NOTICE: INTERESTED AND AFFECTED PARTIES;
BANK COLLIERY- ACCESS BROWN SHAFT II;
A DIVISION OF ANGLO OPERATIONS LIMITED;
NEMA EIA/EMP PHASE

AngloAmerican

Real Mining, Real people, Real Difference

Case 2746

To:	**South African Heritage Resources Agency**	From:	Riana Bate
Fax:		Pages:	1
Phone:	021 462 4502	Date:	**2013/06/07**
Re:	**Anglo Operations Limited: Access Brown Shaft II- Application for Listed Activities in terms of the National Environmental Management Act (Act no. 107 of 1998)**		

Attention: Ms. Jenna Lavin

Anglo Operations Limited (Reg. No.: 1921/006730/06) has applied for the authorisation of listed activities in terms of sections 24 and 24D of the National Environmental Management Act (Act no. 107 of 1998) read together with Government Notice No. R544, R545 and R546, which comprise the construction of an access adit and associated infrastructure for the purpose of underground coal mining activities (Access Brown Shaft II). The activities will result in the transformation of undeveloped land of more than 20 hectares to commercial (mining) and industrial (mining) use. A conveyor belt will be constructed to transport the raw coal to an existing plant (Bank Colliery) for further processing. Pipelines will be constructed to transport water from the proposed access adit to a mined out underground water storage area and to the proposed access adit to be used for the underground mine machinery. These activities will occur on certain portions of the following farms: **Wolvenfontein 471 JS, Bankfontein 340 JS, Blesbokvlakte 24 IS, Blesbokvlakte 596 IS, and Bank Colliery 608 IS, Middelburg district, Mpumalanga.** The application was accepted by the Mpumalanga Department of Economic Development. Environment and Tourism (MDEDET), with the following reference number: **17/2/3N-206.**

Geovicon Environmental (Pty) Ltd has been appointed as the independent environmental consultant to compile the Environmental Impact Assessment Report in terms of section 31, 32 and 33 of the Environmental Impact Assessment Regulations published in Government Notice No. R543.

The **Draft Environmental Impact Assessment Report** is hereby submitted to you for comment.

Comments regarding the proposed mining operation must be submitted in writing, under reference number **17/2/3N-206**, on or before **8 July 2013** to:

Consultant:
GEOVICON Environmental (Pty) Ltd
P. O. Box 4050
Middelburg
1050

Tel.: 013 243 0542
Fax.: 086 632 4936
Cell.: 082 359 5604
E-mail: geovicon@iafrica.com
Contact person: Riana Bate

SA HERITAGE RESOURCES AGENCY
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19 JUN 2013

KINDLY SIGN AND FAX BACK TO THE NUMBER ABOVE AS CONFIRMATION OF RECEIPT OF THE DOCUMENT.

Receipt of above-mentioned document is hereby acknowledged.

Received by:.....Signature:.....

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Bank Colliery

DRAFT
Environmental Impact Assessment and Environmental Management Programme

Bank Colliery
Access Brown Shaft II

June 2013

Submitted as contemplated in Regulation 30, 31 and 32 of the Environmental Impact Assessment Regulations, 2010 (GNR 543 in Government Gazette 33306 of 18 June 2010)

For the application for Environmental Authorization in terms of the National Environmental Management Act, 1998 (Act No.107 of 1998)

DEDET Reference No.: 17/2/3 N - 206

Executive Summary

Bank Colliery, which is a Division of Anglo Operations Limited, is an operational mine located 20 km south of Middleburg in the Nkangala District Municipal within the Mpumalanga Province (See Figure 1). Bank Colliery had two mining operations i.e. Bank 2 Seam and Bank 5 Seam mining operations. Bank 2 Seam operations were opened in 1966 to produce Steam Coal and expanded to produce Low Ash Coal in 1977. The No. 5 Seam operations originally opened as Blesbok Colliery in 1947 to produce Metallurgical coal. The two mining operations were merged in 1981 to form Bank Colliery. Currently, the No. 2 and 4 seam product is exported. Bank Colliery is operating under a converted old order mining right and an approved EMPR under the Mineral and Petroleum Resources Development Act of 2002.

Due to the depth of the coal seams Bank Colliery conducts its mining operations mainly by means of underground mining methods. Bank Colliery is currently mining the No. , 2 and 4 coal seams within their mining right area. The mine has one operational shaft (Main Shaft) and six decommissioned shafts, (South Shaft, Brown Shaft I, Five Shaft, East shaft and West shaft). R.O.M coal from the mining operations is processed at a washing plant (Bank 2 coal washing plant) and discard produced from the washing plant is disposed of at a co-disposal facility (Bank 2 co-disposal site).

This document concerns changes at Bank Colliery's mining area, i.e. Access Brown Shaft II, whereby a new shaft will be constructed for the exploitation of the No. 2 seam coal reserves. This project will be conducted on certain portions of the farm Wolvenfontein 471 JS, Blesbokvlakte 596 IS, Blesbokvlakte 24 IS, Bankfontein 340 JS and Bank Colliery 608 IS. The proposed Access Brown Shaft II Underground Mining Project entails the removal of the No. 2 coal seam by means of underground mining, using the Bord and Pillar mining methods. Access to the workings will require the construction of a new access shaft i.e. Access Brown Shaft II.

The National Environmental Management Act, 1998 (Act 107 of 1998) requires that any person or entity that intends to undertake activities listed in government notices 544, 545 and 546 must obtain an environmental authorisation in terms of section 24D of the National Environmental Management Act before undertaking such activities. On evaluation of the Access Brown Shaft II project, the following listed activities were identified i.e. GN 544: Activity 9: The construction of a dirty water pipeline exceeding 1000 metres in length for the bulk transportation of water, with a peak throughput of 120 litres per second.

GN 545: Activity 5: The construction of a pollution control dam for the storage of effluent and the discharge of water into a water resource in terms of the National Water Act 36 of 1998. Activity 6: The transportation of coal, outside an industrial complex, using a conveyor with a throughput capacity of more than 50 tons per day. Activity 15: The physical alteration of undeveloped land to commercial (mining) and industrial (mining) use, where the total area to be transformed is more than 20 hectares.

GN 546: Activity 16: The construction of infrastructure (Ventilation Shaft) covering more than 10 square metres such construction occurs within 32 metres of a tributary of the Spookspruit, measured from the edge of a watercourse.

Based on the above, an application for an environmental authorisation for the above listed activities was undertaken with the Department of Economic Development, Environment and Tourism (eMalahleni Regional Office). The final Scoping Report has been accepted and the Environmental Impact Assessment (EIA) and Environmental Management Programme (EMP) (this document) is thereby being submitted.

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2	Vegetation Survey Report for the Proposed Access Brown Shaft II
3	Mammal List for the Proposed Access Brown Shaft II
4	Surface water Study for The proposed Access Brown Shaft II
5	Geohydrological Report for the proposed Access Brown Shaft II
6	Ambient Air Quality Impact Study in Support of the Access Brown Shaft II
7	Noise Impact Assessment Report for the proposed Access Brown Shaft II
8	Heritage Study for the Proposed Access Brown Shaft II Mining Right Area
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10	Surface Infrastructure Layout Plans
11	Construction Methodology and Designs

SECTION ONE

Introduction

1. INTRODUCTION

1.1 WHO IS DEVELOPING THE EIA/EMP REPORT?

EIA/EMP Report Compilation : Geovicon Environmental (Pty) Limited
P.O. Box 4050
MIDDELBURG, 1050
Tel: (013) 243 0542
Fax: (086) 632 4936
Contact: Mr. O.T. Shakwane

Geovicon Environmental (Pty) Limited is a geological and environmental consulting company. The company was formed in 1996, and currently has seventeen years experience in the geological and environmental consulting field. During the past ten years, Geovicon Environmental (Pty) Limited has successfully completed consulting projects in the Mining sector (coal, gold, base metal and diamond), Quarrying sector (sand, aggregate and dimension stone), Industrial sector and housing sector. Geovicon Environmental (Pty) Limited has undertaken contracts within all the provinces of South Africa, Swaziland, Botswana and Zambia. During 2001 Geovicon Environmental (Pty) Limited entered the field of mine environmental management and water monitoring.

Geovicon Environmental (Pty) Limited is a Black Economically Empowered Company with the BEE component owning 60% of the company. Geovicon Environmental (Pty) Limited has three shareholders i.e. O.T. Shakwane, J.M Bate and T.G. Tefu.

Mr. O.T Shakwane obtained his BSc (Microbiology and Biochemistry) from the University of Durban Westville in 1994, and completed his honours degree in Microbiology in 1995.

Mr. T.G. Tefu is a geologist. He obtained his BSc. in geology at the University of Witwatersrand. He worked with several mining companies and was also employed by the Department of Mineral Resources' Environmental Management directorate.

Mr. Bate, founder of Geovicon Environmental (Pty) Limited, is used by the company on an ad hoc (consultancy) basis. He is also a qualified geologist. He obtained his BSc (geology) from the Potchefstroom University for CHE in 1993, and completed his honours degree (cum Laude) in geology in 1994. He obtained his MSc (cum Laude) in 1995.
Over the past years Geovicon Environmental (Pty) Limited has formalised working relationships with companies that offer expertise in the following fields i.e. Geohydrology, Civil and Geotechnical Engineering, Geotechnical Consultancy, Survey and Mine Planning and Soil & Land Use Consultancy.

1.2 WHO WILL EVALUATE THE EIA/EMP REPORT?

Before the proposed listed activities applied for can proceed, the environmental impacts that may result from the proposed project must be assessed. Based on the information provided in this EIA/EMP report, DEDET will decide whether or not to authorise the proposed listed activities.

In the spirit of co-operative governance, other commenting authorities will be consulted with. These include:

Department of Mineral Resources (DMR)

Mpumalanga Tourism and Parks Agency (MTPA)

Department of Water and Environmental Affairs (DWEA)

National Department of Agriculture (NDA)

1.3 Legal Requirements

The National Environmental Management Act, 107 of 1998 (NEMA) requires that a Scoping Report be conducted and that the Environmental Impact Assessment (EIA) be carried out for activities listed activities applied for under the Environmental Impact Assessment Regulations 2010

In addition to the NEMA, the following key legislation is also relevant to the EIA/EMP Report:

Minerals and Petroleum Resources Development Act (MPRDA), No 28 of 2002

Environment Conservation Act (ECA), No 73 of 1989

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

The Mine Health and Safety Act (MHSA), No 29 of 1996, as amended

The National Water Act (NWA), No 36 of 1998, as amended

National Environmental Management Biodiversity Act (NEMBA), No 10 of 2004

Air Quality Act (AQA), No 39 of 2004.

The EIA/EMP (this report) will be finalised based on the comments received from interested and affected parties.

1.4 Purpose of the EIA/EMP Report

The EIA/EMP report addresses the requirements as contemplated in the Environmental Impact Assessment Regulations, 2010. This report also documents the issues and concerns raised during the consultation phase (if any), and includes the findings of the specialist assessments for issues that have been raised.

The aim of this EIA/EMP Report is to:

Provide information on the proposed project and present the findings of the Studies to the authorities

Provide information regarding alternatives that have been considered

Show how authorities and interested and affected parties were afforded the opportunity to contribute to the project, and to indicate the issues raised and the responses to those issues

Describe the baseline receiving environment

Describe the extent of environmental consequences for the construction and operating phases of the proposed project

Propose mitigation measures for impacts that are considered significant

Describe the environmental feasibility of the proposed project

Present findings in a manner that facilitates decision-making by the relevant authorities

SECTION TWO

Project Background & Context

2. PROJECT BACKGROUND AND CONTEXT

2.1 OVERVIEW OF THE PROJECT

2.1.1 Name of the Applicant

Anglo Operations Limited

2.1.2 Name of the Proposed Project

Bank Colliery's Access Brown Shaft II

2.1.3 Address of proposed Project

Bank Colliery's Access Brown Shaft II

Portion 7 of the farm Wolvenfontein 471 JS
MIDDELBURG

2.1.4 Project Manager

Ms. Kgaowelo Moshokwa

2.1.5 Contact Person

Ms. Kgaowelo Moshokwa
Anglo Operations (Pty) Ltd, Bank Colliery
Private Bag X410, Van Dyksdrift, 2245
Cell: 079 687 5458

2.2 LOCATION

Refer to Figure 1 for the regional setting of the proposed Access Brown Shaft II. The proposed Access Brown Shaft II is situated on the remaining extent of portion 7 of the farm Wolvenfontein 471 JS along the R545 road within a Bank Colliery's Brown Shaft II mining right area.

2.2.1 Magisterial District & Regional Services Council

Middelburg, Mpumalanga

District Municipality: Nkangala District Municipality

Local Municipality: Steve Tshwete Local Municipality

2.2.2 Direction and Distance to Nearest Towns

Table 1: Direction and Distance to Nearest Towns.

Town	Direction	Distance (km)
Middelburg	North	20 km
Witbank	Northwest	25 km
Bethal	South	50 km

2.2.3 Surface Infrastructure

The area on which Access Brown Shaft II will be constructed is currently an area used for the cultivation of hay grass. With the exception of the servitude described below, no surface infrastructure exists within the proposed mining project area.

2.2.4 Presence of Servitudes

A number of servitudes such as power lines, overland conveyor route, provincial road (R35), Duhva water pipeline, and a vent shaft occur in the vicinity of the proposed Access Brown Shaft II project area. See Appendix 10 for a plan indicating the servitudes in the vicinity of the proposed Access Brown Shaft II project area.

