	Alien invasive	Herb
Rumex crispus	Curly Rumex	Alien invasive	Herb
Veronica anagallis-aquatica	-	Alien invasive	Herb
Cuscuta campestris	Common Dodder	Exotic	Climber
Eragrostis tef	Tef	Exotic	Grass
Paspalum dilatatum	Dallis Grass	Exotic	Grass
Paspalum distichum	Water Couch	Exotic	Grass
Amaranthus hybridus hybridus var. erythrostachys	-	Invasive	Herb

4.8.5 Medicinal plant species recorded during the survey

Medicinal plants are important to many people and are an important part of the South African cultural heritage (Van Wyk et al., 1997). Plants have been used traditionally for centuries to cure many ailments, as well as for cultural uses such as building material and for spiritual uses such as charms. The areas in which these plants occur could be under more pressure

from people collecting them for cultural and medicinal reasons. These collectors will trample other species in the area and remove medicinal plant species, leaving the ground open for weedy or alien species to colonise. Medicinal plant species that have been confirmed in the area of interest is listed in Table 4-4.

Table 4-4: Medicinal plant species

Scientific Name	English Name	Ecological Status	Form
Gladiolus sericeovillosus calvatus		Charm	Herb
Ipomoea crassipes	Leafy-flowered Ipomoea	Charms	Herb
Indigofera evansiana		Cultural	Herb
Tulbaghia sp.		Edible; Charm	Herb
Crinum bulbispermum	Orange/Vaal river lily	Medicinal	Herb
Hibiscus trionum	Bladder Hibiscus	Medicinal	Herb
Ledebouria cooperi	Cooper's Squill	Medicinal	Bulb/Herb
Ledebouria ovatifolia		Medicinal	Bulb/Herb
Ledebouria revoluta	Common Ledebouria	Medicinal	Bulb/Herb
Linum thunbergii	Wild Flax	Medicinal	Herb
Senecio inornatus		Medicinal	Herb
Vernonia oligocephala	Bicoloured-leaved Vernonia	Medicinal	Herb
Pseudognaphalium luteo-album	Jersey Cudweed	Medicinal; Cultural	Herb

4.9 Fauna

The results of the animal desktop studies have been summarised below. Mpumalanga is faunally diverse, with 163 mammal species, 567 bird species, 154 reptile species, 51 amphibian species and 62 indigenous fish species (Emery et al, 2002). As with the provincial flora, the highest diversity of fauna is located within the central and eastern parts of the province (Plan 10).

4.9.1 Mammals

Fifteen of the 34 mammals (44%) endemic to South Africa can be found in the Grassland Biome and 4 of these (27%) are endemic to the biome (Smithers, 1983) and of the 92 threatened land mammals in South Africa 18 (20%) can be found in the Grassland Biome. In Table 4-5, the species with Red data status that may occur in the area of interest is listed.

Table 4-5: Red Data mammal species

Genus and species name	Species; subspecies	English name	Status
Chrysospalax	*villosus*	Rough-haired Golden Mole	Critically Endangered
Ourebia	*ourebi*	Oribi	Endangered
Damaliscus	*lunatus lunatus*	Tsessebe	Endangered
Mystromys	*albicaudatus*	White-tailed Rat	Endangered
Leptailurus	*serval*	Serval	Near Threatened

Genus and species name	Species; subspecies	English name	Status
Hyaena	*brunnea*	Brown Hyaena	Near Threatened
Mellivora	*capensis*	Honey Badger	Near Threatened
Lutra	*maculicollis*	Spotted-necked Otter	Near Threatened
Miniopterus	*fraterculus*	Lesser Long-fingered Bat	Near Threatened
Miniopterus	*schreibersii*	Schreiber's Long-fingered Bat	Near Threatened
Myotis	*tricolor*	Temminck's Hairy Bat	Near Threatened
Myotis	*welwitschii*	Welwitsch's Hairy Bat	Near Threatened
Rhinolophus	*clivosus*	Geoffroy's Horseshoe Bat	Near Threatened
Rhinolophus	*darlingi*	Darling's Horseshoe Bat	Near Threatened
Rhinolophus	*landeri*	Lander's Horseshoe Bat	Near Threatened
Atelerixs	*frontalis*	South African Hedgehog	Near Threatened
Amblysomas	*septentrionalis*	Highveld Golden Mole	Near Threatened
Dasymys	*incomtus*	Water Rat	Near Threatened
Crocidura	*maquassiensis*	Maquassie Musk Shrew	Vulnerable

4.9.2 Birds

Of the 40 species endemic to South Africa 21, or 53%, are found in the Grassland Biome. Twelve (57%) of these are endemic to the biome. The southern highland grasslands of Mpumalanga, together with the adjacent areas of KwaZulu-Natal and the Free State have been declared an Endemic Bird Area (EBA) in urgent need of conservation by BirdLife International, advisors to the IUCN on matters affecting birds. An EBA supports at least two endemic species of birds with a distribution range of less than 50 000 km². The South African Grassland EBA supports three - Rudd's Lark, Botha's Lark and Yellowbreasted Pipit -all considered threatened on a global scale (Stattersfield et al, 1998);

Of the 16 species occurring in South Africa and considered to be threatened on a global scale by BirdLife International, 11 (69%) are either entirely restricted to the Grassland Biome or have a substantial proportion of their local population reliant on this biome. This is also true for 9 of the 30 near-threatened species (Collar et al, 1994); and

Of the 79 species considered to be threatened or near threatened on a southern African scale by the Avian Demography Unit (Barnes, 1996), 31 (39%) are restricted to or substantially dependent on these grasslands. Red listed species are listed in Table 4-6.

Table 4-6: Red data birds

Scientific	English Name	Red Data status
Botaurus stellaris	Bittern	Vulnerable
Ciconia nigra	Black Stork	Near Threatened
Mycteria ibis	Yellowbilled Stork	Near Threatened
Phoenicopterus ruber	Greater Famingo	Near Threatened
Phoenicopterus minor	Lesser Flamingo	Near Threatened
Sagittarius serpentarius	Secretarybird	Near Threatened
Gyps coprotheres	Cape Vulture	Vulnerable
Hieraaetus ayresii	Ayres' Eagle	Near Threatened

Scientific	English Name	Red Data status
Circus ranivorus	African Marsh Harrier	Vulnerable
Circus pygargus	Montagu's Harrier	Near Threatened
Circus maurus	Black Harrier	Near Threatened
Falco peregrinus	Peregrine Falcon	Near Threatened
Falco biarmicus	Lanner Falcon	Near Threatened
Falco naumanni	Lesser Kestrel	Vulnerable
Anthropoides paradisea	Blue Crane	Vulnerable
Crex crex	Corncrake	Vulnerable
Podica senegalensis	African Finfoot	Vulnerable
Eupodotis caerulescens	Blue Korhaan	Near Threatened
Rostratula benghalensis	Old World Painted Snipe	Near Threatened
Charadrius pallidus	Chestnutbanded Plover	Near Threatened
Glareola nordmanni	Blackwinged Pratincole	Near Threatened
Tyto capensis	Grass Owl	Vulnerable
Alcedo semitorquata	Halfcollared Kingfisher	Near Threatened

4.9.3 Reptiles

Approximately 13 (14%) of the 93 species of threatened reptiles and amphibians in South Africa occur in the Grassland Biome (Branch, 1988a) and 11 (85%) of these are endemic to the biome. Approximately 42 (22%) of the 195 reptiles endemic to South Africa are found in the Grassland Biome (Branch, 1988b). Of these 20 (48%) species and a further 7 subspecies are endemic to the biome.

The Southern African Python (*Python natalensis*) is designated as Vulnerable and the Aurora House Snake (*Lamprophis aurora*) as rare.

4.9.4 Amphibians

Approximately 16 (30%) of the 54 amphibians endemic to South Africa are found in the Grassland Biome (Passmore & Carruthers, 1995). Of these 8 species (50%) are endemic to the biome. Of these the Giant Bullfrog (*Pyxicephalus adspersus*) is designated as endangered.

Plan 10: Terrestrial Biodiversity

4.10 Air Quality

Mpumalanga Province experiences a wide range of both natural and anthropogenic sources of air pollution ranging from power generation to veld fires, mining activities, industrial processes, agriculture, paper and pulp processing, vehicle use and domestic use of fossil fuels. Different pollutants are associated with each of the above activities, ranging from volatile organic compounds and heavy metals to particulate matter, dust and odours. Mpumalanga experiences distinct weather patterns in summer and winter that affect the dispersal of pollutants in the atmosphere. In summer, unstable atmospheric conditions result in mixing of the atmosphere and rapid dispersion of pollutants. Summer rainfall also aids in removing pollutants through wet deposition. In contrast, winter is characterised by atmospheric stability caused by a persistent high pressure system over South Africa. This dominant high pressure system results in subsidence, causing clear skies and a pronounced temperature inversion over the Highveld. This inversion layer traps the pollutants in the lower atmosphere, which results in reduced dispersion and a poorer ambient air quality. Preston-Whyte and Tyson (1988) describe the atmospheric conditions in the winter months as highly unfavourable for the dispersion of atmospheric pollutants.

4.11 Noise

The surrounding land use is predominantly agricultural and business. Likely noise sources in the area are vehicular traffic on the municipal roads as well as agricultural activities on the surrounding farms.

The predominant noise source is expected to be the vehicular traffic on the R50 Arterial route, which is located ±250m south of the study area, as well as the Leandra/Dryden arterial route, which diagonally divides the proposed site.

The South African Bureau of Standards have set out in the South African National Standard (SANS 10103:2008) acceptable noise levels in various districts for varying land use purposes. These have been depicted in Table 4-7 below. Presently the site would be considered a rural district thus only 45 dBA is allowed during the day and 35 dBA at night. These standards play an important role for different districts and land use purposes.

Taken into account the mentioned noise sources, it is expected that the existing ambient noise levels are within or near the limit guidelines as mentioned above.

Table 4-7: Acceptable noise levels for different land use purposes (SANS 10103, 2008)

Type of District	Equivalent continuous rating level (LReg.T) for noise dBA					
	Outdoors			Indoors, with open windows		
	Day-night LR,dna	Day-time LReq,db	Night-time LReq,nb	Day-night LR,dna	Day-time LReq,db	Night-time LReq,nb
RESIDENTAIL DISTRICTS						
a) Rural districts	45	45	35	35	35	25

Type of District	Equivalent continuous rating level (LReg.T) for noise dBA					
b) Suburban districts with little road traffic	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
NON-RESIDENTIAL DISTRICTS						
d) Urban districts with some workshops, with business premises, and with main roads	60	60	50	50	50	40
e) Central business districts	65	65	55	55	55	45
f) Industrial districts	70	70	60	60	60	50
NOTE 1 If the measurement or calculation time interval is considerably shorter than the reference time intervals, significant deviations from the values given in the table might result.						
NOTE 2 If the spectrum of the sound contains significant low frequency components, or when an unbalanced spectrum towards the low frequencies is suspected, special precautions should be taken, and specialist advice should be obtained. In this case the indoor sound levels might significantly differ from the values given in columns 5 to 7						
NOTE 3 In districts where outdoor LR,dn exceeds 55 dBA, residential buildings (e.g. dormitories, hotel accommodation and residences) should preferably be treated acoustically to obtain indoor LReq,T values in line with those given in table 1.						
NOTE 4 For industrial districts, the LR,dn concept does not necessarily hold. For industries legitimately operating in an industrial district during the entire 24 h day/night cycle, LReq,d = LReq,n =70 dBA can be considered as typical and normal.						
NOTE 5 The values given in columns 2 and 5 in this table are equivalent continuous rating levels and include corrections for tonal character, impulsiveness of the noise and the time of day.						
NOTE 6 The noise from individual noise sources produced, or caused to be produced, by humans within natural quiet spaces such as national parks, wilderness areas and bird sanctuaries, should not exceed a maximum Aweighted sound pressure level of 50 dBA at a distance of 15 m from each individual source.						
a The values given in columns 2 and 5 are equivalent continuous rating levels and include corrections for tonal character and impulsiveness of the noise and the time of day.						
b The values given in columns 3, 4, 6 and 7 are equivalent continuous rating levels and include corrections for tonal character and impulsiveness.						

4.12 Visual Aspects

The study area is located on the farm Brakfontein 264R, Portions 6, 8, 9, 10, 30, 20, 26 and RE in the Delmas area. The study area fits into the context of the surrounding region in that the area, which is predominantly characterized by agricultural activities, interlaced by drainage lines and associated wetlands. There is evidence of mining activity in the immediate vicinity of the project areas (approximately 1.9 km north of the study area, 2.4 km, 1km and directly south of the study area while) while Leeupan Colliery is located ±8.5 km to the northwest of the study area and Stuart Colliery is located ±7.5km in the same general direction (slightly more northern). The town of Delmas is located ±14km to the northwest of the study area and the R50 Arterial route is located ±250m south of the study area. The study area is not near any nature reserves and the area is largely disturbed by agricultural

and the aforementioned mining activities. These features are illustrated in the Local Setting Plan (Plan 2).

4.13 Archaeology & Heritage

With reference to the attached Initial Heritage Statement (Appendix B), a total of 12 heritage resources were identified within the surrounding areas of the proposed Brakfontein project area (Plan 11). These heritage resources include graves, historical homesteads, an old mine and three shelters with Stone Age material. Therefore, there is a potential for graves and historical structures such as homesteads within the project area as well as Stone Age heritage resources. A Phase 1 Heritage Impact Assessment (HIA) is recommended, to identify and assess heritage resources with the proposed project area that includes a historical study of the old mine, visual impact assessment and a focussed grave survey in conjunction with the Public Participation Process (PPP).

Plan 11: Potential Heritage Sites

4.14 Social Environment

This section provides a brief overview of the socio-economic environment affected by the proposed project. In order to provide sufficient context, it focuses on the local municipal area, although site specific information is also presented. Information has been sourced from the 2007 Community Survey, the Victor Khanye Local Municipality's Integrated Development Plan (IDP) for 2006 – 2011, as well as the screening study (which included a site visit) for the same project conducted by Digby Wells during August 2011.

4.14.1 The Victor Khanye Local Municipality

The Victor Khanye Local Municipality (VKLM) is one of six local municipalities in the Nkangala District Municipality in Mpumalanga province. It borders the Ekurhuleni Metropolitan Municipality to the west and is located between Johannesburg in Gauteng and Nelspruit in Mpumalanga, about 10km from the N12 highway which joins the N4 Maputo Corridor. It covers an area of roughly 1 570km^2, and is characterised by an increase in the number of mining and related activities, especially in the Leandra area.

Farming is the dominant economic activity in the local municipality, occupying about 60% of its surface area. However, the trade industry is the largest contributor to the local economy, followed by agriculture and mining.

4.14.2 Population

In 2007, there were an estimated 50 500 people residing in the VKLM, representing a 10% decline in population since the 2001 Census. This decline may be partially attributable to the limited economic activities available in the local municipal area, as also discussed in Section 4.14.5. Almost 90% of the population are black Africans, about 60% of whom speak isiNdebele. In 2001, about 30% of the population were under the age of 20, while about 20% were in their 20s.

4.14.3 Settlements and housing

The main urban areas within the local municipal area are Delmas, Eloff, Sundra and Botleng. Rural settlements include Brakfontein, Argent, Arbor, Dryden and Waaikraal, and agricultural settlements (smallholdings) are located in the vicinity of Eloff, Sundra, Strydpan and Delmas.

According to the 2007 Community Survey, 66% of households lived in a brick structure on its own stand or yard, while 25% lived in an informal dwelling or shack in a squatter settlement, almost all of who occupy their structure rent-free. The VKLM has a housing backlog of about 5 000 houses and is experiencing a number of challenges in their effort to provide adequate housing.

4.14.4 Household energy and other basic services

As shown in Table 4-8, at least 80% of the households in the local municipal area have access to electricity and use it for lighting, cooking and/ or heating, although some of these

connections are likely illegal, especially given the high percentage of households resident in informal squatter settlements void of formal services.

Table 4-8: Fuel source for lighting, heating and cooking

Fuel source	Lighting	Heating	Cooking
Electricity	80%	36%	54%
Candles	17%	-	-
Coal	-	47%	26%
Wood	-	7%	4.3%
Paraffin	1.3%	5%	14%
Other	2%	5%	2%
Total	**100%**	**100%**	**100%**

About 90% of the population have access to piped ***water***, whether it is inside their dwelling, yard or outside their yard. Almost 70% of households have a flush ***toilet*** connected to a sewerage system, while more than 20% of households make use pit latrines, bucket latrines or have no access to a toilet facility. Just more than 75% of households have their ***refuse*** removed once a week, while 21% of households have their own refuse dump.

4.14.5 Literacy, education, employment and income

Educational levels are low in the local municipality (and below the provincial average): a quarter of the population has had no formal schooling and only 14% have attained matric. Almost two-thirds of VKLM's population is functionally literate, compared to 73% of the Nkangala District Municipality's population, and 68% of the province's population.

Roughly 40% of the population in the local municipality is economically active, although only a quarter of this population is employed, translating into an unemployment rate of 75%. About a third of the employed population work in elementary occupations, 18% in industrial occupations and 13% in craft and trade occupations.

During 2001, a fifth of households in the VKLM reported not earning an income, while the average household income was almost R2 300 per month. This is indicative of high levels of poverty and a heavy reliance on social assistance such as grants and subsidies.

4.14.6 Transport

The public transport system is limited in the whole of Mpumalanga province. This, in combination with the high levels of poverty in the VKLM, results in the dominant means of transport being by foot (about 75% of the population). Although a minibus taxi service is available in the area, those living in poverty cannot afford this means of transport. In addition, the passenger rail linking the VKLM with Pretoria, Johannesburg, Witbank, Middelburg and Nelspruit was discontinued for unknown reasons. This lack of efficient transport limits the economic opportunities for those resident in the local municipality, and cuts them off from economic hubs, reinforcing the cycle of poverty.

4.14.7 HIV/ AIDS

During 2008, the HIV prevalence ratio for all age groups in the local municipality was 11.4%, which is slightly higher than the provincial prevalence.

4.14.8 Land claims

As at the end of 2010, there were six gazetted and one potential land claim in the V

KLM, affecting the following farms:

- Klipfontein 568 JR
- Honingkranz 536 JR
- Vlakvarkfontein 213 IR
- Dwaalfontein 565 JR
- Hartbeesfontein 537 JR
- Moabsvelden/ Middelbiult 248 IR
- Wolvenfontein 224 IR (not yet gazetted)

These land claims should not affect the proposed project.

4.14.9 Municipal developmental issues

Based on ward consultative meetings with the local communities, the VKLM has identified the following as priority developmental issues:

- ***Basic service delivery and infrastructure development***, including housing and property development, environment and waste management, water and sanitation, emergency services, primary health services, and land and spatial reform;
- ***Local economic development***, including SMME development, job creation, poverty alleviation and tourism development;
- ***Institutional development and municipal transformation***, including organisational design, performance management, training and skills development, and information technology and systems;
- ***Financial viability and management***, including revenue enhancement and supply chain management; and
- ***Good governance***, including combating fraud and corruption, and increasing public participation.

4.14.10 Conditions on and surrounding the project site

There are a number of coal mines and a power station in the vicinity of the project site, as listed in Table 4-9.

Table 4-9: Mining and power projects surrounding the project site

Project/ operation	Company	Location relative to project site
Leeupan Colliery	Exxaro Coal	10km north west
Stuart Colliery	Stuart Coal	11km north west
Vanggatfontein	Keaton Energy	2.5km north
Kendal Power Station	Eskom	14km north east

The project site is currently used for capital intensive agricultural activities (evidenced by the presence of centre pivot irrigation systems) and cattle farming. There seems to be both land owners and workers living on the project site, evidenced by three formal structures (two presumably for land owners or managers and one for farm workers). There are also a number of formal and informal dwellings surrounding the project site. This information will be verified during the impact assessment phase, and the number of structures will be quantified.

The project site is serviced with roads, power lines and a railway line. There are a number of farm roads on the project site that are likely used by local farmers, and there are two Eskom substations adjacent the project site. There are also pipeline markers north of one of the substations, which may be a gas pipeline and may be planned to traverse the project site.

5 POTENTIAL ENVIRONMENTAL IMPACTS

5.1 Topography

5.1.1 Construction

The construction of the mine and associated impacts would have minimal impacts on a regional scale but on a local scale the topography would be altered due to construction of dumps, dams and stockpiles. The construction of such infrastructure is likely to have an impact on site specific and local topographical functioning and the visual environment.

5.1.2 Operation

During the operational phase the topographical disturbance would increase slightly due to growth of discard dumps, stockpiles and other associated infrastructure.

5.1.3 Decommissioning

Once the infrastructure and machinery has been removed, the topographic disturbance of the discard dump and other drastic changes to the site specific topography will persist; they

will become part of the visual landscape and could possibly carry on affecting local topographic functioning.

5.2 Soil

Presently the area is used for arable commercial farming. Agriculture in Mpumalanga has been in existence for more than 100 years. A balance between arable crop production and grazing developed over this time in the Brakfontein project area which allowed up to now the optimal utilisation of the land. Mining will have an influence on land capability thereby changing the post mining land use of the Brakfontein project area permanently.

5.2.1 Construction Phase

During the construction phase of the mining project, the work carried out will mainly be the setting up of infrastructure, namely, roads, buildings, and workshops. This will entail the clearing of areas and the disturbance of the topsoil. The topography and natural drainage lines may also be disturbed. The overall impact will be loss of topsoil as a result of erosion and possible contamination of the soil by fuel and oils as a result of general construction activities. Soil compaction caused by heavy vehicles and machinery may also be a problem.

The impacts will be negative, some may be permanent, but during construction will probably be site specific. Soil contamination may cause pollution of underground water. Some degree of soil disturbance will take place and this may have a serious impact on the soil capability and productivity.

Construction activities will change the land use from agriculture to mining. Mined areas including the areas where buildings and infrastructure have been erected will be unsuitable for any farming use.

5.2.2 Operational Phase

Soil erosion and soil pollution may be encountered during the operational phase. Water runoff from roads and plant areas must be controlled in order to prevent soil erosion. Diesel and oil spills are common at mine sites due to the large volumes of diesel and oil consumed by construction vehicles. Pollution may however be localised. Small pockets of localised pollution may be cleared up easily using commercially available hydro carbon emergency clean-up kits.

Stockpiled soil must be clearly demarcated and protected against erosion by establishing vegetation on the stockpiles.