2.2.5 Name of River Catchments

Bank Colliery mining right area falls within the Upper Olifants River catchments. Bank Colliery mining right area falls within the B11 and B12 tertiary drainage regions of the Olifants River catchment. Within these tertiary regions the mine falls within the B11B, B11G, B11H, B12D and B12B quaternary drainage regions.

A number of streams have their headwaters within the Bank Colliery's mining right area or slightly upstream of the mining right area. These streams can be divided into two groups. Those that drain into the Olifants River upstream of the Witbank Dam and those that drains into the Olifants River downstream of the Witbank Dam into the Loskop Dam. The streams that drain into the Olifants River upstream of the Witbank Dam include the Koring Spruit and the Boschmanskranz Spruit. The Spook Spruit drains downstream of the Witbank Dam and hence drains into the Loskop Dam. The proposed Access Brown Shaft II Underground Mining area falls within the Spook Spruit catchment.

2.3 Name and Address of Land Owner & Farm Description

Table 2 indicate the surface owners on the proposed Access Brown Shaft II underground mining project water use areas.

Table 2: Description of immediate and adjacent landowners and their property

FARM	PORTION	SURFACE RIGHT OWNERS

Wolvenfontein 471 JS	Portion 7*	Mr. D.S. van Wyk
Wolvenfontein 471 JS	Portion 8*	Anglo Operations Limited
Wolvenfontein 471 JS	Portion 9*	Anglo Operations Limited
Wolvenfontein 471 JS	Portion 11*	Anglo Operations Limited
Blesbokvlakte 24 IS	Portion 9*	Bleswolf Boerdery (Pty) Limited
Blesbokvlakte 596 IS	Remaining extent*	SANCOR (Pty) Limited
Bank Colliery 608 IS	The farm*	Anglo Operations Limited
Bankfontein 340 JS	Portion 9*	Anglo Operations Limited
Bankfontein 340 JS	Portion 10*	Anglo Operations Limited

* Indicate farm portions on which the proposed Access Brown Shaft II Underground Mining Project and associated infrastructure will be undertaken.

Table 3: Details of Immediate and Adjacent Landowners

Farm Name/Portions	Surface Owner	Contact Person	Telephone
Bankfontein 340 JS Portion 10 and portion 9 (portion of portion 6)	Anglo Operations Limited	Leased to Mr. D.S. van Wyk	Cell: 083 633 5773
Wolvenfontein 471 JS, Portion 5	BECSA Middelburg Mine	Div de Villiers	Tel: 013 689 4212
Wolvenfontein 471 JS, Portion 8 (portion of portion 3)	Anglo Operations Limited	Leased to S.I.S. Farming	Tel: 013 291 5600/082 388 3186
Wolvenfontein 471 JS, Portion 6 and portion 18	Bleswolf Boerdery	Jannie Schoeman	Cell: 082 388 3111
Wolvenfontein 471 JS, Portion 14	Komatie Ontwikkelings MPY (Pty) Ltd	Ebrahim Suliman	Cell: 082 551 7794
Wolvenfontein 471 JS, Portion 15	Republic of South Africa	Andre Hennop (land occupier)	Cell: 083 327 9830
Blesbokvlakte 24 IS	Bleswolf Boerdery (Pty) Ltd	Jannie Schoeman	Cell: 082 388 3111
Blesbokvlakte 596 IS	SANCOR (Pty) Ltd	Jannie Schoeman	Cell: 082 388 3111

2.4 BRIEF PROPOSED PROJECT OVERVIEW

Anglo Operations Limited intends to undertake an underground coal mining operation called Access Brown Shaft II. The underground mining will utilise the bord and pillar mining technique. The mining operation will result in the construction of an incline shaft and associated overburden stockpiles. This will require construction of the associated infrastructure, which includes a pollution control dam, access roads, fuel bay, LV substation, ventilation shaft, conveyor belt, workshop, wash bay, dirty water pipeline to south shaft and a raw water pipeline from Bankfontein. In terms of sections 24 and 24D of the National Environmental Management Act (Act no. 107 of 1998) read together with Government Notice 544, 545 and 546, Anglo Operations Limited will require an environmental authorisation before commencement of the above-mentioned activities. Hence the following listed activities will be applied for:

2.4.1 NEMA Listed Activities in terms of Government Notice R544 – Listing Notice 1 of 2010

Activity 9: *The construction of a dirty water and raw water pipeline exceeding 1000 metres in length for the bulk transportation of water, with a peak throughput of 120 litres per second.*

The construction of a raw water pipeline and dirty water pipeline. The raw water pipeline will transport raw water from the existing Bank Colliery to the proposed access Brown Shaft II area, to be used for the mine machinery such as the continuous miners. The dirty water from the proposed Access Brown Shaft II pollution control dam will be transported via pipeline to old underground workings in the existing South shaft area.

2.4.2 NEMA Listed Activities in terms of Government Notice R545 – Listing Notice 2 of 2010

Activity 5: The construction of a pollution control dam for the storage of dirty water and the discharge of water into a water resource in terms of the National Water Act 36 of 1998.

A pollution control dam will be constructed to store all dirty water and runoff from the Access Brown shaft II area and underground mine workings. This will trigger a water use in terms of the National Water Act 36 of 1998.

Activity 6: The transportation of coal, outside an industrial complex, using a conveyor with a throughput capacity of more than 50 tons per day.

The coal that will be mined will be transported from the Access Brown shaft II underground workings to the existing Bank colliery for further processing via conveyor belt, with a throughput capacity of more than 50 tons per day.

Activity 15: The physical alteration of undeveloped land to commercial (mining) and industrial (mining) use, where the total area to be transformed is more than 20 hectares.

The construction of the Access Brown shaft as well its associated infrastructure will result in the transformation of more than 20 hectares to commercial (mining) and industrial (mining) use.

2.4.3 NEMA Listed Activities in terms of Government Notice R546 – Listing Notice 3 of 2010

Activity 16: The construction of infrastructure (Ventilation Shaft) covering 10 square metres or more where such construction occurs within 32 metres of a tributary of the Spookspruit, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.

A ventilation shaft for Access Brown shaft II will be constructed within 32 metres of the tributary of the Spookspruit .It should be noted that although the soils are indicative of a wetland area, the area has already been disturbed by agricultural activity (grazing land.)

SECTION THREE

Baseline Information

3. BASELINE INFORMATION

3.1.1 Geology

3.1.1.1 Regional Geology

The Bank Colliery mining area is situated in the central block of the Witbank Coalfield. The stratigraphic sequence typically comprises sediments of the Dwyka Group and the Vryheid Formation of the Ecca Group, which rest unconformably on an uneven floor of basement rocks comprised of gabbro diabase and felsites of the Bushveld Igneous Complex. The Dwyka sediments are typically diamictite and grit, while the Vryheid Formation consists of sandstone, siltstone, interlaminated sand/siltstone, shale and coal seams. Up to seven coal seams exist with the Bank Colliery Mining Right area. However, only four of these, the No. 1, 2, 4, and 5 Seams are considered to be of economic importance.

The No 2 seam, which is the target seam for the proposed Access Brown Shaft II is developed over virtually the entire mining right area and lies at an average depth of 60m. The No. 2 coal seam has an average thickness of 6m.

Figure 2 indicates the typical stratigraphic column of boreholes drilled over the proposed Access Brown Shaft II. From the above mentioned figure it is evident that an alternating package of sandstone, mudstone and shale layers is situated above the No. 2 coal seam.

3.1.2 Climate

3.1.2.1 Regional Climate

Bank Colliery falls into the Eastern Plateau Highveld climate zone, characterised by relatively warm wet summers and cold dry winters.

3.1.2.2 Mean Monthly Rainfall

Average monthly rainfall and the number of days experiencing rainfall are presented in Table 4. The mean annual precipitation of the site is 687 mm. The mean annual evaporation of the site is 1522 mm (S-Pan). The Mpumalanga Highveld has distinct wet and dry seasons. 91% of the Colliery's mean annual rainfall falls between October and April inclusively. 68% of the area's mean annual evaporation occurs in this period (Midgley et al., 1990).

Table 4: Average Rainfall for the region (over 77 years from 1929 to 2006)

MONTH	MM	AVERAGE NO OF RAIN DAYS
January	116.5	10.4
February	96.3	7.8
March	74.8	7.1
April	42.8	4.5
May	16.3	2.1
June	7.6	1.2
July	6.6	0.9
August	6.9	1.0
September	24.2	2.8
October	67.8	7.0
November	112.6	10.4
December	110.6	10.3
Annual Average	**687**	

3.1.2.3 Mean Monthly Maximum and Minimum Temperatures

The mean maximum and minimum temperatures, extrapolated from the Pretoria, Middelburg, Belfast and Carolina weather stations are presented in Table 5.

Table 5: The mean maximum and minimum temperatures

MONTH	DAILY MAX. °C	DAILY MIN. °C	DAILY MEAN. °C
January	27,2	13,7	20,5
February	26,8	13,4	20,1
March	26,0	11,4	18,7
April	23,9	7,4	15,7
May	21,3	2,2	11,7
June	18,5	-1,8	8,3
July	18,4	-1,7	8,3
August	21,4	0,8	11,1
September	24,0	5,3	14,7
October	26,0	10,1	18,0
November	26,2	11,8	19,0
December	27,1	13,2	20,1

3.1.2.4 Wind Direction and Speed at the Project area

In the study area, the mean daytime surface winds are predominantly north westerly as a result of the prevalent anticyclonic circulation, with easterly winds being the next most frequent. In the winter, the frequency of south westerly winds increases because of the passage of cyclonic westerly waves. Light topographically induced winds from the eastern sector are common at night. The so-called Escarpment Breeze that develops at night under weak pressure gradients is up to 1 000m deep. Winds are mostly light except during thunderstorms. Very occasionally tornadoes do occur. Sunshine

duration in summer is about 60% and in winter about 80% of the possible.

3.1.2.5 Mean Monthly Evaporation

The mean monthly evaporation (S-Pan) for the region obtained from Bethal Weather Station is presented in Table 6. The mean annual evaporation of the site is 1522 mm (S-Pan). The Mpumalanga Highveld has distinct wet and dry seasons. 91% of the Colliery's mean annual rainfall falls between October and April inclusively. 68% of the area's mean annual evaporation occurs in this period (Midgley et al., 1990).

Table 6: Mean monthly evaporation for the region.

MONTH	Evaporation (mm)
January	167.4
February	139.6
March	137.7
April	105.9
May	89.2
June	72.4
July	79.3
August	105.0
September	136.1
October	164.1
November	154.8
December	170.5
TOTAL	**1522**

3.1.2.6 Extreme weather conditions

Hail: Occurs 4 to 7 times per year

Drought: ± every 6 years

Frost: Can occur from end of April to September

3.1.3 Topography

3.1.3.1 Local topography

The mine is situated in the Eastern Highveld region of Mpumalanga, which is characterised by a gentle undulating plateau with fairly broad to narrowly incised valleys such as the Olifants River valley.

Bank Colliery's Access Brown Shaft II lies between 1 560 m and 1 600 mamsl, with gently undulating topography. The area slopes to the north towards the Vaalbankspruit and to the west towards the Spookspruit.

3.1.4 Soils

Pedoplan International Consultants was appointed by Geovicon to conduct a detailed soil-landform assessment over the proposed Access Brown Shaft II, which occurs on the farm Wolvenfontein 471 JS, south of Middelburg, Mpumalanga. See Appendix 1 for the detailed report. The objectives of the study were as follows:

To conduct a detailed assessment of the soils-landform resources, comprising identification, description, classification and mapping of the soil-terrain types and assessing their attributes relating to agricultural potential, the potential for other land uses, susceptibility to erosion and topsoil quality.

To identify pre-mining land uses.

To assess the land capability of soil, terrain and climate combinations.

To identify and demarcate wetland zones from a soil-landform perspective.

To assess the impact of strip and subsurface coal mining on the soil-landform resources and propose mitigation measures.

3.1.4.1 Landform

The project area forms part of the Highveld Plateau. The latter constitutes a remnant of an old, high altitude (1600 m above sea level), gently undulating land surface, with pans in places. It is mainly underlain by coal bearing shale and sandstone of the Vryheid formation (Geological Survey, 1986).

On a meso scale, the land surface is predominantly composed of level to gently sloping (1-3% slope) crests (about 5% in extent), gently to moderately sloping (3-8% slope) midslopes (about 70%), gently to moderately sloping (2-8% slope) footslopes (about 20%), and a level (0-2%) bottomland (about 5%).

3.1.4.2 Soil Form Map

The distribution of the soil-landform resources is given on the detailed soil-landform map (Figure 3). The map legend, also contained in Figure 3, indicates the dominant soil components as well as the position (hillslope unit and slope class) they occupy in the landscape. The sizes of map units are also shown in Table 7.