5.2.3 Decommissioning Phase

Mining and rehabilitation should develop together and maintained during all phases of mining. During mining operations the impact on the soil will mostly be the result of stripping and stockpiling of the topsoil and sub-soil. The natural sequence of the soil horizons is lost while stockpiling soil causes the organic carbon content and fertility to be reduced.

Rehabilitation of the disturbed mined areas causes mechanical compaction and soil contamination.

The impacts will be negative and mostly of a permanent nature. The disturbance of the soil layers will be a problem, even after the area has been rehabilitated. Recovery of the soil quality is dependent on the quality of rehabilitation. Fertility may be improved through soil amelioration but soil depth and compaction are not easily alleviated.

5.3 Land Use and Land Capability

The general degradation of the soil caused by the stripping and stockpiling that takes place during the opencast mining operation would result in land-use changes. Cultivated arable land suitable for crop cultivation will be reduced resulting in a change in land use. Normally this land use change is from arable agriculture to grazing due to a decrease in soil capability.

If heavy vehicles and machinery are not confined to the roads, widespread compaction may take place. However, it is unlikely that land capability will be significantly affected.

5.4 Surface Water

There are potential water quality and quantity impacts that can arise from the project which can negatively impact on the surface water environment throughout the phases of mining (construction, operation, decommissioning and post closure). The main impact will be as a result of the proposed opencast mining activities that are planned for the south eastern side of the project area. This will necessitate that a GN R 704 from exemption is applied for under the Integrated Water Use Licence Application (IWULA) for mining through a water resource. The underground mining planned for the far north western site will also be underneath a water resource and a similar application for exemption will be required as a result. However the significance of the impact will be less than that expected for the opencast mining. The potential impacts for the different phases of mining are detailed below.

5.4.1 Construction Phase

During the construction phase the clearing of the site and vehicular movement are the main activities anticipated and may have potential impacts on quality and quantity of surface water.

Surface Water Quality

Dust from vehicular movement may settle in the water resources resulting in siltation. The pro-longed hydrocarbon leakages and spillages may impact negatively on the surface water resources. The topsoil berms that will be put to isolate the dirty/mining area if not vegetated may result in soil erosion during the rainfall season. This may lead to siltation of the water resources.

Surface Water Quantity

The delineation and isolation of the mine area (dirty area) by means of topsoil berms may result in loss of surface runoff to the surface water catchment.

5.4.2 Operation Phase

During the operational phase, increased surface water quality and quantity impacts are expected as a result of the activities that will take place particularly where the opencast mining is planned. It is therefore proposed that rollover mining be implemented in order to reduce the significance of the potential impacts.

Surface Water Quality

Surface water quality during operation may be impacted upon negatively by the spillages/leaks of chemicals, hydrocarbon containing materials, sewage and the erosion of soil to the surface water resources.

The management of seepage and rainfall into the opencast pit may lead to surface water quality impacts if not disposed in lined pollution control dams. This also applies to the ability to re-use/recycle water within the project area.

The operation and maintenance of the contaminated water control facilities such as PCDs and RWDs could impact on surface water quality in a negative/positive way. Should these be operated in line with GN R 704, the potential of negative impacts will be greatly reduced.

Surface Water Quantity

The operational phase will increase the volume of water prevented from reporting to the catchment. However, rollover mining method may have some neutral impact in that the volume prevented from reported to the catchment is limited to the open cast area that is being mined at any given time and not incremental with the mining progress.

As mining progresses and more material is processed in the plant, increased volume of water will be required which may impact in the volume of raw-water intake to the site. It is imperative that water re-use/recycling is implemented.

5.4.3 Decommissioning Phase

The decommissioning phase should have neutral impacts as it restores the site to as close to the pre-mining conditions as possible. However the demolition of the site may have negative impacts.

Surface Water Quality

Soil erosion and dust could result from the vehicular movement during the demolition process may pose a risk of contaminating the surface water resources. Similarly the handling of hazardous materials such as chemicals, sewage and those containing hydrocarbons may result in the contamination of surface water resources.

Surface Water Quantity

The decommissioning process could impact on the surface water quantity in a positive/neutral manner as water will be returned to the catchment. This will be possible only

if the management of the demolition process is carried out properly and the area is cleaned and vegetated as this will not impact on the quality of the water resources.

5.4.4 Post-closure Phase

Water quality and quantity impacts may be realised post closure depending on the decommissioning and rehabilitation efforts that would have been implemented.

Surface Water Quality

Post closure activities that could impact on water quality include the on-going maintenance and rehabilitation such as application of grass seeds to vegetate the rehabilitated area as this will prevent soil erosion and siltation of the surface water resources.

Surface Water Quantity

Ensuring that the drainage lines are restored and that the water is allowed to flow freely will result in neutral/positive water quantity impacts.

5.4.5 Cumulative Surface Water Impacts

There may be cumulative quality impacts post mining as a result of poor management of surface water during the period of mining. These impacts include the continued contamination of water by hydrocarbon containing material being washed off-site during the rainfall seasons.

The poor maintenance of the rehabilitated areas may result in soil erosion that could result in the siltation of the water resources long after mining has ceased.

The decanting of water from the mined out area or even spoils remaining from mining activity could also impact negatively on water quality.

In terms of water quantity, the development of sink holes or even the improper backfilling could result in surface runoff not reporting to the catchment but infiltrating into the ground. These could have potential groundwater quality impacts.

5.5 Groundwater

5.5.1 Construction phase

The following impacts can be expected during the construction phase:

Groundwater quality

During the construction phase, few impacts are expected on the groundwater quality. Minor impacts on the groundwater can be from accidental hydrocarbon spillage from construction vehicles at the service station or diesel bays.

Groundwater quantity

Paved areas and road construction will lead to an increased surface runoff that will increase evaporation and decrease infiltration to aquifers. This impact is however expected to have a low impact on the groundwater quantity.

5.5.2 Operational phase

The following impacts can be expected during the operational phase:

Groundwater quality

Groundwater quality will be negatively impacted on due to the formation of Acid Mine Drainage from expose rock piles, discard dumps and coal stockpiles. Coal deposition is associated with pyrite being formed as the stratum is deposited in a reducing atmosphere. Mining activity will expose the pyrite to oxidising agents such as oxygen and ferric iron. This will lead to formation of acidic conditions and the subsequent water quality deterioration due to heavy metal transport and salt loading, as the buffering capacity of the natural rock is utilised.

Groundwater quantity

Drawdown of the surrounding aquifers due to pit dewatering will influence the groundwater system. This can impact on water users in the area that rely on groundwater for domestic and agricultural purposes. Many ecological systems also rely on groundwater and a lowered water table can negatively impact on certain species.

5.5.3 Decommissioning phase

The following impacts can be expected during the decommissioning phase:

Groundwater quality

Incorrect rehabilitation or removal of hazardous material can pollute the aquifers for a long period of time. Acid mine drainage (AMD) is an on-going chemical reaction and if incorrect backfilling and flooding techniques are undertaken the contamination risk will increase.

Groundwater quantity

Dewatering of the opencast pit will no longer be necessary and the cone of depression will recover. The natural water table will increase making more groundwater available for water users.

5.5.4 Post closure

The following impacts can be expected during the post closure phase.

Groundwater quality

Depending on the acid formation and acid neutralisation potential of the surrounding rock AMD my continue lowering the pH and pollute the groundwater environment.

Groundwater quantity

No impact is expected on the water quantity during the post mine phase. However it is possible that the artificial aquifers created by the mining process might lead to decant zones whereby groundwater is lost through the system.

5.6 Aquatic & Wetland Environments

5.6.1 Construction Phase

During the construction phase of the mine a number of impacts will be presented. The clearance/removal of terrestrial habitats (vegetation) and construction of infrastructure for mining activities allows for increased soil erosion, soil abstraction and runoff (Yu et al., 2012). The incidence of increased soil erosion causes an increase in the sediment loads of local streams therefore altering natural hydrodynamic properties such as sediment carrying capacity as well as sediment deposition within the area (Zokaib and Naser, 2011). The occurrence of runoff from the proposed pollution sources allows for the introduction of exposed terrestrial elements into the aquatic environment thereby altering the normal physical chemistry of the stream in terms of pH, turbidity, conductivity as well as total dissolved salts therefore reducing the surface water quality (Lupankwa et al., 2006). In addition to this, materials used for construction such as lubricants and poly aromatic hydrocarbons may enter into the aquatic environment and allow for accumulation in sediments and biota located within the aquatic ecosystem.

5.6.2 Operational Phase

The primary impact for consideration during the operational phase of the mine is the proposed opencast pit. The proposed opencast pit of the mine may result in the removal of a considerable portion of the wetlands occupying the project area. The loss of wetland systems due to the opencast mining activities cannot be mitigated, other than considering a form of wetland banking or an offset strategy in order to compensate for the lost wetlands. Lost wetlands will result in water quantity implications for the catchment area with aquifers not being recharged due to a loss of wetland seepage areas, as well as important ecological services being lost.

Secondary impacts may be associated with the blasting and removal of topsoil and vegetation which may result in increased runoff and thus increased sedimentation in the water courses as well as an alteration of water quality. The development of the catchment may also result in the loss of important seepage areas, impacting on the recharge of aquifers supporting wetland systems. This will result in water quality and quantity implications for the catchment.

5.6.3 Decommissioning Phase

The primary focus for this phase of the operation should be the opencast pit. Impacts associated with the pit cannot be mitigated due to the loss of the hydro-dynamics of the systems as a result of the altered geology of the catchment. Thus, efforts should be focussed on restoring the surface hydrology of the catchment to ensure that aquatic and wetland ecosystems are supported as a water resource.

5.7 Fauna

5.7.1 Construction Phase

The destruction of natural vegetation and habitat for animal life has already taken place within the surrounding environment. The destruction of the areas with undisturbed natural grassland will result in the destruction of natural habitat of reptiles, birds, frogs, insects and mammals present within the areas. The grassland and surrounding vegetation offers habitat to certain birds, reptiles, frogs, insects and mammals that could be present. The removal of the top soil is one of the first activities that will take place. The removed soil could be stockpiled for later use. Once construction starts animals will move out of the area, if given the chance, and settle in a more sheltered area. With the removal of the vegetation during construction phase less food items will be available to animals in the area, and the risk of erosion will make the area even less desirable for animals especially the burrowing species.

Noise created during construction will have a negative effect on fauna, causing them to move away from the affected areas.

5.7.2 Operational Phase

The increase in human activity will have an overall negative impact on the remaining animal life. The impacts in this phase are identical to impacts discussed in the construction phase.

5.7.3 Decommissioning Phase

The majority of animals would have moved out of the area by the time this phase commences, therefore the impacts are considered to be very low, even though heavy machinery will be used in the de-construction of infrastructure.

5.8 Flora

5.8.1 Construction Phase

The existing vegetation within the proposed area of development will be impacted on as most of the existing vegetation will be removed to facilitate the construction of mining related infrastructure. The current state of the vegetation can be described in terms of the successional stage of the grass layer which is predominantly in a climax/sub-climax stage, with certain areas in the pioneer stage. Topsoil stripping for establishment of opencast pit will have a negative effect on the amount of ground cover. The direct result of this will be the increased occurrence of soil erosion. A positive aspect could be the removal of alien vegetation, however the removal of these plant species should be done with care as the re-colonisation of the area by these plants could occur if any seeds are left behind. During construction the amount of heavy vehicle activity will increase dramatically, increasing the risk of pollution of water and soil which can cause harm to vegetation more specifically, oil or diesel spills.