Table 7: Soil-landform map units

MAP UNIT	LANDFORM COMPONENT	SOIL COMPONENT	AREA (ha)	AREA (%)
Hu	Gently to moderately sloping midslopes (3-6% slope)	Moderately deep to deep (80-120 cm), well-drained, dark red, apedal, sandy clay loam of the Hutton form, on weathered rock	5.99	1.40
Li1	Level to gently sloping crests or upper midslopes (1-2% slope)	Deep (100-140 cm), well-drained, red, apedal, sandy loam or sandy clay loam on hard plinthite of the Lichtenburg form	5.02	1.17
Li2	Level to gently sloping midslopes (2-5% slope)	Moderately deep (60-90 cm), well-drained, red, apedal, sandy loam or sandy clay loam on hard plinthite of the Lichtenburg form; many, hard Fe-Mn concretions in subsoil	26.04	6.09
Li3	Level to gently sloping crests or upper midslopes (1-2% slope)	Shallow (30-50cm), well-drained, dark red, apedal, sandy loam or sandy clay loam on hard plinthite of the Lichtenburg form; few to many, hard Fe-Mn concretions	14.86	3.47

Gc1	Level to gently sloping crests (1-3% slope)	Deep (100-120 cm), well-drained, yellow-brown, apedal, sandy loam or sandy clay loam on hard plinthite of the Glencoe form	2.11	0.49
Gc2	Gently to moderately sloping midslopes (2-8% slope)	Moderately deep (50-100 cm), well-drained, yellow-brown, apedal, sandy loam or sandy clay loam on hard plinthite of the Glencoe form	13.56	3.17
Gc3	Gently to moderately sloping midslopes (4-8% slope)	Shallow (30-50 cm), well-drained, yellow-brown, apedal, sandy loam on hard plinthite of the Glencoe form; few to many, hard Fe-Mn concretions	5.63	1.32
Li-Gc	Gently sloping midslopes (2-5% slope)	Association of shallow to moderately deep (40-60 cm), well-drained, red or yellow-brown sandy loam or sandy clay loam on hard plinthite; few to many, hard Fe-Mn concretions	31.47	7.36
Cv	Gently to moderately sloping midslopes (2-6% slope)	Deep to very deep (100->150 cm), well-drained, yellow-brown, apedal, sandy loam to sandy clay loam of the Clovelly form on weathered sandstone	17.11	4.00
Av1	Gently to moderately sloping crests or midslopes (1-6% slope)	Moderately deep to deep (effective depth 80-130 cm), moderately well-drained, yellow-brown, apedal, sandy loam or sandy clay loam on soft plinthite deep subsoil of the Avalon form	71.75	16.78
Av2	Gently sloping footslopes (2-4 % slope)	Moderately deep (effective depth 60-90 cm), moderately well- drained, yellow-brown, mottled, apedal, sandy loam or sandy clay loam on soft plinthic deep subsoil of the Avalon form	20.65	4.83
We	Gently to moderately sloping footslopes and valley bottom (1-8% slope)	Shallow (effective depth 30-40 cm), poorly drained, grey brown, sandy loam or sandy clay loam topsoil on plinthic, sandy clay loam subsoil of the Westleigh form	34.79	8.14
Lo	Gently to moderately sloping footslopes (4-8% slope); unevensurface roughness in places in the form of erosion channels	Shallow (effective depth 30-40 cm), somewhat poorly drained, grey-brown or grey, loamy sand or sandy loam topsoil and E horizon, on grey, plinthic, sandy clay loam deep subsoil of the Longlands form	109.77	25.66
Lo-We	Level valley bottom (0-1% slope); uneven surface roughness in places in the form of erosion channels and overburden deposits	Association of poorly drained soils with shallow effective depth (10-40 cm): (i) grey, loamy sand or sandy loam topsoil and E horizon, over grey, plinthic, sandy clay loam deep subsoil of the Longlands form, and (ii) grey, sandy loam or sandy clay loam topsoil, on plinthic, sandy clay loam subsoil of the Westleigh form; water tables commonly present; associated with Katspruit form in places; sandy or loamy overburden in places	22.67	5.30
Lo-We-Es	Level valley bottom (0-1% slope); uneven surface roughness in places in the form of erosion channels and overburden deposits	Association of somewhat poorly to poorly drained soils with shallow effective depth (10-40 cm): (i) grey, loamy sand or sandy loam topsoil and E horizon, over grey, plinthic, sandy clay loam deep subsoil of the Longlands form; (ii) grey, sandy loam or sandy clay loam topsoil on plinthic, sandy clay loam subsoil of the Westleigh form; and (iii) loamy sand topsoil and E horizon, over grey-brown, strong prismatic, sandy clay subsoil of the Estcourt form	10.88	2.54
Se	Gently sloping footslopes (2-4 % slope)	Shallow (effective depth 20-30 cm), greyish brown, finely mottled, weak to moderate blocky, sandy clay loam over, greyish brown, mottled, strong angular blocky, sandy clay loam or sandy clay subsoil of the Sepane form	14.03	3.28
Ka	Level valley bottom (0-1% slope)	Deep soil materials: very poorly drained, dark grey, sandy loam or sandy clay loam topsoil on grey, gleyed sandy clay of the Katspruit form	5.29	1.24
Dr	Gently to moderately sloping midslopes and footslopes (4-8% slope)	Shallow (30-40 cm) somewhat poorly drained, dark grey, mottled, sandy loam on hard plinthite of the Dresden form; associated with similar soil of the Wasbank form	8.50	1.99
GP	Miscellaneous land class: Gravel pit		2.16	0.50
E	Miscellaneous land class: Erosion		0.27	0.06
D	Dam		1.03	0.24
P	Pan		4.25	0.99
		TOTAL	**427.83**	**100.0**

3.1.5 Land Capability

3.1.5.1 Suitability for dryland agricultural use

In this study to assess suitability for agriculture, the rating process has been based on the land capability system and diagnostic criteria as described by Scotney*et al.*, 1987 and Schoeman*et al.*, 2002. Due to the nature of this study only the **physical suitability for agriculture** has been appraised (See Table 8). Climate with its C2 rating is regarded as uniform over the project area. (The map units can therefore not be ranked into capability classes higher than class II.)

Table 8: Land Capability Assessment

MAP UNIT	LAND CAPABILITY CLASS*	PHYSICAL AGRICULTURAL POTENTIAL	MAP UNIT	LAND CAPABILITY CLASS*	PHYSICAL AGRICULTURAL POTENTIAL
Hu	II	Moderately high	We	VI	Very low
Li1	II	Moderately high	Lo	VI	Very low
Li2	III	Moderate	Lo-We	V	Very low
Li3	IV	Low	Lo-We-Es	V	Very low
Gc1	II	Moderately high	Se	V	Very low
Gc2	II	Moderate	Ka	V	Very low
Gc3	IV	Low	Dr	VI	Very low
Li-Gc	III	Moderate	GP	VII	Very low-None
Cv	II	Moderately high	E	VII	Very low-None
Av1	II	Moderately high			
Av2	II	Moderately high			

3.1.5.2 Land capability according to the Chamber of Mines' guidelines

According to these guidelines for the classification of land (2007), their land capability subdivisions reflect four classes, viz. class I (wetland), class II (arable land) class III (grazing land), and class IV (wilderness land). For the project area, these classes are shown in Figure 4 and explained in Table 9 albeit with a difference: the arable class is complemented with its agricultural land capability rating (Table 8), and wetland identification by the different classes of wetlands.

Table 9: Land capability (Chamber of Mines' guidelines)

LAND CAPABILITY MAP UNITS	LAND CAPABILITY	SOIL-LANDFORM MAP UNIT	AREA (ha)	AREA (%)
I-p	Class I – Wetland: permanent	D, P	5.28	1.23
I-s	Class I – Wetland: seasonal	Ka, Lo-We, Lo-We-Es	38.84	9.08
I-t	Class I – Wetland: temporary	Lo, We, Se, Dr	167.09	39.07

II-mh	Class II – Arable land: moderately high potential	Hu, Li1, Gc1, Cv, Av1, Av2	122.63	28.67
II-m	Class II – Arable land: moderate potential	Li2, Gc2, Li-Gc	71.07	16.62
III	Class III – Grazing land	Li3, Gc3	20.49	4.79
IV	Class IV – Wilderness land	GP, E	2.43	0.56
		TOTAL	**427.83**	**100.0**

3.1.6 Land Use

The land use at the proposed mining area consists predominantly of cattle grazing and grass harvesting in places. The land use within the proposed mining area can be divided as follows i.e. approximately 85% is used for grazing with the remainder used for grass harvesting. No further infrastructure, apart from the fences, power lines and the existing servitudes is present at the Access Brown Shaft II.

3.1.7 Natural Vegetation / Plant Life

The proposed Bank Colliery, Access Brown Shaft II, proposed shaft and infrastructure area, raw water pipeline and used water pipeline are situated in the Grassland Biome of South Africa (Rutherford, 1988). Mucina and Rutherford (2006) classify these areas within the Eastern Highveld Grassland vegetation unit (Gm 12) of the Mesic Highveld Grassland Bioregion.

The 1:50 000 topocadastral maps, 2629AB, 2629BA, 2529CD and 2529DC indicate the proposed shaft and infrastructure area, the raw water pipeline area and the used water pipeline area as cultivated fields and grazing land. The proposed shaft and infrastructure area comprises mainly a cultivated weeping love grazing area. The proposed raw water pipeline comprises mainly grazing land on the western side of the R 35 and cultivated pasture on the eastern side of the R 35. The proposed used water pipeline comprises firstly a cultivated grazing area from the proposed shaft, then cultivated maize areas and grassland areas up to the defunct South Shaft from where it will follow the existing water pipeline servitude between existing maize fields.

Hundred and eighteen plant species were observed in total in the different areas of investigation. This is quite a large number for areas where intensive crop cultivation, livestock farming and mining activities are the main land uses. It thus seems that the vegetation biodiversity is high, but it must be taken into account that many of these species are exotic species due to the current land uses. Some declared weed and invader species were also observed. Of the 118 plant species, 31 are grass species and 5 are rush/sedge species while quite a number of forb species (not grass, tree, sedge or rush species) are established in the areas (82 in total).

According to the amended regulations in the Conservation of Agricultural Resources Act (no 43 of 1983), five declared weed and invader species were observed in the areas of investigation *viz.* Pampas grass (Cortaderia selloana), Scottish thistle (*Cirsium vulgare*), Large cocklebur (*Xanthium strumarium*), Thorn apple (*Datura stramonium*) and Mexican poppy (*Argemone ochroleuca*). These plants must be eradicated.

According to the National red list of South African Plants version 2012.1, one plant species encountered in the areas of investigation is listed as declining (*Hypoxis hemerocallidea* – African potato). This plant is still used by the local people. It occurs in large numbers in the area where the proposed raw water pipeline will be constructed.

Eleven medicinal plant species were observed in the areas of investigation *viz. Aster harveyanus* (Bloublommetjie), *Helichrysum nudifolium* (Everlastings), *Dicoma anomala* (Maagbitterwortel), *Vernonia oligocephala* (Bitterbossie), *Hypoxis hemerocallidea* (African potato), *Pelargonium luridum* (Wild malva), *Gomphocarpus fruticosus* (Milkweed), *Elephantorrhiza elephantine* (Elephant's root), *Centella asiatica* (Pennywort), *Typha capensis* (Bulrush) and *Physalis viscosa* (Sticky gooseberry). All these plant species are widespread.

The proposed raw water and used water pipelines will transect certain wetland areas associated with the Bankspruit and its tributaries. These wetland areas are in close proximity to existing agriculture (cultivation and grazing), pipeline servitude, road and mining activities.

3.1.8 Mammal List

Determination of mammals present over an area to be impacted on by mining activities is a prerequisite before commencement with any mining activities. The information regarding the mammals of the area must be part of the Environmental Impact Assessment and Environmental Management Programme Report. Big C Rock Engineering cc was appointed by Geovicon to compile a mammal list on a portion of the farm Wolvenfontein 471 JS over the proposed shaft area and a report was compiled based on the information gathered. A copy of the report is attached as Appendix 3.

3.1.8.1 Methodology

Prior to investigation of the area a study was conducted on historic occurrence of mammals which is attached in Appendix 3 as an addendum. Line transects per foot was conducted in the study area order to identify species through either behavioural (nesting, footprints, etc.) or actual sightings

3.1.8.2 Findings

Table 10: Mammals (or signs thereof) that were detected on the study area with their respective conservation status:

Species Name	Common Name	Conservation Status	
		IUCN	NEMBA
Canis mesomelas	Black backed Jackal	Least Concern	Not Listed
Civettictis civetta	African Civet	Least Concern	Not Listed
Cynictis penicillata	Yellow Mongoose	Least Concern	Not Listed
Felis lybica	African Wild Cat	Least Concern	Not Listed
Genetta genetta	Small Spotted Genet.	Least Concern	Not Listed
Lutra lutra (Picture 2)	Spotted Necked Otter	Near Threatened	Protected Species
Otomys irroratus	Vlei Rat	Least Concern	Not Listed
Tatera brantsii	Highveld Gerbil	Least Concern	Not Listed

Table 11: The bird species that were observed on the study area:

Species Name	Common Name
Anas sparsa	African Black Duck
Ardea melanocephala	Black Headed Heron
Boystrichia hagedash	Hadeda Ibis
Bubulcus ibis	Cattle Egret
Cisiticola fulvicapilla	Neddicky
Cisticola tinniens	Levaillant's Cisiticola
Euplectes orix	Red Bishop
Fulica cristata	Red – Knobbed Coot
Himantopus himantopus	Black – Winged Stilt
Platalea alba	African Spoonbill
Ploceus capensis	Cape Weaver
Streptopelia capicola	Cape Turtle Dove
Streptopelia senegalensis	Laughing Dove
Threskiornis aethiopicus	Sacred Ibis
Vanellus armatus	Blacksmith Lapwing
Vanellus coronatus	Crowned Lapwing

Table 12: Invertebrates that were observed on the study area:

Species Name	Common Name
Apis mellifera	Honey Bee
Olorunia ocellata	Common Grass Funnel Web Spider
Onitis alexis	Bronze Dung Beetle
Trinervitermes spp.	Snouted Harvester Termite

3.1.9 Surface Water

Ilanda Water Services was appointed by Geovicon to conduct a specialist Surface water study over the proposed Access Brown Shaft II. See Appendix 4 for the detailed report.