The impact on the vegetation can also be considered to be a positive impact due to destruction and removal of exotic species. This impact can be considered as positive, site specific and permanent.

5.8.2 Operational Phase

Topsoil stripping during mining of areas will remove the valuable layer of soil in which plants grow, this will cause the destruction of natural vegetation.

Dust created during all opencast mining activities may have a negative effect on vegetation due to dust deposition on leaves, which affects transpiration and photosynthesis.

Pollution of soil water and vegetation is a real possibility and could have an alarming negative effect on future land capability. Contaminated soil and water will create an environment in which rehabilitation will not be successful.

Invasion of exotic and weed species into un-mined or rehabilitated areas. The open and disturbed areas in the vicinity of the mining activities will create a favourable environment for exotic and weedy plant species to establish themselves. These areas could then create small populations of these plants from which further colonisation could take place into un-mined areas.

5.8.3 Decommissioning Phase

During decommissioning the existing infrastructure will be removed and the environment returned to a natural state as far as possible. This entails the creation of favourable habitat and growing conditions for plant species used during rehabilitation.

5.9 Air Quality

5.9.1 Construction Phase

The construction phase will increase the current dust levels due to increased activity of vehicles and heavy machinery, the construction of a haul road, the stripping of vegetation and exposure of soil layers. Preparation of areas for opencast mining by stripping soil and blasting rock will increase dust levels. Therefore the construction phase will have negative impacts on air quality in the area.

5.9.2 Operational phase

If exposed soil occurs in the vicinity of infrastructure, then further negative impacts on air quality are expected. Increased human activity and traffic around infrastructure could also add to dust levels in the vicinity of infrastructure. Coal transport along the haul road will also contribute to dust levels. Therefore operation of infrastructure will further negatively impact on air quality.

The proposed opencast mining will negatively impact on air quality, by adding to the dust levels in the area during blasting and movement of earth. The opencast mining, stockpiling

of overburden, the on-site stock pile and the loading of raw coal onto the trucks or rail will contribute to increased dust levels in the area.

5.9.3 Decommissioning phase

During decommissioning and mine closure the air quality will be negatively impacted on briefly due to the increased activity of heavy machinery and trucks in the area and the removal of the infrastructure. Mobilisation of exposed soils will also contribute to dust levels in the area. As the dust settles and rehabilitation of the land is completed, the air quality should gradually improve.

Rehabilitation of the opencast areas and the final void should ultimately have a neutral impact on air quality in the region due to the closure of opencast mining and re-vegetation of exposed soils reducing dust creation and ultimately allowing dust levels to decrease to pre-mining levels.

5.9.4 Post closure

Once exposed soils are re-vegetated, dust levels should be reduced to the current levels.

5.10 Noise

5.10.1 Construction Phase

The construction vehicles and machinery responsible for site clearing and stock piling as well as construction of infrastructure may impact on the ambient noise levels at the relevant noise sensitive receptors. Blasting activities during the development of the open cast pits may also intermittently impact on the relevant noise sensitive receptors.

5.10.2 Operational Phase

It is expected that the noise from the blasting may propagate the furthest from the mining operations but will be intermittent of nature. The continuous operation of the haul trucks and shovels may have the highest impact on the ambient noise levels of the area.

5.10.3 Decommissioning Phase

The demolition of the on-site infrastructure as well as the rehabilitation of the opencast area may impact on the noise levels at the relevant noise sensitive receptors, but is expected to be of a short duration. Once all activities on site have ceased, the noise levels are expected to decrease to pre-mining levels.

5.11 Visual

5.11.1 Construction

The construction of the proposed Brakfontein mine is unlikely to change the visual resource, landscape or character of the area since there are already a number of mines (active or inoperative) surrounding the Brakfontein study area. Infrastructure, machinery and transport

of materials and labour associated with construction processes are likely to be visible from the R50, neighboring farms and the smaller dirt roads that surround the study area; the visual impacts will be negative but are likely to be minor in the context of the current already disturbed landscape.

5.11.2 Operation

The machinery and infrastructure associated with the operation of the mine is likely to be visible by people travelling on the R50, surrounding farms and dirt roads that will surround the mining operation. The visual impacts will be negative but are likely to be minor in the context of the current already disturbed landscape.

5.11.3 Decommissioning

Although machinery and some of the infrastructure associated with the mine will be removed during closure, the discard dump and other drastic changes to the site specific topography will remain a visual impact within the landscape as they are not likely to be removed during the decommissioning and closure phase. However, sloping, rehabilitation and vegetation of these aspects will take place, thus reducing the overall visual impact.

5.12 Archaeology

Primary impacts that are likely to occur will take place during the construction phase of the project. These impacts include the disturbance and possible destruction of heritage sites due to blasting and clearing of vegetation. Secondary impacts include vandalism and further disturbance due to the influx of workers and vehicular movement on site. Further impacts will be identified during the Heritage Impact Assessment.

5.13 Socio-Economic

5.13.1 Construction Phase

Socio-economic benefits that may result from the construction of the proposed project include the following:

- ***Employment opportunities for local unskilled and semi-skilled individuals***. As mentioned, the educational level (and thus likely also the skills level) in the local municipality is low, unemployment is high and poverty is rife. Thus, even though only a small percentage of the local municipal population stand to benefit from local employment, the positive impact thereof could be substantial for those who benefit, albeit temporary.
- ***Skills-training for the construction workforce***. In addition to the financial gain associated with temporary employment, the workforce may receive some skills-training that will enable them to perform their duties. The benefit of such training will likely extend beyond the construction period as it will contribute to the pool of local skills, rendering some of the local residents more employable on other and future projects.

- ***Opportunities for local businesses and SMMEs***. Some of the goods and services required during the construction phase of the proposed project could be procured from local businesses and SMMEs. If this is feasible, the proposed project will contribute positively to both the local economy and the local business sector.

The negative socio-economic impacts associated with the proposed project will likely be most pronounced during the construction phase, and may include the following:

- ***An influx of job-seekers into the local municipal area***. Although an influx of job-seekers is not a negative impact per se, it is associated with, and contributes towards a number of other negative socio-economic impacts, including the following:
- *Expansion of existing informal settlements*. This is a particular risk for this project as there are existing large informal settlements in the local municipality. Residents in these settlements will likely be willing to rent a room to a migrant job-seeker as it could be a source of income for them.
- *Social conflict between the incumbent and migrant populations*. Such conflict may be caused by differing value systems or the incumbent population feeling as though the migrants are taking job opportunities away from them.
- ***Disruption of movement patterns***. It was mentioned that there are a number of roads running through the project site, and that these roads are likely used by residents on and surrounding the project site. The proposed project may result in the closure of these roads (forcing the road users to make use of alternative roads) or these roads will be realigned.
- ***Increase in construction-related traffic***. The construction activities will necessarily result in an increase in traffic (especially heavy motor vehicle traffic) on and surrounding the site, which is associated with the *deterioration of the roads,* including an increase in potholes. This places all road users at a greater risk of being involved in an accident when travelling along the affected roads.
- ***Physical and economic displacement***. It was mentioned that both land owners and farm workers may be residing on the project site. The workers may have to be resettled as a result of the project.
- ***Conflict with other developmental plans.*** Given the conditions on and surrounding the site, it is possible that the proposed project may interfere with another project affecting the same area (referring specifically to the presumed gas pipeline), thereby limiting the benefits, or exacerbating the negative impacts of that project.

5.13.2 Operational Phase

The three socio-economic benefits mentioned (local employment, skills training and opportunities of local businesses and SMMEs) could potentially continue throughout the operational phase of the proposed projects. In addition, the larger local municipal area could potentially benefit from other ***Local Economic Development or Corporate Social Investment initiatives*** the proponent may initiate or partake in, thereby extending the

benefits of the project beyond those who are employed by the project or render a service to the mine.

The major negative socio-economic impacts likely to be associated with the operational phase of the project include the following:

- ***Housing of the operational workforce***. There is a housing backlog of approximately 5 000 houses in the local municipal area, and that the municipality is faced with the challenges associated with large informal settlements. As such, the housing of the operational workforce, particularly the unskilled and semi-skilled migrant workers, may prove problematic.
- ***Increase on municipal pressure to provide basic services***. Related to the above, the proposed project may put additional strain on the local municipality to provide basic services such as water, electricity and refuse removal to the mine and its employees.

5.13.3 Decommissioning Phase

The socio-economic benefits associated with the decommissioning of the mine are very similar to those mentioned and include ***temporary employment opportunities for locals, skills training*** for the temporary workforce and ***opportunities for local businesses and SMMEs***. These benefits relate to the workforce that would be required to undertake physical activities associated with decommissioning, such as dismantling of infrastructure.

The most adverse socio-economic impact associated with decommission is ***job losses***, particularly of the unskilled and semiskilled local workers. Upon decommissioning, the level of unemployment in the local municipally area will likely increase somewhat and the economic benefits associated with employment will cease, which may impact negatively on the quality of life of some of the households. Although this is an inevitable part of a mining project, certain measures (determined partially by the local environment) can be taken to reduce its negative impact.

6 SITE SPECIFIC SCREENING STUDY

A Screening study was undertaken to highlight environmental and social aspects of the proposed project site upfront, so that these can be brought into the mine planning process.

The following potential environmental risks have been identified:

- *Wetland and river exclusion:* Streams and water courses, as well as wetlands and their feeding areas/catchments could fragment the coal resource or cause the requirement of various boxcuts. The wetlands will have to be delineated and classified carefully and in detail depending on the depth of the seams and geological conditions, it may be possible to apply for underground access under the streams with development that has a high safety factor by leaving enough overburden between the streams and the unground workings.

- *Rocky outcrops:* These can be seen as sensitive landscapes and may need to be left undisturbed.

The following potential social risks have been identified.

- *Physical resettlement:* as there are people living on the project site it is likely that Universal Coal will need to negotiate with land owners for the surface rights. There may be farm workers who are living on the farm owners land and these workers might need to be resettled. Similarly any families living in informal dwellings may also need to be resettled should they be within the mine footprint area or 500m from the open pit. Should resettlement be necessary it is Universal Coal's responsibility to ensure that it this is undertaken in accordance with best practice guidelines and in a socially responsible manner.
- *Growth of Informal settlements*: There are informal structures on Brakfontein 264 portion 6 and portion 20. It is possible that these settlements may grow either naturally or due to exploration and mining drawing people to the area. This may lead to encroachment of settlements on the Project Site and the requirement for physical resettlement.
- *Sites of Archaeological and heritage significance:* There are graves on the project site which will either need to be avoided or excavated. It is also possible that some of the dwelling structures on the project site are over 60 years and therefore these cannot be demolished without a permit from the South African Heritage Resources Agency (SAHRA).
- *Land Claims:* A land claims enquiry will need to be submitted for the project site. Should there be a land claim for any of the relevant properties this may delay or restrict development on the property until the outcome of the land claim process has been finalised.
- *Servitudes:* There are markers on the Brakfontein 277 IR Portion 9 which is likely to be a pipeline route. This pipeline may break up the project area and possibly the ore body. This may restrict mining or construction on certain sections of the property and should be investigated further.

With assessments and the necessary management plans and mitigation measures in place, there may be challenges to undertake the proposed development, but with the information available at the stage of this screening exercise no fatal flaws were identified.

Negotiations with land owners and neighbouring owners and residents will be critical from the onset and stakeholder engagement and communication is critical.

7 CUMULATIVE IMPACTS

During the EIA phase cumulative impacts will be assessed in order to determine how the proposed project will contribute to the already existing and potential future environmental impacts occurring in the area. A geographical area will be identified in order to access the cumulative impacts and various aspects will be considered within this geographical zone. A historical approach will be taken to assessing the aspects together with current and proposed activities with the use of available to establish the possible occurring cumulative impact within the geographical zone. Related consequences of identified cumulative impacts will be determined through a cause and effect relationship approach.

8 PUBLIC PARTICIPATION PROCESS

Public participation is an essential and legislative requirement for environmental authorisation in a number of the major Acts applicable to this activity. The principles that demand communication with society at large are best embodied in the principles of the National Environmental Management Act (Act 107 of 1998, Chapter 1), South Africa's overarching environmental law. In addition, Section 24 (5), Regulation 54-57 of GNR 543 under the NEMA, guides the public participation process that is required for an EIA process.

The public participation process for the proposed development has been designed to satisfy the requirements laid down in the above legislation and guidelines and is also compliant for the other applicable Acts like the MPRDA and NWA. Figure 8-1 provides an overview of the EIA technical and public participation process steps, and shows how issues and concerns raised by the public are used to inform the technical investigations of the EIA at various milestones during the process. The following sections provide an overview of the public participation activities conducted thus far and the steps to be undertaken in the EIA phase.

8.1 Objectives of Public Participation in an EIA

The objectives of public participation in an EIA are to provide sufficient and accessible information to I&APs in an objective manner so as to:

During Scoping:

- Assist the I&APs to identify issues of concern, and provide suggestions for enhanced benefits and alternatives.
- Contribute their local knowledge and experience.
- Verify that their issues have been considered and to help define the scope of the technical studies to be undertaken during the Impact Assessment.

During Impact Assessment:

- Verify that their issues have been considered either by the EIA Specialist Studies, or elsewhere.

- Comment on the findings of the EIA, including the measures that have been proposed to enhance positive impacts and reduce or avoid negative ones.

The key objective of public participation is to ensure transparency throughout the process and to promote informed decision making.

A public meeting combined with an open house was held on 20 June 2012 at the Delmas Country Lodge. The purpose of the meeting was to review the contents of the Draft Scoping Report and for stakeholders to provide their comments and to raise issues of concern.

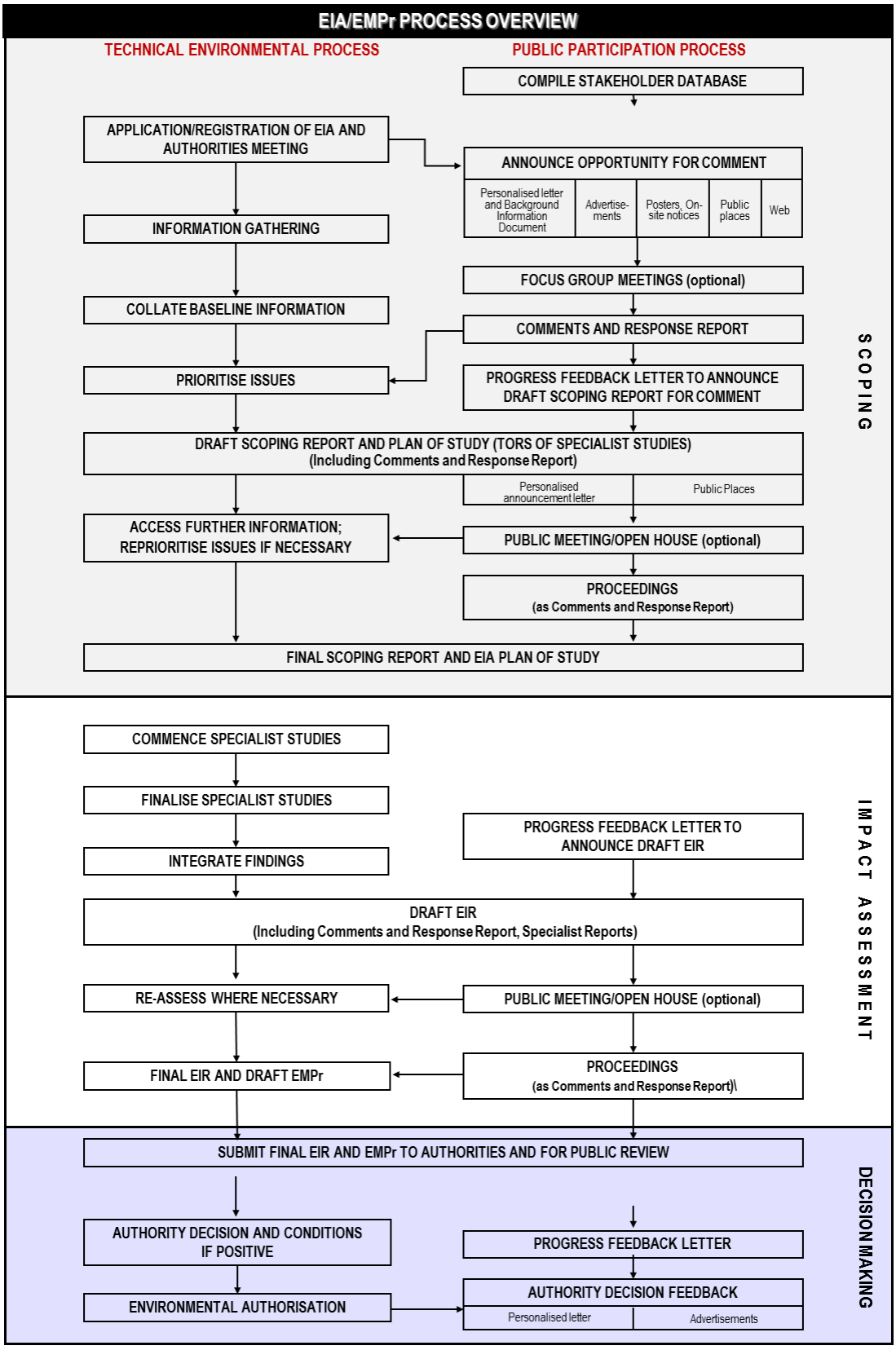


Figure 8-1: Technical and public participation process and activities that comprise the Environmental Impact Assessment for the proposed Brakfontein Coal Mine project

8.2 EIA Application Form and Landowner Notifications

The EIA application form (Appendix A.1) for the proposed project was submitted to MDEDET on 13 March 2012. Subsequent to the submission of the application form a letter notifying potentially directly affected land owners and occupiers were sent via registered mail on 3 April 2012. Proof of the notification letters was submitted to MDEDET. A copy of the letter is attached as part of the Public Participation Appendix A.1.

8.3 Identification of interested and affected parties

The identification of stakeholders is on-going and refined throughout the EIA process. As the on-the-ground understanding of affected stakeholders improves through interaction with various stakeholders in the area the database is updated. The identification of key stakeholders and community representatives (land owners and occupiers) for this project is important as their contributions are valued.

The stakeholders' details are captured on Maximiser version 12, an electronic database management software programme that automatically categorises every mailing to stakeholders, thus providing an on-going record of communications - an important requirement by the authorities for public participation. In addition, comments and contributions received from stakeholders are recorded, linking each comment to the name of the person who made it.

According to the NEMA EIA Regulations under Section 24(5) of NEMA, a register of I&APs (Regulation 55 of GNR 543) must be kept by the public participation practitioner. Such a register has been compiled and is being kept updated with the details of involved I&APs throughout the process (See Appendix A.2).

Two main I&AP groups were identified:

1) *Regulatory authorities*

Relevant authorities were identified as these departments and divisions form part of the project decision-making process and need to be appropriately informed.

- Department of Mineral Resources (DMR);
- Department of Water Affairs (DWA);
- Department of Public Works, Roads and Transport (DPWRT); and
- Mpumalanga Department of Agriculture, Rural Development and Land Administration (MDARDLA);
- Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET);
- Mpumalanga Tourism and Parks Agency (MTPA);
- Victor Khanye Local Municipality - managers, environmental and social departments.

2) Public

- Adjacent land owners;
- Directly affected land owners (see Table 8-1below for specific detail);
- Agricultural organisations;
- Environmental groups.

Table 8-1: Directly Affected Landowners

Farm Name	Farm Number	Farm Portion	Farm Owner
Brakfontein	264IR	6	Norwesco INV PTY LTD
Brakfontein	264IR	8	Confident Concept PTY LTD
Brakfontein	264IR	9	Koos UYS & SEUN Boerdery CC
Brakfontein	264IR	10	Andries Schoeman Brakfontein Boerdery PTY LTD
Brakfontein	264IR	20	Abundant Development PTY LTD
Brakfontein	264IR	26	Koos Uys & Seun Boerdery CC
Brakfontein	264IR	30	Andries Schoeman Brakfontein Boerdery PTY LTD
Brakfontein	264IR	31	Transnet LTD
Brakfontein	264IR	R	Andries Schoeman Brakfontein Boerdery PTY LTD

8.4 Announcement of opportunity to become involved

The opportunity to participate in the EIA was announced in April 2012 as follows:

- Distribution of a letter of invitation to become involved, addressed to individuals and organisations, accompanied by a Background Information Document (BID) containing details of the proposed project, including a map of the project area, and a registration sheet (Appendix A.3);
- Advertisements were placed in the following newspapers as seen in Table 8-2 (Appendix A.5).

Table 8-2: Advertisements placed during the announcement phase

Newspaper	Date
Middelburg Observer	26/04/2012

Newspaper	Date
Streeknuus	26/04/2012
Mpumalanga News	25/04/2012
Witbank News	27/04/2012

- Notice boards were positioned at prominent localities on 17 April 2012. These notice boards were placed at conspicuous places and at various public places (Appendix A.3). Site notices were placed prominently to invite stakeholder participation Figure 8-2.

Figure 8-2: Site notice boards were put up in the study area

8.5 Obtaining comment and contributions

The following opportunities are available during the Scoping phase for contribution from the I&APs:

- Completing and returning the registration and comment sheets on which space was provided for comment (included in the BID); Providing comment telephonically or by email to the public participation office; and
- Providing comments at a public meeting which was held on 20 June 2012 to review the contents of the Draft Scoping Report

Issues relevant to the current project configuration which have been raised thus far have been considered and will be carried forward into the Impact Assessment phase.

8.6 Comments and response report and acknowledgements

The issues raised thus far during the scoping phase of the project, was captured in a Comments and Response Report (Appendix A.6). The report will be updated to include additional I&AP contributions that may be received as the Scoping phase process proceeds, and as the findings of the EIA become available. The issues and comments raised during this public review period of the Final Scoping Report will be added to the Draft EIR as

Version 3 of the Comments and Response Report. The contributions made by I&APs were and will be acknowledged in writing.

8.7 Scoping Report

The purpose of public participation in scoping is to enable I&APs to verify that their contributions have been captured, understood and correctly interpreted, and to raise further issues.

8.7.1 Draft Scoping Report

The Draft Scoping Report was made available from 23 May to 2 July 2012 for public review. The report was available for review at the Delmas Public Library and electronic copies (CDs) were made available at the public meeting held on 20 June 2012 or on request. The report was also available on the Digby Wells website. Table 8-3 contains the information that was communicated to the stakeholders with regards to the availability and review of the Draft Scoping Report.