Bank Colliery mining right area falls within the Olifants River and Klein Olifants catchments. Bank Colliery mining right area falls in the B11 and B12 tertiary drainage regions of the Olifants River catchment. Within these tertiary regions the mine falls within the B11B, B11G, B11H, B12D and B12B quaternary drainage regions. Figure 5 depicts the location of the Bank Colliery Mining right area in relation to the tertiary and quaternary drainage regions within the Olifants River.

The mining right area of Bank Colliery in relation to the major catchments and the natural surface streams are shown on Figure 6. A number of streams have their headwaters within the Bank Colliery's mining right area or slightly upstream of the mining right area. These streams can be divided into three groups. Those that drain into the Olifants River upstream of the Witbank Dam, those draining into the Olifants River just downstream of the Witbank Dam and those that drain into the Middelburg dam. The streams that drain into the Olifants River upstream of the Witbank Dam include the Koringspruit and the Boschmanskranzspruit. The Spookspruit and the Vaalbankspruit drain downstream of the Witbank Dam and upstream of the Middelburg dam catchments respectively.

The proposed Access Brown Shaft II area falls within the Spookspruit catchment. The Access Brown

Shaft II site is located in quaternary catchment B11H. It is located next to the R35, approximately 12 km North of Komati village and the Komati power station.

3.1.9.1 Catchment Boundaries

3.1.9.1.1. Catchment Delineation

The subcatchments of all three streams that traverse the study area were delineated using the Surveyor General's 5m contour data. These catchment boundaries are shown in Figure 6.

The tributary of the Spookspruit catchment measures 20.1 km^2 where it exits the study area. The Blesboklaagtespruit catchment measures 7.3 km^2 where it passes under the proposed conveyor. The tributary of the Blesboklaagtespruit catchment measures 25.3 km^2 where it passes under the proposed conveyor.

3.1.9.1.2. Catchment Characterisation

The proposed mining activities are located in quaternary catchment B11H, in the Olifants Water Management Area. The catchments are typical Mpumalanga Highveld catchments. Vegetation is predominantly Highveld grasslands and dry land maize lands. Limited lands appear to be under irrigation. There are numerous small dams located on the rivers within the study areas. There is little development in Spookspruit tributary and Blesboklaagtespruit tributary catchments, with a few farmsteads scattered throughout the catchment. The villages of Bank and Schoongesicht are located in the Blesboklaagtespruit catchment. All catchments can be considered as rural.

3.1.9.1.3. Mean Annual Runoff

The mean annual runoff for the tributary of the Spookspruit is 0.56 Mm^3 where it exits the study area. The mean annual runoff for the tributary of the Blesboklaagtespruit is1.17 Mm^3 where it exits the study area. The mean annual runoff for the Blesboklaagtespruit is 0.34 Mm^3 at the point where it exits the study area.

The mean annual runoff for the quaternary catchment B11H is 11.38 Mm^3 (Middleton and Bailey, 2009). The catchment characteristics of the rivers and streams mentioned above are similar to those of the quaternary catchment so the mean annual runoff was scaled from the quaternary catchment runoff, based on relative catchment size.

3.1.9.2 River Diversions

No river diversions are planned for the activities covered by this Report.

3.1.9.3 Water Authority

The Olifants River basin upstream of the Witbank Dam is a government water controlled catchment. The authority in charge is the Department of Water Affairs and Forestry (Mpumalanga Regional Office).

3.1.9.4 Sensitive Landscapes

The proposed Brown Shaft II and infrastructure area is situated on the western side of a wetland area associated with a tributary of the Spookspruit. The proposed Brown Shaft II will not be constructed within this wetland area although part of the Access Brown Shaft II infrastructure, namely the ventilation shaft will be constructed within 32 metres of the water course. It should be noted that although the soil types indicate a wetland area, the vegetation has been disturbed by agricultural activity and is now transformed to grazing land.

Several farm dams were constructed in this tributary resulting in the occurrence of standing water only during heavy rainfall events. Water is not flowing in this tributary. No definite channel was observed. Where ploughing can take place, cultivated maize areas occur in close proximity to this wetland area. An Eskom power line is also constructed through this wetland area in the vicinity of the proposed shaft and infrastructure area.

The proposed raw water pipeline will cross the Spookspruit immediately on the northern side of the damwall of the Bankfontein dam. This area is in close proximity to the mining activities of Bank Colliery. The dam is utilised for recreational activities.

The proposed used water pipeline, where it will be constructed in the existing conveyor belt area of the defunct South Shaft, is in close proximity of the wetland area of the far eastern tributary of the Bankspruit. Since the pipeline will be constructed within the existing conveyor belt area, no additional wetland areas will be utilised. Soybean cultivation is also taking place in this area.

From the defunct South Shaft, the proposed used water pipeline will cross the eastern tributary of the Bankspruit and the Bankspruit itself. In this area the pipeline will be constructed within an existing water pipeline servitude between maize fields.

No water is flowing in the Eastern tributary of the Bankspruit. A deep erosion gully is present on the southern side of the servitude in this wetland area. It is currently dry.

No channel exists in the area where the proposed used water pipeline will cross the Bankspruit within the existing pipeline servitude. No water is flowing in this area and it is surrounded by maize.

3.1.10 Groundwater

Geo Pollution Technologies – Gauteng (Pty) Ltd was appointed by Geovicon to perform a Geohydrological Study in support of the proposed Access Brown Shaft II Project. The report, which details the prevailing ground water conditions, aquifer sensitivity, and groundwater impacts assessment for the study area is attached as Appendix 5.

3.1.10.1 Regional Hydrogeology

According to the 1:50 000 General hydrogeological Map (Johannesburg 2526) groundwater resources are widespread but limited with borehole yields generally between 0.1 and 0.5l/s. Groundwater occurrence is better developed along aquifers associated with the contact zones of the dolerite intrusions where yields of 0.5 – 2.0 l/s are likely to occur. The aquifer represents important source for base flow into the streams draining the area. The hydrogeology of the area can be described in terms of the saturated and unsaturated zones. From the previous studies, the summary below of the aquifer system is given.

The aquifer represents an important source for base flow into the streams draining the area. The hydrogeology of the area can be described in terms of the saturated and unsaturated zones:

3.1.10.1.1. Saturated Zone

In the saturated zone, at least four aquifer types may be inferred from knowledge of the geology of the area:

- A shallow aquifer formed in the weathered zone, perched on the fresh bedrock.
- An intermediate aquifer formed by fracturing of the Karoo sediments.
- Aquifers formed within the more permeable coal seams and sandstone layers.
- Aquifers associated with the contact zones of the dolerite intrusives.

Although these aquifers vary considerably regarding geohydrological characteristics, they are seldom observed as isolated units. Usually they would be highly interconnected by means of fractures and intrusions. Groundwater will thus flow through the system by means of the path of least resistance in a complicated manner that might include any of these components.

3.1.10.1.2. Shallow perched aquifer

A near surface weathered zone is comprised of transported colluvium and *in-situ* weathered sediments and is underlain by consolidated sedimentary rocks (sandstone, shale and coal). Groundwater flow patterns usually follow the topography, often coming very close to surface in topographic lows, sometimes even forming natural springs. Experience of Karoo geohydrology indicates that recharge to the perched groundwater aquifer is relatively high, up to 3% of the Mean Annual Precipitation (MAP).

3.1.10.1.3. Fractured Karoo rock aquifers

The host geology of the area consists of consolidated sediments of the Karoo Supergroup and consists mainly of sandstone, shale and coal beds of the Vryheid Formation of the Ecca Group. Most of the groundwater flow will be along the fracture zones that occur in the relatively competent host rock. The geology map does not indicate any major fractures zones in this area, but from experience it can be assumed that numerous major and minor fractures do exist in the host rock. These conductive

zones effectively interconnect the strata of the Karoo sediments, both vertically and horizontally into a single, but highly heterogeneous and anisotropic unit

3.1.10.1.4. Aquifers associated with coal seams

The coal seam forms a layered sequence within the hard rock sedimentary units. The margins of coal seams or plastic partings within coal seams are often associated with groundwater. The coal itself tends to act as an aquitard allowing the flow of groundwater at the margins. Geohydrological Report for the Proposed Underground Mining at Access Brown Shaft 2 Bank Colliery, Mpumalanga Province

3.1.10.1.5. Aquifers associated with dolerite intrusives

Dolerite intrusions in the form of dykes and sills are common in the Karoo Supergroup, and are often encountered in this area. These intrusions can serve both as aquifers and aquifuges. Thick, unbroken dykes inhibit the flow of water, while the baked and cracked contact zones can be highly conductive. These conductive zones effectively interconnect the strata of the Ecca sediments both vertically and horizontally into a single, but highly heterogeneous and anisotropic unit on the scale of mining. These structures thus tend to dominate the flow of groundwater. Unfortunately, their location and properties are rather unpredictable. Their influence on the flow of groundwater is incorporated by using higher than usual flow parameters for the sedimentary rocks of the aquifer.

3.1.10.1.6. Unsaturated Zone

Although a detailed characterization of the unsaturated zone is beyond the scope of this study, a brief description thereof is supplied.

The unsaturated zone in the proposed mining area is in the order of between 1 and 10 metres thick (based on static groundwater levels measured in the existing boreholes) and consists of colluvial sediments at the top, underlain by residual sandstone/siltstone/mudstone of the Ecca Group that becomes less weathered with depth.

3.1.10.2 Local Hydrogeology

Groundwater resources are spatially widespread (17 boreholes points were found in the area).

3.1.10.2.1. Hydrosensus

A hydrocensus was conducted on and around the proposed mining site (to a distance of approximately two kilometres) during July 2012. The position of all the boreholes relative to the proposed mining area can be seen in Figure 7. A total of 14 boreholes and 3 surface water bodies and streams were identified during this hydrocensus study. Although there were no privately owned boreholes identified, the area is utilized for grazing of large livestock. All the boreholes are on the mine property.

Water Levels

Groundwater levels, varying between 4.31 and 88.36 mbgl, were measured in the surrounding area during the survey. The average static water level was measured to be 8.7 mbgl.

Usually a good relationship should hold between topography and static groundwater level. This relationship can be used to distinguish between boreholes with water levels at rest, and boreholes with anomalous groundwater levels due to disturbances such as pumping or local geohydrological heterogeneities. The relationship using the boreholes from the hydrocensus is shown in Figure 8. It is evident that an unrealistic low groundwater level has been measured in UG2, UG3, BH20 and BHX4. Due to the presence of extensive underground mining activities in the area, these boreholes have most probably been drilled into the underground mine and are thus not representative of the general groundwater level in the area. This will most definitely lead to unrealistic water levels, as the water level in the mine is measured in such a case and not the actual groundwater level. A good correlation (98.7%) was found between the static water levels and the topography. This general relationship is useful to make a quick calculation of expected groundwater levels at selected elevations, or to calculate the depth of to the groundwater level (unsaturated zone).

However, due to the heterogeneity of the subsurface, these relationships should not be expected to hold everywhere under all circumstances, and deviations could thus be expected. The calibrated static water levels as modelled have been contoured and are displayed in Figure 9. Groundwater flow direction should be perpendicular to these contours and inversely proportional to the distance between contours. Using this relationship, the inferred groundwater flow directions are depicted as Figure 10. As can be expected, the groundwater flow is mainly from topographical high to low areas, eventually draining to local streams.

These static water levels were also subtracted from the elevations to determine the unsaturated aquifer thicknesses of different points over the study area. These values are intrinsically the same as the depth to the natural groundwater level measured from the surface. The average depth to the groundwater levels in the fractured aquifer in the proposed mining area are 8 meters.

3.1.10.3 Groundwater Quality

Seventeen (17) water samples were collected from hydrocensus boreholes, streams and open pits around the site during the investigation. The samples were submitted for major cation and anion analyses to determine water quality in the area. The groundwater results are compared with the maximum recommended concentrations for domestic use, see Figure 11.

The results from these analyses were plotted as Pie diagrams (circular graphs as in Figure 12), Stiff diagrams (Figure 13) and a piper diagram (Figure 14).

The pie diagrams show both the individual ions present in a water sample and the total ion concentrations in meq/L or mg/L. The scale for the radius of the circle represents the total ion concentrations, while the subdivisions represent the individual ions. It is very useful in making quick comparisons between waters from different sources and presents the data in a convenient manner for visual inspection.

A Stiff pattern is basically a polygon created from four horizontal axes using the equivalent charge concentrations (meq/L) of cations and anions. The cations are plotted on the left of the vertical zero axis and the anions are plotted on the right. Stiff diagrams are very useful in making quick comparisons between waters from different sources.

On the piper diagram the cation and anion compositions of many samples can be represented on a single graph. Certain trends in the data can be discerned more visually, because the nature of a given sample is not only shown graphically, but also show the relationship to other samples. The relative concentrations of the major ions in mg/L are plotted on cation and anion triangles, and then the locations are projected to a point on a quadrilateral representing both cation and anions.

3.1.10.3.1. General Groundwater Description

In general the groundwater is of good quality for most parameters analysed with exceptions of Ca, Mn, Fe F SO4 and TDS in some samples. Sulphates are within the target quality water range for the majority of the samples, although high sulphate values were observed in borehole UG3, where an elevated concentration was observed.

The major anion constituting the groundwater composition can be observed to be bicarbonate. It can also be seen from this figure that a general tendency of higher sulphates exists around the existing mine (Bank Colliery). Most boreholes located down-gradient and around the proposed shaft area show groundwater compositions that are of a good quality, with no signs of impact by ARD. However, the boreholes BH14, BH15, BH16, BH18 and KLIP5 located around the proposed underground mining area are likely to be impacted by ARD, given the neutral pH value of the groundwater and likely insufficient carbonate buffering capacity as illustrated in UG3 where bicarbonate has been depleted by sulphate.

Neutral to slightly acidic pH values can be seen in all boreholes. These pH levels may be attributed to the buffering of acid rock drainage (ARD) by the local carbonate rich geology.

The elevated metal concentrations (Fe and Mn) in numerous boreholes (BH15, BH16, BH18, BH20, KLIP5, UG3, X3 and X5) are at predominantly at Class II level according to the DWAF standards, with UG3 exceeding the maximum allowable limit for Mn. The cause of this exceedance in Mn concentration can be attributed to an initially lowered pH value. At low pH's certain metals become soluble in water and thus can be attributed to the formation of ARD in the vicinity.

From Figure 14 (piper diagram) it can be seen that water in the area has a very similar signature with sulphates causing a single anomaly in the stiff diagram of UG3. The boreholes BH16, BH18, BH20, X3 and X5 have a Ca-HC03 signature, while BH14, BH15 and KLIP5 display a mixed signature between Ca-HCO3 and Na-HCO3 indicating a mixing of younger, fresh groundwater and deep, The groundwater around the proposed mine generally has a low alkalinity and therefore a low buffer capacity.

Table 13: Average values and concentrations for groundwater at Bank Colliery

Sample NR	BH14	BH15	BH16	BH 18	BH20	UG3	KLIP 5	X3	X5
Ca (mg/l)	12.40	5.45	27.50	52.60	39.80	9.61	242.00	9.17	52.40
Mg (mg/l)	3.62	2.70	11.50	24.90	20.70	7.90	61.60	5.92	26.90
Na (mg/l)	21.20	8.67	12.10	38.40	60.60	17.20	41.10	11.10	14.00
K (mg/l)	3.11	2.97	3.79	11.10	5.98	4.44	7.49	2.74	7.79
Mn (mg/l)	0.00	0.00	0.00	0.86	0.38	0.13	3.36	0.22	1.25
Fe (mg/l)	0.00	0.52	0.02	0.90	0.05	0.00	0.12	0.00	0.07
F (mg/l)	0.00	0.00	0.00	0.46	23.60	0.00	1.13	0.00	0.00
NO_3 (mg/l)	14.87	0.00	1.24	0.00	0.49	27.80	0.49	0.00	0.00
Al (mg/l)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HCO_3 (mg/l)	36.59	30.48	141.00	411.66	330.02	40.24	222.78	76.50	360.61

Cl (mg/l)	34.00	6.50	8.60	18.00	11.00	30.00	28.00	7.40	6.50
So_4 (mg/l)	1.30	14.00	13.00	4.95	5.40	6.63	783.00	3.17	2.71
TDS by sum (mg/l)	122.00	60.00	158.00	406.00	348.00	136.0	1268.00	86.00	346.00
M-Alk($CaCO_3$)	30.00	25.00	116.00	338.00	272.00	33.00	183.00	63.00	297.00
pH	6.52	6.73	7.57	7.25	7.76	6.69	7.35	7.66	7.70
EC	16.60	8.61	25.30	64.60	53.40	20.60	150.00	13.80	52.90

3.1.10.3.2. Potential Groundwater pollutants

The potential contaminants associated with the mining activities may emanate from the underground mining area, product stockpile, and pollution control dam (PCD) and R.O.M. area.

Workshops and fuel and oil handling facilities are likely sources of hydrocarbon related contaminants. Oils, grease and other hydrocarbon products (such as petrol and diesel) handled in these areas may contaminate the environment by spillages and leakages. Oils and greases are removed and collected in oil traps. Run-off (contained with hydrocarbons) which is not collected may enter the storm water system from where it may contaminate surface water bodies and groundwater. Septic tanks and sewage treatment plants potentially contaminate groundwater. Contaminants associated with these plants include coliforms (e.g. E.coli), bacteria viruses, ammonia, phosphate, sulphate and nitrate. Effluent from these systems usually contains elevated concentrations of organic matter which may lead to elevated COD and BOD. Waste disposal areas may source a wide range of contaminants, ranging from metals, organic matter, hydrocarbons, phosphates, etc.

Sulphate is probably the most reliable indicator of pollution emanating from coal mining. Sulphate concentrations can however increase due to mobilisation during the mining process.

3.1.10.3.3. Aquifer Sensitivity

A Groundwater Quality Management Index of 4 was estimated for the study area from the ratings for the Aquifer System Management Classification. According to this estimate a **medium level groundwater protection** is required for the fractured aquifer. Reasonable and sound groundwater protection measures are recommended to ensure that no cumulative pollution affects the aquifer, even in the long term.

DWA's water quality management objectives are to protect human health and the environment. Therefore, the significance of this aquifer classification is that if any potential risk exists, measures must be taken to limit the risk to the environment, which in this case is:

- The protection of the underlying aquifer (weathered & fractured)
- The Spookspruit streams/wetlands to the northeast.

3.1.11 Air Quality

Mining and related activities have a potential to impact on the air quality of its surrounding area. Potentially air pollution may arise as a result of particulates entering the atmosphere. These particulates arise as dust from earth movement, material movement on haul roads and other gravel roads and product stockpiles.In view of this, it is crucial that the current status of the air quality is

determined. Environmental and Health Risk Consulting was appointed by Geovicon to perform an ambient air quality impact assessment in support of the proposed Access Brown Shaft II Project. The report, which details the air quality assessment criteria, background information and air quality impacts assessment for the study area is attached as Appendix 6.

Briefly the following were the key findings from the above-mentioned study:

- Suspended particulates account for most emissions from the process with PM10 being the criteria pollutant of consequence.
- Dispersion of particulate emissions from the process was modelled using the ISC-AERMOD View model based on the standard Gaussian solution.
- The results present the spectrum from maximum ground level concentration to maximum impact area, and accounts for daily and annual reference periods.
- Ground level concentrations were predicted for atmospheric conditions based on local meteorological data for the period June 2007 to May 2012.
- Nuisance dust from construction operations will probably exceed the residential action level up to a distance of 400m downwind of operations. The receivers of concern are the commercial/residential dwellings at the R35/Bank Road intersection.
- During normal operations dust deposition rates as high as 1 100mg/m2/day are predicted onsite, during extreme pollution episodes associated with dry and windy spells. Vehicles entering and leaving the mine will always be the most visible sources of pollution.
- It is unlikely that nuisance dust emanating from the project will have negative long term health impacts on people residing in the study area.
- PM10 concentrations are likely to remain below the 24-hour and annual AQA limits during the operational phase of the project.
- Maximum daily concentrations as high as 118µg/m3 could occur within the shaft area boundary.
- Annual PM10 concentrations will remain below the current background levels at the nearest sensitive receivers.
- Air quality management during the operational phase of the mine should focus on all residences within a radius of 1 kilometre from the mining operation.
- The impact assessment considered the cumulative effects on air quality caused by the aggregate of past and present actions in the area.
- Modelling predictions are based on emission reduction factors ranging from 70% to 90% for selected activities. Implementation of a combination of control measures in a focused approach will see a further reduction in the predicted impact area.

- Source monitoring should be used in combination with modelling to assess the effectiveness of control measures at the receiving environment.

- Strict monitoring of ambient air quality will assist effective air quality management and open communication to all stakeholders.

3.1.12 Noise

M2 Environmental Connections was commissioned to undertake a specialist study to determine the potential noise impact on the surrounding sound environment due to the establishment of the Access Brown Shaft II mining project. A copy of the report is attached as Appendix 7 of this report. The report describes the potential noise impact that the mine and its associated infrastructure may have on the surrounding sound environment, highlighting the methods used, potential issues identified, findings and recommendations.

3.1.12.1 The Study area

The development is proposed in a relatively flat topography. There are man-made berms and structures that will serve as noise barriers.

Roads and rail roads

The R35 carries high traffic volumes (relative to sound emissions) and traverses the study site from north to south separating the proposed facility (including the start of the proposed conveyor belt) from the existing facility (end of the proposed conveyor belt). The locality of this road is also along the boundary of a few noise-sensitive developments (also known as NSD or receptor) in the study area.

An unnamed/unidentified paved road with less traffic volumes than the R35 road was viewed to traverse the area from east to west and is one of the main vehicle routes from the R35 road to the existing facility in the study area. Other smaller paved and un-paved roads traverse the area but it carries insignificant traffic. The locality of R35 road is illustrated in Figure 15.

Surrounding Land use

The surrounding land use is mainly mining considering the existing development in the study area. Areas further away from the existing development were seen to be rural in terms of acoustics..

Ground conditions and vegetation

The area is not well covered with vegetation with low growing grass defining the area along with a few scattered areas of trees. Ground conditions were seen to be of hard ground conditions, which would not be very acoustically absorbent in nature.

Existing Background Ambient Sound Levels

The study area has a rural character in terms of the background sound levels. Onsite measurements and the existing soundscape are discussed in more detail in the report attached in Appendix 7.

3.1.12.2 Potential Sensitive Receptors

Potentially sensitive receptors, also known as noise-sensitive developments (NSDs) were initially identified using Google Earth®, supported by a site visit to confirm the status of the identified dwellings.

The reason for the site visit, apart from sampling ambient sound levels, is that there could be a number of derelict or abandoned dwellings that could be seen as a sensitive receptor, or small dwellings that could not be identified on the aerial image, or those that were built after the date of the aerial photograph. The status of the building (commercial, industrial or residential) needs to be indentified as well.

Potential receptors in and around the proposed development were identified and are presented in Figure 16, with their localities defined in Table 14.

Table 14: Locations of the identified noise-sensitive developments (Datum type: WGS84 – Hartbeeshoek)

Noise-sensitive development	Status	Location (Latitude)	Location (Longitude)	Est. distance to development (m)
NSD01	Residential	-26.000516°	29.494486°	1,900
NSD02	Residential/business	-25.989823°	29.481740°	950
NSD03	Religious	-25.982195°	29.479753°	740
NSD04	Residential/commercial	-25.982257°	29.479035°	810
NSD05	Residential	-25.982034°	29.477758°	980
NSD06	Residential	-25.973490°	29.486566°	990

3.1.12.3 Current Environmental Sound character

Measurement Procedure

Ambient (background) noise levels were measured at appropriate times in accordance with the South African National Standard SANS 10103:2008. The equipment defined in Table 15 below was used for gathering data. It should be noted that the microphones used in conjunction with the various sound level meters are regularly laboratory checked between calibration intervals. These would include instances where the diaphragm of the microphone would be cleaned of any minor contaminates.

Table 15: Equipment used to gather data

Equipment	Model	Serial no	Calibration
SLM	Rion NL-32	01182945	23 January 2012
Microphone*	Rion UC-53A	315479	23 January 2012
Preamplifier	Rion NH-21	28879	23 January 2012
Calibrator	Rion NC-74	34494286	24 January 2012
Anemometer	Kestrel 4000	587391	Calibrated[1]
SLM	Svan 955	27324	31 January 2012
Microphone*	ACO 7052E	49596	31 January 2012
Preamplifier	Svantek SV12L	25685	31 January 2012

On Site Measurements

Measurements were taken during the day and night of the 12th and 13th of June 2012. The sound measuring equipment was calibrated directly before, and directly after the measurements was collected. In all cases drift was less than 0.2 dBA. These points are considered sufficient to determine the ambient (background) sound levels in the area. The results of the singular ten minute bin samples are presented in Table 16 with the average of numerous 10 minute bins taken over a 20 hour day/night-time period presented in

Table 17.

Table 16: Results of singular ten minute bin sound level samples (Datum type: WGS84, Decimal Degrees)

Point name	Latitude, Longitude	$L_{Aleq,T}$ (dBA)	L_{A90} (dBA)	$L_{A, max}$ (dBA)	$L_{A, min}$ (dBA)	Ave Wind Speed (m/s)	Comments and sounds during monitoring
GNBS02(R)	-25.979235° 29.480011°	73.0	35.0	89.0	30.3	1.7	Road traffic noise.
GNBS03(A)	-25.981520° 29.479083°	59.2	49.6	69.7	46.3	5	Wind friction, road traffic noise (R35 and access road to NSD03 – NSD05), compressor and light industrial activities at NSD03 – NSD05 and people talking.

Table 17: Results of 20 hour ten minute bin ambient sound level samples (Datum type:WGS84, Decimal Degrees)

Point name	Latitude, Longitude	Ave. $L_{Aleq,T}$ (dBA)	Ave L_{A90} (dBA)	Minimum L_{A90} (dBA)	Maximum L_{A90} (dBA)	Highest wind gust (m/s)	Comments and sounds during monitoring
GNBS01(A)	-25.975345° 29.482577°	53.81	36.54	25.8	54.8	3.1	Ambient day/night-time monitoring point.
GNBS05(Ref)	-25.973657° 29.452435°	58.87	52.28	40.50	59.2	8.2	Existing mine day/night-time monitoring point.