Table 8-3: Copies of the Draft Scoping Report can be obtained at the following public places as indicated

	Address		
Person		**Location**	**Contact**
Printed Copies			
Ms Lydia Mehlape	Cnr Sarel Cilliers & Van Riebeek Avenue PO Box 6, Delmas, 2210	Delmas Public Library	(013) 665-2425 (013) 665-4721
Electronic Copies			
Anelle Lotter	359 Pretoria Avenue, Randburg	www.digbywells.com	011 789 9495
Nathalie Kalele	Phone and request a CD copy which will be sent to you via the postal services		011 789 9495

Notification of the availability of the report for public review was posted and emailed to stakeholders on 17 May 2012. Stakeholders were invited to comment on the Draft Scoping Report in the following ways:

- Completing a comment sheet (which was distributed with the notification letter);
- Writing a letter, or producing additional written submissions;
- Sending an email or phoning the public participation office; or
- Attending a public meeting which was held on 20 June 2012.

A public meeting and open house was held at the Delmas Country Lodge on Wednesday, 20 June 2012 from 15:00 to 20:00. The purpose of the public meeting was to present the outcome of the scoping phase, and to allow discussions around the Draft Scoping Report. Recommendations and issues/concerns raised during the meeting was captured and is reflected in the Comments and Response Report. The register is included in Appendix A.4.

8.7.2 Final Scoping Report

The Draft Scoping Report and Plan of Study for the EIA was updated based on comments from the key commenting authorities and comments obtained from I&APs. The Final Scoping Report was submitted to MDEDET, commenting authorities and is available for public review from 18 July to 28 August 2012. Stakeholders have also received notification that the Final Scoping Report is available for their review.

8.8 Public participation during the impact assessment phase

Public participation during the impact assessment phase of the EIA will mainly involve a review of the findings of the EIA, presented in a Draft Environmental Impact Report (EIR), the Draft Environmental Management Programme (EMPr) and the volumes of Specialist Studies.

I&APs will be advised in good time of the availability of these reports, how to access them, and the dates and venues of public and other meetings where the contents of the reports will be presented for comment.

8.8.1 Announcing the Availability of the Draft EIR and EMPr

A letter will be circulated to all registered I&APs, informing them of progress made with the specialist studis and that the Draft EIR and EMPr are available for comment. The report will be distributed to public places and also presented at a stakeholder meeting.

8.8.2 Public Review of Draft EIR and EMPr

The EIA Guidelines specify that stakeholders must have the opportunity to verify that their issues have been captured and assessed before the EIA Report will be approved. The findings of the specialist assessments will be integrated into the Draft EIR. The report will be written in a way accessible to stakeholders in terms of language level and general coherence. The Draft EIR will have a comprehensive project description, motivation, and description of alternatives considered and also the findings of the assessment and recommended mitigation measures. It will further include the Comments and Responses Report, which will list every issue raised, with an indication of where the issue was dealt with in the EIR. The findings of the assessment and recommended mitigation measures will also be incorporated into the EIR.

As part of the process to review the Draft EIR and EMPr, a meeting will be arranged to afford stakeholders the opportunity to obtain first-hand information from the project team members and also to discuss their issues and concerns.

Contributions at the meeting will be considered in the Final EIR. It is proposed that the same public places be used as in the scoping phase and also that stakeholder meetings be conducted at the same venues as during scoping.

8.8.3 Announcing the Availability of the Final EIR and EMPr

After comments from I&APs have been incorporated, all stakeholders on the database will receive a personalised letter to report on progress, to thank those who commented to date and to inform them that the Final EIR and EMPr have been submitted to the lead authority for consideration. They will also be provided the opportunity to comment on the final reports.

8.8.4 Announce Authorities' Decision on Environmental Authorisation

The decision of the authorities on whether Environmental Authorisation was granted or not will be communicated to stakeholders as specified in the conditions. It is anticipated that the decision will be communicated through the following methods:

- Personalised letters to individuals and organisations on the mailing list; and
- Advert in local or regional newspapers.

9 SPECIALIST TERMS OF REFERENCE FOR THE EIA

9.1 Topography

As part of the EIA, a topographical rehabilitation program needs to be developed. Modelling will need to be performed to compare closure scenarios and establish what can be achieved with regards to earth movement in order to obtain minimum mass movement. This will further be optimised to try and achieve movement on a once off basis to minimise rehandling. Once an agreed plan has been modelled the surface topographical data will be presented in such a way that it can be used to manage the levels to which the mining machinery should place the material at various parts of the pits. Plans will also indicate what land capability classes can be achieved in the different areas. Recommendations will be given as to what materials need to be moved, and to where. This will aid in the final re-establishment and rehabilitation of the topography of the site.

By performing topographical remodelling, a desirable post-mining surface can be visualised which can be used as a tangible closure target. Additionally, efficiency with regard to minimising rehandling and movement of material can be enhanced.

9.2 Soil

9.2.1 Terms of Reference

The following tasks are requested:

- Compilation of a soil survey report assessing the soil types, land use and land capabilities to determine the baseline soil status.

9.2.2 Deliverables

The following deliverables are suggested in order to complete the study:

- A soil report explaining the baseline soil, land use and land capability status contributing to agricultural potential including comments on soil stripping, estimated soil volumes and stockpiling of top and subsoil;
- Maps indicating major soil group delineations, land use and land capability in the designated Brakfontein project area.

9.2.3 Assumptions

The following assumptions apply;

- Access to the project area is available;
- Representative soil samples based on the major soil groups found need to be analysed for chemical and physical soil properties and;
- Commencement of the project depends on the availability of the main contractor due to prior commitments on existing projects.

9.2.4 Methodology and Scope of Work

A survey of the dominant soils groups present at the Brakfontein site will be conducted during field visits, the site will be traversed by vehicle and on foot. A hand soil auger will be used to survey the soil types present and to obtain soils samples. Survey positions will be recorded as waypoints using a handheld GPS. Other features such as existing open trenches and animal burrows will also be helpful to determine the soil type and depth.

The soil forms (types of soil) found in the study area will be identified using the South African soil classification system namely; Soil Classification: A Taxonomic System for South Africa (Soil Classification working group, 1991). Several digital photographs will be recorded as reference information.

The topsoil (0-30 cm) and subsoil (30-60 cm) of dominant soil forms will be sampled. Samples will be analysed at a reputable soil laboratory for soil acidity, fertility and textural indicators.

9.3 Land Use and land capability

The existing land use will be simultaneously recorded at each chosen soil survey point. Agricultural potential and land capability depends on soil capability which will also be determined and recorded at chosen soil survey positions. The dominant land capability will be classified according to the method described by Schoeman et al (2000).

9.4 Surface Water

The management of surface water is legislated under the National Water Act (Act 36 of 1998) (NWA) as amended in the Regulation GN R 704 which specifies the use of water in mining. In managing the surface water resources, the Department of Water affairs (DWA) has promulgated a series of Best Practice Guidelines (BPGs) that guide the use of water in mining. These legislative frameworks are taken into account when considering the specialist

surface water assessment. The surface water methodology will be undertaken in three phases including desktop assessment, site assessment and report compilation.

9.4.1 Desktop Assessment

The following activities will be undertaken:

- The desktop assessment will cover the surface water environment characterization using existing information sources such as Water Research Commission (WRC) reports, Geographic information Systems (GIS) and existing reports of previous work conducted within the area; and
- A selection/identification of strategic surface water quality sampling points will be conducted to ensure that sites from up- and downstream of the project site are covered. This will be used to ensure a baseline characterization of the site prior to the commencement of mining.

9.4.2 Site Assessment

The following activities undertaken during the site visit will include:

- Gaining an understanding of the project site and confirming the existence of the surface water resources as captured in the desktop assessment;
- Surface water quality samples will be collected from up- and downstream of the project site. These will be submitted to a South African National Accreditation Standards (SANAS) accredited water quality laboratory for physical, chemical and microbiological analyses; and
- A floodline assessment will be conducted detailing the limits of mining and indicating the 1:100 year floodlines.
- Hydrocensus – existing groundwater boreholes.

9.4.3 Report Compilation

The surface water assessment report will be compiled detailing the following:

- Site characteristics indicating the water resources;
- A surface water baseline report indicating the pre-mining status of the surface water quality in line with the National Standards (SANS) 241 for drinking water (2005);
- All impacts that may result from the mining activities will be identified and weighted using the Digby Wells method to determine their significance;
- Mitigation measures for the reduction of the significance of impacts will be developed and the significance post mitigation will be determined;
- A surface water management plan will be developed indicating the areas of management, responsible persons; and

- A surface water monitoring programme will be developed for the LoM phases (construction, operation, decommissioning and post-closure). The areas of monitoring, variables of concern and frequency of monitoring will be detailed as well as the handling and interpretation of data and reporting.

9.5 Groundwater

A baseline assessment is a detailed assessment of an area to characterise the hydrogeological dynamics of an aquifer system of a specific area in a catchment and to determine the background or pre-mining conditions. This enables the authorities to gain an insight into the health of the integrated ground and surface water and when processes start to impact negatively on the system. This audit or monitoring is required to be conducted by the companies engaging in any process to ensure that possible impacts can be mitigated pro-actively before large scale contamination arises.

The following headings describe the studies and methodologies necessary to accomplish a study of this nature and specifically for the project area and receiving hydrogeological environment.

9.5.1 Methodology

The methodology utilised to obtain quantitative and qualitative information will be site specific. The methodology will entail the acquisition of all relevant hydrogeological background information and data. This will be a phased approach due to the order in which the data and results become available when physical field studies are completed. This normally comprises a desk study, field visit, site specific surveys, possible intrusive studies (drilling and aquifer testing), data interpretation and reporting. Once completed a detailed technical specialist report will be compiled from all relevant data that will feed into the final EIA.

9.5.2 Desk Study:

During this phase all relevant data to the project area will be collected while taking cognisance of the scale of the assessment. A review process is conducted and certain interpretations performed to establish a conceptual idea of the hydrogeological occurrence and dynamics. This information is used to inform the field visits and other technical surveys. The information required normally includes the following:

- DWA, NGA and WARMS data from the information directorate;
- All relevant reports from previous studies conducted in the area;
- Geological reports from the exploration phase;
- Hydrogeological reports, borehole logs, test data;
- Precipitation and climate data from the weather bureau or local stations;
- Existing Monitoring data; Published geological maps;

- Published hydrogeological maps;
- Aerial imaging (satellite images and aerial photography) and surveys; and
- Information on water levels, quality and water use.

9.5.3 Field Visit and hydrocensus:

A site visit is required to initiate the project and familiarise Digby Wells with the current ground water usage in the area as well as to gain/collect information on activities and general groundwater related infrastructure. The site visit is normally integrated with a hydrocensus. The hydrocensus is utilised to gather information on local groundwater infrastructure such as production boreholes and possible monitoring boreholes as well as natural springs or fountains. Specific data from the boreholes is gathered either verbally or by physical measurements and recorded on a specific form. This data is utilised to construct a conceptual idea of what the aquifer characteristics might be and if the available information is suitable to achieve this. If the available data is lacking to achieve this, it will be addressed during the field survey and intrusive assessment phase. Typically the information to be acquired includes:

- Borehole coordinates and elevation of collar;
- Depth of borehole;
- Borehole construction;
- Static water level;
- Water quality sample (if access possible);
- Borehole yield;
- Water use description and volume; and
- General Field notes with important descriptions such as infrastructure and use in the vicinity of the borehole and possible activities contributing to contamination.

9.5.4 Field survey and Intrusive work:

The DWA, NGA data indicates that there are only two possible boreholes within the project site boundaries. This will not be adequate to characterise the aquifer systems in the area nor will it be sufficient for groundwater monitoring. Additional boreholes will have to be drilled to augment the current information base.

Intrusive work (drilling) will commence after the geophysical data is interpreted and targets are positioned on the ground. The Reverse Circulation (RC) method as part of the exploration programme can be used but preferably the Rotary Air Percussion (RAC) drilling method so that blow yields could be measured along with water strikes and other important data. Management of this phase will be crucial to record the optimum amount of hydrogeological information required for conceptualisation. If successful boreholes are completed, they will be aquifer tested using pump out discharge tests and recovery tests to

obtain the necessary aquifer parameters. These boreholes will also be incorporated into the monitoring network for the life of mine and post mining monitoring. Boreholes will also be recommended for potable use if required.

9.5.5 Hydrogeological modelling:

Conceptual Model:

This is a vital step in the process, and the development of a representative conceptual model to real site conditions is important. The conceptual model aims to describe the groundwater environment in terms of the following:

- Aquifers - these are rock units or open faults and fractures within rock units that are sufficiently permeable (effectively porous) to allow water flow;
- Interconnections between aquifers;
- Boundaries that result in the change or interruption of groundwater flow; and
- Hydro-stratigraphic units - these are formations, parts of formations, or a group of formations displaying similar hydrologic characteristics that allow for a grouping into aquifers and associated confining layers.
- The groundwater flow system:
- Precipitation, evapotranspiration;
- Runoff, groundwater head data which yields groundwater flow;
- Hydraulic parameters;
- Recharge and discharge areas, exchange of groundwater and surface water; and
- Geochemical data including major ions and isotope data

Numerical modelling:

The conceptual hydrogeological model will be encoded into a numerical model. It is proposed to utilise MODFLOW as modelling code and PM-WIN 5 will be used as data pre and post processor. This will allow future upgrading of the numerical model as MODFLOW is the most widely used modelling code. Contaminant transport will be assessed utilising MT3D. A numerical model must be viewed as an asset that is maintained over the life of the project and upgraded as required. The model domain will extend to the closest groundwater boundaries not expected to be impacted by mining.

The model will incorporate the mine workings if any. The model will be calibrated to the latest water levels (steady state) as well as historic water level monitoring (transient). Once calibrated the model will be utilised to run the required scenario's to determine the likely impacts from opencast and underground mining. The scenario modelling will cover all current and future mining plans as well as a period of 50 years after closure.

9.6 Aquatic Ecosystems

The River Health Program (RHP) is the national monitoring programme used to monitor and assess the freshwater resources within South Africa. In order to determine the ecological integrity of the aquatic environment, individual biophysical attributes of the streams will be assessed. These biophysical attributes refer to the drivers and biological responses of an aquatic ecosystem. The selected drivers and biological responses for this study include:

The abiotic driver assessment:

- The assessment of physio-chemical variables of the water; and
- Habitat indices:
    - Index of Habitat Integrity (IHI)
    - Invertebrate Habitat Assessment System (IHAS)

The biotic response indicator assessment:

- Macroinvertebrate Response Assessment Index (MIRAI);
- Fish Response Assessment Index (FRAI); and
- Riparian Vegetation Assessment Index (VEGRAI).

The identified river Freshwater Ecological Priority Area (FEPA) program achieves biodiversity targets for river ecosystems and threatened/near-threatened fish species, and were identified in rivers that are currently in a good condition (WRC, 2011). These selected FEPAS should remain in a good condition in order to contribute to national biodiversity goals and support sustainable use of water resources. River FEPAs make reference to the entire sub-quaternary catchment, although FEPA status applies to the actual river reach within such a sub-quaternary catchment. The surrounding land and smaller stream network need to be managed in a way that maintains the good condition of the river reach (WRC, 2011). Recommendations have been proposed in light of the associated FEPAs for the respective mining operation and land uses.

9.7 Wetlands

The actual site assessment will include an ‘on-site’ evaluation of the wetland condition and functioning. The wetland delineation procedure takes into account (according to DWAF guidelines for wetland delineations, 2005) the following attributes to determine the limitations of the wetland:

- Terrain Unit Indicator – helps to identify those parts of the landscape where wetlands are more likely to occur;
- Soil Form Indicator – identifies the soil forms, which are associated with prolonged and frequent saturation;
- Soil Wetness Indicator – identifies the morphological “signatures” developed in the soil profile as a result of prolonged and frequent saturation; and,

- Vegetation Indicator – identifies hydrophilic vegetation associated with frequently saturated soils.

The WET-Management series is a set of integrated tools that are used to guide well-informed and effective wetland management. These tools are used at different spatial and institutional levels and meet a range of management needs. The tools which will be selected for this study include:

- WET-Health: assist in assessing the health of wetlands using various indicators.
- WET-EcoServices: used to assess goods and services that wetlands provide.

9.8 Fauna

9.8.1 Desktop Study

A literature study will be conducted to determine the potential faunal species that could occur in the area of interest. Particular emphasis will be placed on species of importance such as those with Red Data status or cultural value.

9.8.2 Physical Study

Faunal survey

The presence of mammals, birds, reptiles and terrestrial invertebrates needs to be investigated, with particular emphasis on those with Red Data status. The presence of these species will be related to the vegetation units classified.

Other aspects to be included are:

- The presence of different habitats (habitat diversity).
- The inter-relationship between the habitats identified on the routes and those in the surrounding area, and the dependency of certain species (both fauna and flora) on this relationship

9.8.3 Approach and Methodology

Background Research

A literature study report completed by Digby Wells, exists for the project. This report includes information sourced through a desktop study. This will be used as background information and will aid with the field work for this study.

Physical study and report compilation

A detailed field assessment of all natural habitats occurring on site will be conducted. Meetings will also be held with the relative authorities in order to determine if there is any conservation status assigned to the project area. Animal species protected by National and Provincial legislation will similarly be established.

Faunal survey

The presence of mammals, birds, reptiles and terrestrial invertebrates will be investigated, with particular emphasis on those with Red Data status. The presence of these species will be related to the vegetation units (habitats) classified during the floral survey. The influence of habitat diversity on species composition will be investigated. This survey will assess the potential Red Data habitats and indicate the probability that Red Data species actually occur in these habitats.

Independent sample plots are traversed on foot in a zigzag manner in order to record as many species as possible within the shortest possible time. Actual sightings, spoor, calls and nesting sites are used to establish the presence of animals.

Invertebrates are sampled using a sweep net of 350 mm diameter. At each sample plot 100 sweeps were conducted across a transect of roughly 150 m. Insects are collected from the net using a pooter, placed into a jar filled with 40% ethanol, and brought back for identification and species counts. For each sample plot the insects are identified to at least family level and where possible to genus and species level.

The impacts of the construction and operation of the mine on the animal life will be investigated and discussed. This will include the impacts on the presence of certain important species as well as the impacts relating to habitat diversity. The influence on the animal life in the ecosystems and their interactions will be assessed and discussed.

Deliverables

A report encapsulating the following deliverables will be completed:

- Legislation, policies, standards, and criteria relating to the topic;
- Field assessment methodology;
- Baseline fauna information;
- Impact assessment based on the proposed project (quantify impacts and cumulative impacts);
- Proposed mitigation and management measures;
- Environmental objectives and goals, including a gap analysis;
- Recommended monitoring programme for fauna; and
- Plans, maps (1:50 000), and figures throughout.

The report will be written according to structures approved in South African legislation and in accordance with World Bank standards.

9.9 Flora

9.9.1 Desktop Study

A literature study will be conducted to determine the vegetation types and species, that could occur in the area of interest. Maps illustrating vegetation classification will be sourced. Particular emphasis will be placed on species of importance such as those with Red Data status, medicinal value and cultural value.

9.9.2 Physical Study

Floristic survey

The primary objective will be to characterise the vegetation along the proposed route by conducting an indepth vegetation survey. This should give an indication of the vegetation units present and identify the presence of potential habitat types for the faunal survey. Potential areas of importance, such as those where Red Data species of both fauna and flora could occur, should be identified. Wetland areas, including all pans, streams and rivers need to be noted and assessed. The presence of the following plants needs to be established:

- Those with Red Data status (individual co-ordinates taken);
- Those with medicinal uses;
- Those with cultural uses;
- Those that are declared weeds and invader species.

9.9.3 Approach and Methodology

Background Research

A literature study report exists for the project. This report includes information sourced through a desktop study. This will be used as background information and will aid with the field work for this study. Species protected under national and provincial protection will also be identified in this stage.

Planning prior to going out to the field is necessary. Existing plans and maps will be used to gain an understanding of the site and to get an idea of what to expect once on site. Sites of importance, such as rivers can often be determined from these and then investigated in detail during the field work. Discussions with members of other disciplines, particularly the soil scientists, will be initiated so as to ensure the integration of knowledge.

Physical study and report compilation

A detailed field assessment of all natural habitats occurring on site will be conducted. Meetings will also be held with the relative authorities in order to determine if there is any conservation status assigned to the project area. Plant species protected by national or provincial legislation will similarly be established. Satellite images and aerial photographs will

be used to complement the field work and assist in delineating vegetation types and identifying any possible sensitive vegetation units.

Floristic survey

The primary objective is to characterise the vegetation in the study area by conducting an in-depth vegetation survey. Plant species present on the project site will be identified and listed. This will be done through a detailed analysis of many sample plots, identifying all plant species in each sample plot. The relative abundance of each species will also be recorded. The presence of the following plants will be established:

- Those with Red Data status (individual co-ordinates should be taken);
- Those with medicinal uses;
- Those with cultural uses; and
- Those that are declared weeds and invader species.

This will allow for the classification of the different vegetation units (habitats) present. Species composition and habitat diversity will be assessed. The homogenous units identified will be assessed for the presence of the above-mentioned plants. The identification of these units will lead to the recognition of potentially important habitat types for discussion in the faunal survey. Potential areas of importance, such as those areas where Red Data species of both fauna and flora could occur, will be identified and assessed. This study will indicate the extent and distribution of potential Red Data habitat and the probability that Red Data species actually occur in these habitats.

The Braun-Blanquet sampling method could be used for the vegetation survey, if project site conditions demand a different sampling method this will be amended. Braun-Blanquet is a standardised method used for vegetation classification in South Africa whereby all plants within a sample plot of approximately 30 x 30 m are recorded. A cover abundance value is then estimated for each of the identified species according to the Braun-Blanquet scale

The habitat is evaluated in terms of the topography (crest, midslope, foot slope, plain, river and plateau), aspect (north, south, east and west), slope (in degrees), altitude and geomorphology (convex, concave or flat) and GPS coordinates for each of the sample plots are also recorded.

Collected data is imported into TURBOVEG (Hannekens, 1996b) and a list of all species recorded, as well as the sample plot number in which each species was found, is compiled and exported to MEGATAB (Hannekens, 1996a) for vegetation classification. The vegetation is then classified into plant communities following TWINSPAN procedure and then described according to cover abundance, diagnostic species, dominant species and species composition. Vegetation types, as opposed to plant species, provide a good indication of faunal biodiversity because most animals, birds, insects and other organisms are associated with particular vegetation types. According to the Braun-Blanquet technique, cover abundance is estimated for each of the identified species, using the relative scale.