Estimated Minimum Ambient Soundscape

The main anthropogenic noises of significance in the vicinity of the proposed development during the day/night-time hours were the road traffic noise emanating from the R35 road and the existing facility (mining facility).

3.1.12.4 Potential Noise Sources

Potential Noise Sources: Construction Phase

Construction activities include:

- **Establish access roads** – It is expected that access to the proposed development will make use of the existing dirt road on the site (i.e. purple line in Figure 17);

- **Drilling** – It is highly likely that blasting by means of explosives would be used to excavate the mine shaft. As is the practice with blasting, core holes are drilled into rock, blasted, and aggregate removed by means of plant equipment;

- **Site preparation activities** - Includes clearance of vegetation at the footprint of all infrastructures. These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site. Site preparation for the mine shaft is expected to consist of rock rubble removal from blasted rock;

- **Construct foundations** – The volume of concrete for bases/foundations and strip footings is unknown for this report. Due to the small size of the project in terms of construction, it is unlikely that an on-site batching plant would be used to source concrete aggregate;

- **Transport of components & equipment to site** –All components will be brought to site by means of heavy or other vehicles. The typical civil engineering construction equipment will need to be brought to the site for the civil works (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc); and

- **Erect infrastructure** – Various mechanical, electrical and other non concrete related plant equipment would require installation. This would include the conveyor belt and its associated components (conveyor drive train, conveyor gearbox etc).

The equipment likely to be required to complete the above tasks will typically include: excavator/graders, bulldozer(s), dump trucks(s), vibratory roller, bucket loader, rock breaker(s), drill rig, pile drivers, concrete truck(s), , fork lift(s) and various 4WD and service vehicles.

Material Supply: Concrete Batching Plants and use of Borrow pits

There exist three options for the supply of the concrete to the development site. These options are:

1. The transport of "ready-mix" concrete from the closest centre to the development.

2. The transport of aggregate and cement from the closest centre to the development, with the establishment of a small concrete batching plant close to the activities. This would most likely be a movable plant.

3. The establishment of a small quarrying activity, where aggregate will be mined, crushed and screened and used onsite. Cement will still be transported to the site, where there will be a small movable concrete batching plant.

For the purpose of the EIA, Option 2 was assumed as being the preferred option. Aggregate will be sourced from existing commercial borrow pits in the area.

Blasting

Blasting may be required as part of the civil works to clear obstacles or to prepare foundations. However, blasting will not be considered during the EIA phase for the following reasons:

- Blasting is highly regulated, and control of blasting to protect human health, equipment and infrastructure will ensure that any blasts will use the minimum explosives and will occur in a controlled manner. The breaking of obstacles with explosives is also a specialized field and when correct techniques are used, causes significantly less noise than using a rock-breaker.

- People are generally more concerned over ground vibration and air blast levels that might cause building damage than the impact of the noise from the blast. However, these are normally associated with close proximity mining/quarrying.

- Blasts are an infrequent occurrence, with a loud but a relative instantaneous character. Potentially affected parties generally receive sufficient notice (siren) and the knowledge that the duration of the siren noise as well as the blast will be over relative fast results in a higher acceptance of the noise. Note that with the selection of explosives and blasting methods, noise levels from blasting is relatively easy to control.

Traffic

A significant source of noise during the construction phase is additional traffic to and from the site as well as traffic on the site. This will include trucks transporting equipment, aggregate and cement as well as various components used to construct the development.

Construction traffic is expected to be generated throughout the entire construction period, however, the volume and type of traffic generated will be dependent upon the construction activities being conducted, which will vary during the construction period. Noise levels due to additional traffic will be estimated using the methods stipulated in SANS 10210:2004 (Calculating and predicting road traffic noise).

It is expected that an existing dirt road on the site will be used by the construction crew.

Potential Noise Sources: Operational Phase

Noise emitted by proposed development can be associated with various types of noises and noise sources. These include mechanical sources due to operation of plant equipment, material impact noises (such as found at a feeder bin where material is dropped at a height to ground level) and electrical noise (reverse hooters from trucks). These sources generally have different characteristics and can be considered separately.

The following potential noisy infrastructure has been identified for the proposed development:

- **Feeder bin** - (impact, friction noise). At conveyor belt junctions (where conveyors change direction) on route to the existing facility, it is expected that feeder bins would be required to link the previous stretch of the conveyor belt to the following stretch;

- **General work at the workshop area** - (mechanical, impact and friction noises). This would be activities such as equipment maintenance, off-loading and material handling;

- **Front end loader (small – medium size)** - (Mechanical, friction noise). Any stockpiles (small or large) considered on the mine shaft will need to be managed by means of a front end loader (FEL); and

- **Grader (small – medium size)** - (mechanical, friction noise). Management of surface areas may make us of a grader

3.1.13 Sites of Archaeological and Cultural Interest

Archaetnos cc was appointed by Geovicon to conduct a heritage impact assessment for the proposed Access Brown Shaft II Project. A report compiled after the survey of the proposed mining area is attached as Appendix 8 of this report.

Based on the Report, no site of significant archaeological or cultural interest has been identified over the proposed Access Brown Shaft II area..

3.1.14 Visual Aspects

The proposed project area is situated within an approved mining right area, and there is the presence of mining activity within the surrounding areas. The current land use is on the project area is grazing and hence is already disturbed. The implication of this is that the "sense of place" of the study area has been impacted on by these activities. In terms of the proposed Access Brown Shaft II project, infrastructure such as the withdrawal conveyor belt and overland conveyor belt transfer point will be visible from the R35.

3.1.15 Regional Socio-Economic Structure

3.1.15.1 Population Growth and Location

Bank Colliery's Access Brown Shaft II is situated within Steve Tshwete Local Municipality which falls within the Nkangala District Municipality. The estimated population growth figures increased from the period between 1996 and 2001 and 2001 and 2011 from 1.1% to 2.5% growth rate. The population for the Steve Tshwete Local Municipality based on the 2011 Census is 229 831. The population density in the local area where Bank Colliery's Access Brown Shaft II area is located is limited to residents of the mine village, the residents of the informal settlements and the workers of the nearby supermarket. Access Brown Shaft II area is not an area that has been targeted for extensive development; therefore it is unlikely that the current population will expand significantly. It is therefore expected that population changes will only occur as a results of births and deaths in the area.

3.1.15.2 Major Economic Activities and Sources of Employment

The major economic activities in the Witbank/Middelburg area are those associated with coal mining, metallurgical industries, commerce and light engineering, power generation, agriculture and administration. 70% of the Witbank area's economic base is founded in minerals. The area's main export is coal (currently only 24% of the total mined), steel and steel products, thus, making the Witbank and Middelburg economy relatively sensitive to world economic cycles.

3.1.15.3 Unemployment Estimate for the Area

Mining methods are changing from the traditional labour intensive underground mining to capital intensive, low-labour opencast mining, which is leading to increased unemployment amongst the semi- and unskilled workers.

Based on the 2011 Census, the unemployment rate for the Steve Tshwete Local Municipality from year 1996 to 2001 almost doubled, from 11 311 in 1996 to 22 785 in 2001. From 2001 to 2011 there was a decrease in the unemployment rate from 22 785 in 2001 to 20 325 in 2011 which results in a 19.9 % unemployment rate in 2011.

3.1.15.4 Water Supply

There are two abstraction points for raw water supply to Bank Colliery. All of these abstraction points originate from the Komati Water Scheme pipeline. This scheme was started as a result of an agreement between the existing collieries in the local region (including Bank Colliery, which is now a part of Bank Colliery, Springbok Colliery, Koornfontein mine, Eskom, etc.). The source of water for the Komati Water Scheme is the Nooitgedacht Dam. Permits for the limited abstraction of water from the scheme have been issued by DWAF.

Farm owners and nearby informal settlements obtain water from Bank Colliery.

3.1.15.5 Power Supply

Power supply will be obtained from Eskom.

3.1.16 Registered Interested and Affected Parties

The interested and affected parties identified are as follows:

Department of Water Affairs (Mpumalanga Regional Office)

Department of Mineral Resources (Mpumalanga Regional Office)

Department of Economic Development, Environment and Tourism (Mpumalanga Provincial Office)

Department of Agriculture, Forestry and Fisheries

Department of Land Affairs

Mpumalanga Parks and Tourism Agency

South African Heritage and Resources Agency (SAHRA)

Eskom

Immediate/adjacent landowners and legal occupiers

Steve Tshwete Local Municipality

No comments were received from any Interested and Affected parties during the Scoping phase. See Appendix 9 for proof of consultation. Comments received based on the Draft EIA/EMP Report (this report) will be incorporated into the final EIA/EMP Report.

SECTION FOUR

Detailed Description of the Project

4. DETAILED DESCRIPTION OF THE PROJECT

4.1 NEED AND DESIRABILITY FOR THE PROJECT

Anglo Operations Limited's Bank Colliery underground coal reserves are reaching depletion. A mining right has been granted to Anglo Operations Limited's Bank Colliery, to mine coal at the proposed Access Brown Shaft II area via underground mining methods. In order to maintain job employment (approximately 100 people) and coal production rates at Bank Colliery to supply Eskom and the Export market more coal reserves need to be mined. The underground workings at Bank Colliery is flooded closer to the proposed Access Brown Shaft II area and therefore the existing underground workings cannot be used to access the coal reserves at the Access Brown Shaft II area, hence the construction of the Access Brown shaft II and its associated infrastructure.

4.2 DETAIL DESCRIPTION OF THE PROJECT

4.2.1 Surface Infrastructure

All proposed surface infrastructure in relation to the proposed Access Brown Shaft II Project area is shown in the Surface Infrastructure Layout Plans. See Appendix 10.

4.2.1.1 Roads, railways and power lines

With regard to the proposed project, the existing private access road will be used for access to the Brown Shaft II Shaft Complex. This road is relatively narrow for the purpose it should serve and hence it will need to be upgraded.

No railway line exists and none will be used for the Access Brown Shaft II Underground Mining Project area. Raw coal from the underground workings will be transported by an overland conveyor from the workings to the existing washing plant. Note that the new overland conveyor belt will connect to an existing conveyor belt infrastructure. No R.O.M coal stockpile will be necessary at the Access Brown Shaft II shaft complex.

The Eskom power grid used by another shaft i.e. South Shaft will be used for the supply of electricity to the new mining area. This will however require that a new 22KVA power line be installed from the existing substation to the new substation to be constructed at the proposed Access Brown Shaft II mining area.

4.2.1.2 Solid Waste Management

Industrial (non-mineral) and domestic waste, with no value, will be collected by a contractor and disposed off at the registered Middelburg waste disposal site.

Industrial waste arising from the shaft (classified as "hazardous waste" – old paint tins, degreaser

containers, oily rags, etc.) will be collected in a different waste collection system and disposed of by a contractor at a registered hazardous waste site.

Waste with value (scrap), will be stored sorted in a scrap yard adjacent to the mine stores prior to it being sold to and removed by a local scrap metal dealer.

All waste generated from the proposed mining area will be transported to the already existing Bank Colliery waste collection system and disposed at registered waste disposal sites. Note that Bank Colliery has an existing contract with a waste collection company for the collection and disposal of the generated waste. The same company will be used for the collection and disposal of waste generated at the shaft complex. If necessary, all necessary space and infrastructure will be made available for the temporary storage of the waste at the shaft complex.

4.2.1.3 Water Pollution Management Facilities

Polluted water in the form of sewage effluent, water from the proposed underground workings and dirty storm water runoff from the shaft complex will be generated at the proposed project area. This section of the report will describe the facilities to be used for the management of polluted water to be generated from the site.

Sewage Treatment Plant

All sewage emanating from the Access Brown Shaft II ablution facilities will be collected into a conservancy tank that will be constructed at the Bank Colliery's Access Brown Shaft II area. The conservancy tank has been designed to cater for the approximately 100 employees at the Access Brown Shaft II mining area. The septic tank will be designed and constructed to drain supernatant water (effluent) into a conservancy tank, which together with the septic will be emptied by contractor on a regular basis. In view of the above, no effluent from the sewage package plant will be released into the environment.

Dirty Storm Water

All dirty storm water emanating from the Access Brown Shaft II surface infrastructure area will be drained and captured into a new pollution control dam and re-used for dust suppression underground and the rest will be evaporated.

4.2.1.4 Transport

Mine officials and senior skilled employees will use their own vehicles for all transport requirements to and from the shaft. Where necessary a bus service will be made available to transport other employees from their residence, within the mine property, to their working place.

Three conveyor systems will be used i.e. one from underground workings to the feed bin situated at the shaft floor, the second conveyor belt will convey coal from the shaft feed bin to the existing overland conveyor belt and the third will be the existing belt that will convey coal to the Bank Colliery Coal Washing plant.

The existing overland conveyor belt will require some refurbishment and at areas reconstruction since the belt has not been used for a long period.

4.2.1.5 Disturbance of Water Courses

Part of the Access Brown Shaft II infrastructure, namely the ventilation shaft will be constructed within 32 metres of the water course. It should be noted that although the soil types indicate that of a wetland area, the vegetation has been disturbed by agricultural activity and is now transformed to grazing land.

4.2.1.6 Storm Water

Storm water drainage facilities will be constructed at the Access Brown Shaft II area.

4.3 CONSIDERATION OF ALTERNATIVES

4.3.1 Land Use Alternatives

In terms of the Brown Shaft II complex area there were no location alternatives that could be considered. The following are the reasons as to why the location was chosen:

The location of the proposed Brown Shaft II area is the shallowest area of the reserve. The depth from the surface is proportional to cost, therefore it is cheaper to locate the shaft within the shallowest area of the reserve. The reserve depth increases from north to south.

The proposed Brown Shaft II area is in the nearest position away from previously undermined areas. It's not a good idea to construct decline shafts over existing mined out areas due to the risk of subsidence. The area ties in closely to the existing infrastructure of Brown Shaft No.1.The shaft area is away from the temporary wetland areas of the tributary of the Spookspruit. The shaft area could not be constructed under the adjacent Eskom 400kV overhead powerline. The alignment/direction of the decline shaft minimises, streamlines and optimises the infrastructure requirements for the future mining layout of the reserve.

SECTION SIX

Impact Assessment

5. IMPACT ASSESSMENT

5.1 ASSESSMENT METHODOLOGY

The following prediction and evaluation of impacts is based on the proposed Access Brown Shaft II activities to be conducted at the proposed area.

The evaluation distinguishes between significantly adverse and beneficial impacts and allocates significance against national regulations, standards and quality objectives governing:

Health & Safety

Protection of Environmentally Sensitive Areas

Land use

Pollution levels

Irreversible impacts are also identified.

The significance of the impacts is determined through the consideration of the following criteria:

Probability : likelihood of the impact occurring

Area (Extent) : the extent over which the impact will be experienced.

Duration : the period over which the impact will be experienced.

Intensity : the degree to which the impact affects the health and welfare of humans and the environment (includes the consideration of unknown risks, reversibility of the impact, violation of laws, precedents for future actions and cumulative effects).

The above criteria are expressed for each impact in tabular form according to the following definitions:

Probability	Definition
Low	There is a slight possibility (0 – 30%) that the impact will occur.
Medium	There is a 30 –70% possibility that the impact will occur.
High	The impact is definitely expected to occur (70% +) or is already occurring.
Area (Extent)	**Definition**
Small	0 – 40 ha
Medium	40 – 200 ha
Large	200 + ha
Duration	**Definition**
Short	0 – 5 years
Medium	5 – 50 years
Long	51 – 200 years

Permanent	200 + years

Intensity	Definition
Low	Does not contravene any laws, Is within environmental standards or objectives, Will not constitute a precedent for future actions, Is reversible Will have a slight impact on the health and welfare of humans or the environment.
Medium	Does not contravene any laws, Will not constitute a precedent for future actions, Is not within environmental standards or objectives, Is not irreversible Will have a moderate impact on the health and welfare of humans or the environment.
High	Contravene laws, May constitute a precedent for future actions, Is not within environmental standards or objectives, Is irreversible Will have a significant impact on the health and welfare of humans or the environment.

Significance	Definition
Negligible	The impact is insubstantial and does not require management
Low	The impact is of little importance, but requires management
Medium	The impact is important; management is required to reduce negative impacts to acceptable levels
High	The impact is of great importance, negative impacts could render options or the entire project unacceptable if they cannot be reduced or counteracted by significantly positive impacts, and management of these impacts is essential
Positive	The impact, although having no significant negative impacts, may in fact contribute to environmental or economical health

5.2 Assessment of the Environmental Impacts

The tables below describe the assessment of impacts from the proposed activities applied for, for the Access Brown Shaft II mining operation. Note that under the assessment the following abbreviations i.e. E, P and S were used, which stands for Extent, Probability and Significance respectively.

5.2.1 CONSTRUCTION PHASE

ACTIVITY	NATURE OF IMPACT	ASSESSMENT			MITIGATION MEASURES
		E	P	S	
The construction of a dirty water pipeline exceeding 1000 metres in length for the bulk transportation of water, with a peak throughput of 120 litres per second or more.	The route of the pipeline will be marked, which will result in vegetation being cleared along the route of the pipeline.	S	H	L	Ensure that in all areas where vegetation will be cleared, a layer of at least 300mm of topsoil must be removed and stockpiled separately. The area of land to be disturbed and isolated for the purpose of construction will be limited, as far as practical, to the minimum required for safe and efficient operation. No unnecessary destruction of vegetation will be allowed.
	A pipeline trench will be constructed using an excavator with a depth of approximately 1.5metres below natural ground level.	S	H	M	Avoid loss of topsoil, soil erosion, soil compaction, soil contamination and use topsoil removed during the construction phase for the rehabilitation of the disturbed areas. If ground water is encountered, the trench invert level should be sloped to a low point to facilitate drainage.
	The clearing of the site will lead to a loss of land of arable and grazing potential and associated general loss of agricultural production potential.	S	H	M	The area of land to be disturbed and isolated for the purpose of construction and mining activities will be limited, as far as practical, to the minimum required for safe and efficient operation.
	All activities will result in the potential degradation of soils due to the removal of the topsoil layer over the areas to be disturbed during the construction of the infrastructure.	S	M	M	Avoid loss of topsoil, soil erosion, soil compaction, soil contamination and use topsoil removed during the construction phase for the rehabilitation of the disturbed areas.
	The activities will generate dust that will impact the immediate air quality. Machinery used will generate fumes and noise that may have detrimental effects on the surrounding air quality and health of the employees.	S	H	M	Conduct dust suppression over the roads. Ensure that the vehicles' exhaust systems are in good repair order. Ensure that employees are issued with protective equipment. All complaints must be addressed.

	Further impact on surface water during the construction phase relates to potential spillages from construction vehicles. Increased fuels, oils, cement, dust and other waste from construction activities and vehicles may cause contamination of surface water bodies.	S	M	M	All vehicles should be well maintained and in good working order in order to minimise any impact on watercourse and wetland areas.
	Construction and Use of maintenance road will result in the generation of dust, which may impact negatively on neighbouring landowners, and employees.	M	H	M	Conduct dust suppression on the roads. Maintain the roads on a regular basis
	The potential impact of degradation of the tributaries of the Bankspruit during the construction of the pipeline over the water courses.	S	M	M	Design and construct the pipeline infrastructure in accordance with the design specifications recommended by a suitably qualified person in order to avoid any impact on the water course. See Appendix 11 for the construction methodology of the pipelines. Construction of pipeline crossing the tributaries of the Bankspruit should be conducted during periods where no rainfall is anticipated. Gabion mattresses should be used to reduce erosion

The construction of a pollution control dam for the storage of effluent and the discharge of water into a water resource in terms of the National Water Act 36 of 1998.	The construction of the pollution control dam will result in the formation of a topographical void. The dam void will cover an area of approximately 30m x 50m and will be 3m deep. The dam was designed by a suitably qualified person (qualified Civil Engineer).	S	L	L	Design and construct the pollution control dam and mine infrastructure in accordance with the design specifications recommended by a suitably qualified person. See Appendix 11.
	The construction of the pollution control dam will result in the disruption of soil profile as a result of movement of top layer. An area of approximately 0.25 ha will be disturbed during the construction of the pollution control dam, hence approximately 1000m3 of topsoil and 3200 m^3 of subsoil will be stripped.	S	H	L	Removed topsoil will be placed on the topsoil berms around the constructed areas; Removed topsoil will be stockpiled separately from sub soils; The mine will ensure that the topsoil berms/stockpiles does not exceed the height of 4 m; The soil from the topsoil berms will be tested for its fertility and if reduced, fertilizers must be used to increase the fertility of the soil prior to re-use; and the topsoil berms/stockpiles will be seeded.
	The stripping and stockpiling of the soil (Lichtenburg sandy Loam soil form) from the Pollution control dam may result in loss of soil fertility. Approximately 6000m^3 of topsoil and 3200m3 of subsoil will be stockpiled separately in the form of berms around pollution control dam areas.	S	H	L	The mine will ensure that the topsoil berms/stockpiles does not exceed the height of 4 m; The soil from the topsoil berms will be tested for its fertility and if reduced, fertilizers must be used to increase the fertility of the soil prior to re-use; and The topsoil berms/stockpiles will be seeded.
	Construction of the pollution control dam will result in the disruption of the soil profile and clearance of vegetation, which will reduce the land capability of the area. The small extent of the area to be disturbed will lessen the significance of the impact. Note that land capability is determined as a function of soil physical and chemical properties, thus disruption of the soil profile will reduce land capability. This impact will continue through the operational phase.	S	H	L	Topsoil to be removed and stockpiled separately for the purpose of rehabilitation; and Analyse and replenish fertility by use of fertilizers prior to re-use. The area of land to be disturbed and isolated for the purpose of construction will be limited, as far as practical, to the minimum required for safe and efficient operation. No unnecessary destruction of vegetation will be allowed
	The construction of the pollution control dam will result in the formation of voids, which will decrease surface water runoff within the Spook Spruit subcatchment. The voids will cover an area of approximately 1.75ha, which will capture approximately 3000m^3 of rainfall run-off per annum (this constitutes a very little percentage, less than one percent, of the mean annual run-off within the Spookspruit catchment). Loss of MAR within the catchment is therefore considered negligible.	S	H	L	Minimise the area to be covered by the dirty water areas;

The transportation of coal, outside an industrial complex, using a conveyor with a throughput capacity of more than 50 tons per day	The construction of a conveyor belt along servitude, approximately 3.3km long with a throughput capacity of more than 50 tons per day, will result in vegetation clearance.	S	M	L	The area of land to be disturbed and isolated for the purpose of construction will be limited, as far as practical, to the minimum required for safe and efficient operation. No unnecessary destruction of vegetation will be allowed
	Stripping of topsoil along the route of the conveyor belt in order to construct the foundation of the conveyor belt.	S	H	L	Ensure that in all areas where vegetation will be cleared, a layer of at least 300mm of topsoil must be removed and stockpiled separately
	Further impact on surface water during the construction phase relates to potential spillages from construction vehicles. Increased fuels, oils, cement, dust and other waste from construction activities and vehicles may cause contamination of surface water bodies.	S	M	M	All vehicles should be well maintained and in good working order in order to minimise any impact on watercourse and wetland areas.
	The potential impact of water course and wetland degradation during the construction of the pipeline over the water course.	S	M	M	Design and construct the conveyor belt infrastructure in accordance with the design specifications recommended by a suitably qualified person in order to avoid any impact on the water course. Construction of the conveyor belt crossing the watercourse should be conducted during periods where no rainfall is anticipated. Gabion mattresses should be used to reduce erosion
The physical alteration of undeveloped land to commercial (mining) and industrial (mining) use, where the total area to be transformed is more than 20 hectares.	There will be an impact on the topography due to the construction of the infrastructure associated with the shaft area. The infrastructure will however have minimal impact since no structure above 10 meters will be constructed.	S	L	L	Ensure that the infrastructure is removed during the decommissioning phase, which must be conducted such that the area approximates its pre-mining topography.
	The clearing of the site will lead to a loss of land of arable and grazing potential and associated general loss of agricultural production potential	S	H	L	The area of land to be disturbed and isolated for the purpose of construction and mining activities will be limited, as far as practical, to the minimum required for safe and efficient operation.
	The construction and operation of the mine will affect the current land use, as mining will replace agricultural activities	S	H	M	Appropriate compensation must be agreed to between the mine and the land owner. The area of land to be disturbed and isolated for the purpose of construction and mining activities will be limited, as far as practical, to the minimum required for safe and efficient operation. Random movement across the field will be prohibited. Vehicles will keep to demarcated and approved access routes at all times. Following closure the site will be rehabilitated.

	There will be a loss of vegetation during the construction of the shaft box cut	S	H	M	The area of land to be disturbed and isolated for the purpose of construction and mining activities will be limited, as far as practical, to the minimum required for safe and efficient operation. No unnecessary destruction of vegetation will be allowed
	Site clearance, blasting of the shaft areas and construction activities could lead to a disturbance of fauna on site. The herpetofauna, birds, small mammals and insects might be displayed locally but not regionally due to the increase in dust, noise and illumination. However, as the area is already significantly disturbed by both mining and agricultural activities, any wildlife currently occurring on the site is expected to be adapted to such conditions.	S	L	L	The area of land to be disturbed and isolated for the purpose of construction and mining activities will be limited, as far as practical, to the minimum required for safe and efficient operation. Staff will be instructed that no hunting or unnecessary disturbance of wildlife will be allowed on the mine property. Hunting or poaching by mine personnel on adjoining properties will also be prohibited.
	During the construction phase, the clearing of vegetation on site will take place. Earthworks will leave soils bare and exposed to erosion agents. Clearing of vegetation will potentially result in an increase in the volume and flow of rate of surface water runoff entering the surface water bodies on and off the site. This will in turn result in an increase in sediment loads in these water bodies. Should no settlement facilities or storm water diversion works be established prior to the major construction activities commencing, it can be expected that surface water bodies in the area will receive increased silt load.	S	M	M	Storm water drains will be constructed to divert runoff from adjacent areas away from the shaft area. All storm water runoff originating from any potentially contaminated area in the vicinity of the shaft will flow via dirty water drains to retention ponds. These retention ponds will be designed to contain the 1:50 year return period flood event. Water collected in the retention ponds will be pumped to the mine's industrial water circuit for use. Therefore, although this water will be removed from the catchment, it will not be wasted.
	Further impact on surface water during the construction phase relates to potential spillages from construction vehicles. Increased fuels, oils, cement, dust and other waste from construction activities and vehicles may cause contamination of surface water bodies.	S	M	M	Areas such as workshops, diesel storage bays and wash down areas are regarded as dirty. These will be placed on concrete slabs and will have a network of concrete lined "v" drains and pipe culverts that will gravitate to an oil trap. Further to this, storage and handling areas of hydrocarbon substances will be paved and bunded with concrete to prevent accidental contamination of the soil. Alternatively, an impermeable liner will be placed beneath above-ground storage tanks. The integrity of the liner is to remain sound for the duration of the contract, until removal. Areas containing chemicals and hazardous material will be fenced and security controlled. Any significant spillage will be contained and cleaned up.