The impacts of the construction and operation of the mine on the vegetation will be investigated and discussed. This will include the impacts on the presence of certain important species as well as the impacts on habitat diversity. The influence on the ecosystems in the area and their interactions will be assessed and discussed

Deliverables

A report encapsulating the following deliverables will be completed:

- Legislation, policies, standards, and criteria relating to the topic;
- Field assessment methodology;
- Baseline flora information;
- Impact assessment based on the proposed project (quantify impacts and cumulative impacts);
- Proposed mitigation and management measures;
- Environmental objectives and goals, including a gap analysis;
- Recommended monitoring programme for flora;
- Plans, maps (1:50 000), and figures throughout.

The report should be written according to structures approved in South African legislation and in accordance with World Bank standards.

9.10 Air Quality

In assessing the project's aspects and impacts, the following issues will be addressed by the Air Quality Impact Assessment. In all instances cumulative impacts applicable to each element will be considered. All aspects associated with the Project's activities will be considered, however, the section below makes reference to particular focus areas which require specific outcomes in terms of Brakfonteins' requirements:

- Conduct advanced dispersion modelling to identify areas of significant impact in relation to legal and Eskom standards;
- The result of the dispersion modelling will be contour plots (maps) presenting the results of the assessment;
- All potential sources of emissions are to be included in the assessment and modelled to determine the ambient air quality concentrations;
- Consider impacts on all sensitive receptors; and
- Comparison of the predicted concentrations will be made with the ambient monitoring data, SA NAAQS standards and proposed standards for PM2.5 to determine compliance, as well as the World Health Organisation Air Quality Guidelines that are used by the International Finance Corporation for evaluation of Environmental, Health and Safety Standards.

Advanced dispersion modelling simulations of ground level concentrations of particulate matter emissions will be carried out. The anticipated and cumulative impacts of all potential

sources of emission and activities on the ambient air quality of the area will also be identified and discussed.

Analysis of dispersion modelling simulations will highlight:

- Predicted zones of maximum ground level impacts (Particulate Matter PM10 and proposed PM2.5);
- Number of times NAAQS standards for particulate matter PM10 and proposed PM2.5 will be exceeded; and
- Recommendations of buffer zones and impact management zones.

Dispersion models compute ambient concentrations as a function of source configurations, emission strengths and meteorological characteristics, thus providing a useful tool to ascertain the spatial and temporal patterns in the ground level concentrations arising from the emissions of various sources.

Digby Wells will install single dust bucket units which will be erected at relevant receptors and will allow for baseline monitoring period of twelve months. The dust stations will be monitored monthly in order to identify seasonal variations that may influence dust levels. The samples will be sent to a SANAS recognised laboratory for analysis. The results will be interpreted in accordance to both South African and international standards for air quality.

9.11 Noise

9.11.1 Methodology

In order to assess ambient noise levels, baseline noise monitoring will be conducted at various noise sensitive receptors surrounding the proposed Brakfontein Colliery.

All measurements will be taken in accordance with the guidelines of the SANS 10103:2008 “The measurement and rating of environmental noise with respect to annoyance and to speech communication”. The measurements will be taken for a 24hr period, taking into account the daytime as well as night time noise characteristics. According to the SANS 10103:2008 guidelines: daytime is between 06:00 and 22:00; and night time is between 22:00 and 06:00. Monitoring should be taken at a measurement of 1.5 m above ground level.

The baseline information will be included in an environmental noise impact assessment report, along with the quantification of the noise sources that will be produced by the proposed project. The impacts of the proposed project on the ambient noise levels of the area will be assessed by comparing the baseline information with the propagated noise levels from the proposed project. The propagated noise levels will be calculated by using the SANS 10357:2004 guidelines, which entail ‘The calculation of sound propagation by the Concawe method’. The report will also include recommended mitigation measures as well as recommended action plans.

9.11.2 Deliverables

An environmental noise impact assessment report will be compiled and will contain the following:

- Baseline noise measurements;
- Noise impact assessment via noise propagation calculations; and
- Recommendations in terms of mitigation measures and monitoring plans.

9.12 Visual Assessment

A visual impact assessment will be performed to establish the visual effects of the proposed infrastructure on the surrounding environment. The study intends to assess the extent of the visual intrusion of the infrastructure on the surrounding landscape. The scope of the assessment is that of a qualitative investigation determining the visual character of the area. It involves assessing the visual impacts on the environment and includes addressing the following aspects:

- Visual Absorption Potential (ability of the landscape to accommodate the project from a visual perspective);
- Identification of visual elements that are effected and description/evaluation of specific visual impacts;
- Recommendations with reference to mitigation measures; and
- Provision of graphic representations of the above points.

9.12.1 Methods

A Digital Terrain Model (DTM) is created which displays the relief of the topography surrounding the proposed infrastructure. This DTM will then be used to create a viewshed which is the total area that has a direct visual connection for the infrastructure. A map spatially depicts the viewshed area and the areas which have direct visibility of the proposed infrastructure. The height of the surrounding vegetation is taken into consideration during this analysis.

Once this has been performed the proposed infrastructures visibility is assessed by the following criteria:

- Visibility of the infrastructure;
- Visual exposure;
- Visual sensitivity;
- Visual receptors;
- Visual absorption capacity (VAC); and
- Visual intrusion.

The above criteria as well as the proposed impacts are rated and tabulated. Mitigation methods are provided to minimise the impact of the proposed infrastructure.

9.12.2 Deliverables

A visual impact assessment report will be compiled and will contain the following:

- A Viewshed model;
- Visual impact assessment based on the model; and
- Recommendations in terms of mitigation measures.

9.13 Archaeology & Heritage

9.13.1 Aim and Objectives

This Initial Heritage Statement (IHS) provided temporal and historical background and identified existing and potential heritage resources that may exist in the project area. Preliminary Statements of Significance and possible impacts on heritage resources were also identified. The IHS was informed the NHRA and SAHRA Minimum Standards as well as international best practice encapsulated in documents such as the UNESCO World Heritage Convention, ICOMOS Guidance on Heritage Impact Assessments for Cultural World Heritage Sites and others. In this regard, the IHS will be submitted in support of the Notice of Intent to Develop (NID) as required under Section 38(1) of the NHRA.

The following aims and objectives were achieved by the IHS:

- Identify and define cultural landscape;
- Provide temporal and historical background to the project area;
- Identify existing and predict potential heritage resources in the proposed project area;
- Create a sensitivity map based on known and identified heritage resources;
- Provide preliminary Statements of Significance for categories of heritage resources that may occur;
- Predict and list possible environmental impacts on heritage resources; and
- Provide preliminary recommendations based on current known heritage resources, Statements of Significance and predicted impacts.

9.13.2 Methodology

The methodology that was employed in the IHS is discussed briefly.

- A literature review of available published research such as academic journals and academic books were reviewed for information pertaining to the project area and surrounding areas;

- Local heritage impact assessment reports were reviewed to identify potential heritage resources within and surrounding the project area, as well as to review the recommendations given in these reports;
- A desktop survey of available cartographic and satellite imagery survey was conducted to identify potential areas for heritage resources; and,
- Integrating known heritage resource localities into a GIS to predict potential occurrences in project area and provide a preliminary sensitivity map.

9.13.3 Legislative requirements

The following legislation is governing the EIA and subsequent IHS:

National Legislation

- National Heritage Resources Act, No. 25 of 1999 (NHRA) with specific reference to Section 38(1) requiring the submission of a Notice of Intent to Develop to the relevant Heritage Resources Authority;
- National Environmental Management Act, Act No. 107 of 1998 (NEMA); and
- National Water Act, 36 of 1998 (NWA).

International Best Practice and standards:

- IFC Standards, Performance Standard 8, 1998;
- Equator Principles, 2006; and
- ICOMOS Guidance on Heritage Impact Assessments for Cultural World Heritage Properties, 2010.

9.13.4 Deliverables

- A Heritage Scoping Report submitted as an Initial Heritage Statement together with a Notice of Intent to Develop (NID) which will be submitted to the South African Heritage Resources Agency (SAHRA) for comment, review and Terms of Reference (ToR);
- A Heritage Impact Assessment (HIA) completed in line with the ToR supplied by SAHRA.

9.14 Social Assessment

9.14.1 Objectives

The objectives of the impact assessment phase will be as follows:

- To gain a more comprehensive understanding of the following:

- Baseline socio-economic conditions in the affected area, including becoming familiar with other proposed projects in the area;
- The conditions on site and immediately surrounding it, including identifying the land users and location of settlements; and
- The proponent's policy and procedures concerning local employment, Corporate Social Investment and Local Economic Development.

- To identify and assess the prevalent attitudes and perceptions about mining in general and the project in particular.
- To identify, describe and rate the significance of socio-economic benefits and negative impacts that are likely to arise as a result of the proposed project.
- To propose feasible, practical and cost-effective measures to mitigate the negative socio-economic impacts and enhance the benefits that may result from the proposed project.

9.14.2 Methodology

The objectives of the impact assessment phase will be met by employing the following methodology:

- Conducting an ***investigative site visit*** to assess the conditions on and surrounding the site. A photographic and spatial record will be kept of all relevant features.
- ***Reviewing the public participation documentation***, particularly the minutes of meetings held with affected land owners, community members and other stakeholders, in addition to facilitating/ conducting a maximum of six additional ***focus group discussions/ key informant interviews*** specifically for the purposes of the socio-economic impact assessment. Relevant data will be captured and analysed in order to present meaningful findings.
- A ***desktop review*** of available documents that can shed light on the socio-economic conditions of the larger study area.
- ***Compiling a Socio-economic Impact Assessment report***, including the following:
  - A comprehensive baseline socio-economic profile of the local municipal area (with an emphasis on Ward 7) in relation to the district municipal area and province as a whole;
  - A description of the prevalent attitudes and perceptions about mining in general and the proposed project in particular;
  - The identification, description and significance rating of socio-economic impacts likely to emanate from the proposed project; and
  - The presentation of feasible, practical and cost-effective mitigation measures for each of the identified socio-economic impacts and benefits.

9.14.3 Deliverables

Upon completion of the impact assessment phase, as stand-alone Socio-economic Impact Assessment report will be produced, which will be incorporated into the main EIA report.

10 CONCLUSION

The general landscape typical of the Highveld grasslands is that of a gently undulating topography, with dispersed valley bottom wetlands. Much of the landscape within the project boundary has been transformed with very little natural habitats remaining. Areas of ecological importance include sections of wetlands, one of which is associated with the perennial Wilge River, which flows in a north easterly direction across the project area.

Currently the conceptual mine plan indicates that sections of the Wilge River and associated wetland systems are proposed to be mined by opencast methods. It is recommended that Universal Coal revise this mine plan once results from the soil and wetland specialist studies have been received. Depending on the depth of the seams and geological conditions, it may be possible to apply for access under the streams with development that has a high safety factor.

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Appendix A: Public Participation

Appendix A: Public Participation

A.1: Notification letter to the directly affected land owners

- Registration and comments form
- Land tenure map
- Directly affected landowners database
- Proof of distribution

A2: Stakeholder database

A3: Background information document

- Registration and comments form
- Regional setting map
- Placement of notices

A4: Public Meeting

- Attendance Register

A5: Newspaper Advert

A6: Comments and Response Report

Appendix B: Initial Heritage Statement Report

Appendix C: Scoping Report Checklist