	Once the vegetation has been cleared, construction equipment will generate dust from the exposed surfaces. Excessive dust will impact on the surrounding vegetation. Under adverse wind conditions there is potential for minor impacts on the shops and the provincial road to the west of the main road. However as the shops are upslope and some distance away from, the potential impact would be small	M	M	L	Dust along the gravel access roads and construction areas will be controlled to acceptable levels, by means of spraying with water. In this case, acceptable levels are defined, in terms of the guideline on dust fallout published by the Department of Water and Environmental Affairs, to be between 'slight' (<250-500 mg/m2/day of dust fallout) and 'moderate' (250-500 mg/m2/day of dust fallout). The mine will undertake monthly dust monitoring at various locations where it may impact on the interested and affected parties. The setting up such dust monitoring stations by means of bucket method will be undertaken by the mine in collaboration with an air quality specialist.
	The construction activities will cause an increase in ambient noise levels. These activities include movement of trucks and vehicles and movement of earthmoving machinery.	M	L	L	Machinery and vehicles silencer units will be maintained in good working order. Non-compliant machinery and/or vehicles will be removed from service until repaired. Should complaints be received from the community regarding the noise generation, the mine management and contractors will, at the discretion of the ECO, commission an independent and registered noise monitor to undertake a survey of noise output levels from the site, and implement measures to reduce noise to legislated levels.
	Wind blowing and movement of mine machinery over exposed areas will result in the generation of dust and diesel fumes. Any dust clouds generated from the mining area may migrate towards the predominant wind direction. The dust generated may increase the dust concentration within and around the mining area, which will settle on the surrounding vegetation cover. This may have an impact on the neighbouring residents.	S	H	M	Conduct dust suppression on a daily basis; Use of dusticides to prevent the generation of dust on access roads; and Ensure that all machinery used on site is maintained in good working order.

	Dust generated will have an impact on the identified wetlands within the mining area.	S	H	M	Conduct dust suppression on a daily basis; Use of dusticides to prevent the generation of dust on access roads; Contain dirty water within dirty water areas; Divert all clean water into the Spookspruit; and Initiate surface water monitoring upstream of the wetlands areas.
	Machine operators in close proximity to machinery will be exposed to noise levels in excess of 85dB. These noise levels will attenuate to acceptable levels within a short distance (500m). Note that no significant noise increases are expected within a 500m radius of the activities.	S	H	M	Vehicles and mine machinery will not be allowed to generate noise exceeding 85 dB; and Blasting areas will be monitored for levels of vibration, which will be limited to legal limits.
	The construction phase activities will be visible from R35 provincial road and other farm roads; hence the nearby residents and users of the R35 provincial road may be visually impacted on by the proposed mining operation. The area has already been extensively disturbed by mining and agricultural activities. This will lessen the significance of the visual impact.	S	M	L	Use topsoil to construct a berm that will act as visual screen around the visible parts of the mine; and Vegetate the topsoil/subsoil berms
	Upgrading of the private access and its intersection to the provincial road will create a nuisance and a safety hazard to the provincial road users.	S	M	M	Contractors used to upgrade the private access road will be required to follow relevant transport laws during the upgrading of private access road and construction of the intersection to the provincial road, which will included dust suppression, traffic control and erection of road signs signalling the road works.
	Adjacent landowners may be impacted on by dust and noise generated during the construction phase. Note, however, that due to the short duration of the construction phase and the fact that no houses exist within the proposed mining area, the significance of this is deemed low. These impacts will however continue during the operational phase of the mine. Influx of labourers seeking employment may lead to theft or illegal squattering on surrounding farms.	S	M	L	Conduct dust suppression on a daily basis; Use of dusticides to prevent the generation of dust on access roads; and Development of means to discourage squattering and job seeking at the mine property

The construction of infrastructure (Ventilation Shaft) covering 10 square metres or more where such construction occurs within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	The potential impact of water course degradation during the construction of the vent shaft.	S	M	L	Design and construct the Vent shaft infrastructure in accordance with the design specifications recommended by a suitably qualified person in order to avoid any impact on the water course. The area of land to be disturbed and isolated for the purpose of construction will be limited, as far as practical, to the minimum required for safe and efficient operation. No unnecessary destruction of vegetation will be allowed. It should be noted that this area has already been disturbed by agricultural activities, and is currently grazing land.

5.2.2 OPERATIONAL PHASE

ACTIIVITY	IMPACT	IMPACT ASSESSMENT			MITIGATION MEASURES
		E	P	S	
The operation of a dirty water pipeline exceeding 1000 metres in length for the bulk transportation of water, with a peak throughput of 120 litres per second or more.	There is a potential for the pipeline to burst and affect the system of the tributaries of the Bankspruit in terms of surface water quantity	S	L	L	Regular maintenance checks should be conducted along the pipeline to avoid any pipe bursts. A pipe leak detection system will be installed along the pipeline.
	Use of the maintenance road will result in the generation of dust, which may impact negatively on neighbouring landowners, and employees.	M	H	M	Conduct dust suppression on the roads. Maintain the roads on a regular basis
	During the use of the pipeline stream crossing, blockages and bad housekeeping can result in the crossing having an impact on the river systems. If the crossing is not properly designed and constructed spillages can enter the stream. This will result in negative impacts on the river system which include the wetland, fauna and aquatic ecosystems.	S	H	M	Regular maintenance checks should be conducted along the pipeline to avoid any pipe bursts. A pipe leak detection system will be installed along the pipeline.

The operation of a pollution control dam for the storage of effluent and the discharge of water into a water resource in terms of the National Water Act 36 of 1998.	Increased rainwater will be captured in the pollution control dam during flood events. If the pollution control dam does not have sufficient capacity, water containing elevated salt concentrations from the dirty water areas of the mine may enter the natural environment.	S	L	L	Design and construct the pollution control dam and mine infrastructure in accordance with the design specifications recommended by a suitably qualified person. A minimum freeboard of 0.8metres should be maintained at all times. This ensures that during high storm events the facilities have enough capacity to handle the extra water captured.
	Silt collected during high rainfall events may reduce the capacity of the pollution control dam resulting in the release of polluted water into the clean water environment.	S	L	L	Silt trap should be installed to avoid siltation of the dam.
The transportation of coal, outside an industrial complex, using a conveyor with a throughput capacity of more than 50 tons per day	Coal spillages on the conveyor system especially at facilities like the silos and the transfer points can have detrimental impacts if allowed to enter the environment.	S	H	H	The conveyor systems where possible are included into the dirty water containment systems of the mine and runoff arising from these facilities is directed into the dirty water drains. Silt traps are situated at the silos and the water captured pumped to the dirty water dams for use in the plant. Where the conveyor systems water runoff is not included into a dirty water system the potential for coal spillage is considered low and any spillage that does occur under the belt is cleaned up on a regular basis.
	During the use of the conveyor belt stream crossing, blockages and bad housekeeping can result in the crossing having an impact on the river systems. If the crossing is not properly designed and constructed, coal spillages can enter the stream. This will result in negative impacts on the river system which include the wetland, fauna and aquatic ecosystems.	S	L	L	The conveyor belt should be covered when crossing any watercourse and wetland to avoid any spillages into sensitive areas.

The physical alteration of undeveloped land to commercial (mining) and industrial (mining) use, where the total area to be transformed is more than 20 hectares.	The removal of the No. 2 coal seam by underground mining methods will ensure that underground pillars are left intact. The use of safety factors during the determination of the pillar sizing will ensure that no surface subsidence occurs. This will ensure that the overlying strata have a long-term stability thus minimising the possibility of subsidence. The use of mechanical continuous miners during the removal of the coal seam ensures that blasting is kept to a minimum, and only utilised in areas where dolerite dykes or sills are encountered. This again reduces the possibility of fracturing of the overlying strata during mining, hence lessening the significance of the impact.	L	M	L	Use of the Solomon's safety factor of 1,6 for the underground pillars
	Leaking oils and fluids from trucks will result in the contamination of soils along the haul and access roads.	S	M	M	Constructed spillage control measures such as berms along the roads. All roads to be inspected regularly for any spillages. Any spillages will be removed as soon as is practically possible. Maintain vehicles in good repair order. Maintenance of vehicles to be conducted at the workshops. Emergency repairs to be conducted on protected ground e.g., areas covered with tarpaulins.
	During mining, the development of the incline shafts will have impacts on the geological structure over the shaft area. During this activity the overburden is removed to allow access to the coal seams. These excavations will be open for life of mine but will be sealed at closure. However, the stratigraphy will never be replaced	S	L	N	Blasting are kept to a minimum and undertaken under controlled conditions. This limits the development of cracks.
	Surface water runoff from the working area around the shaft areas could contaminate surface water, as a result of chemical contamination or, suspended solids.	S	H	M	All dirty surface water runoff are diverted to pollution control facilities and clean water to the clean water environment
	Overburden stockpiles will create localised high points	S	H	M	Overburden stockpiles will be constructed to an acceptable height so as not to pose any risk to human life.
	Spillage of coal during transportation via the conveyor belt.	S	L	L	Regular maintenance and inspection during transportation of coal should be conducted. the conveyor belt should be covered at wetland and stream crossing s to avoid any potential pollution in the watercourse and wetland

The operation of the Ventilation Shaft covering 10 square metres or more where such operation occurs within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	During maintenance, Leaking oils and fluids from trucks will result in the contamination of soils along the maintenance roads.	S	M	M	Constructed spillage control measures such as berms along the roads. All roads to be inspected regularly for any spillages. Any spillages will be removed as soon as is practically possible. Maintain vehicles in good repair order. Maintenance of vehicles to be conducted at the workshops. Emergency repairs to be conducted on protected ground e.g., areas covered with tarpaulins.
	During maintenance, use of maintenance roads will result in the generation of dust, which may impact negatively on neighbouring landowners, and employees.	M	H	M	Conduct dust suppression on the roads. Maintain the roads on a regular basis

5.2.3 DECOMMISSIONING/CLOSURE PHASE

ACTIVITY	IMPACT	IMPACT ASSESSMENT			MITIGATION MEASURES
		E	P	S	
Filling of final voids Sealing of underground workings Dismantling/demolishing and removal of the conveyors, pipeline, vent shaft, workshop and administration buildings Rehabilitation of roads and overland conveyor belt areas Rehabilitation of overburden stockpile areas Rehabilitation of the pollution control dams and the diversion trenches/berms Seeding of rehabilitated areas Maintenance and monitoring of rehabilitated and surrounding environments	As the disused infrastructure will be demolished and large excavations backfilled, there is a potential for the creation of dangerous excavations and steep embankments which will need to be backfilled and landscaped.	S	H	M	All backfilled areas must be levelled and levelled areas monitored for any settlement depressions, which must be rectified as soon as possible.

5.3 CUMULATIVE IMPACTS

This section of the environmental impact assessment will attempt to determine if the proposed Access Brown Shaft II area Project will contribute towards any cumulative impacts. For the purpose of this document cumulative impacts will be described as the impacts (including those that has been assessed as being insignificant) that would be significant when combined with the same impact arising from another activity within and around the area of the proposed mining project.

It must however be mentioned that the assessment of the cumulative impacts is a difficult exercise that requires a combined effort from the different role stakeholders (farmers, mines, industries, individuals etc.,) that would contribute to the cumulative impacts identified. Accurate data from the contributing parties will be a key for a thorough and accurate impact assessment.

5.3.1 Topography

Several mining operations are being undertaken in the vicinity of the proposed project. The presence of these mining operations will have an added impact on the regional topography of the area such that the sense of place will be affected. Drainage of the area might also be affected by the presence of other mining operations within and around the proposed project area.

Cumulative impacts on topography over the proposed area are reduced by the undulating nature of the regional topography.

5.3.2 Soil, Land Use and Capability

Due to the area being an decline shaft and its on the mining right area, it will be rehabilitated once the mine operation seizes, this therefore reduces the significance of the cumulative impacts.

5.3.3 Natural Vegetation

Due to the area being disturbed already, Rehabilitation of the area would in a sense mitigate against these impacts. The land may be reverted back to agriculture (grazing or crop production) provided good rehabilitation is undertaken.

5.3.4 Surface water

Mining and its associated activities has over the past decades had detrimental effects on the surface water environment. This could be attributed to previous environmentally unfriendly mining practices. The presence of several mining activities within one catchment may have severe effects on the surface water environment. However, due to new technologies and environmental awareness that has been promoted over the last decade, mining and its associated activities can be undertaken such that the impacts on the surface water environment are significantly minimised and controlled.

Agriculture, which currently dominates the area, has also been detrimental to the surface water environment. Several wetlands have been lost due to overgrazing and attempted cultivation. Exposure of ground has also resulted in increased silt entering the water environment resulting in

serious consequences to the livelihood of the surface water environment. Based on the above, cumulative impacts on surface water could be serious if no mitigation measures are undertaken.

Anglo Operations Limited will, in view of the seriousness of the potential impacts, continue to undertake the necessary measures to ensure that the proposed mining operation does not contribute to the identified impacts on surface water environment.

5.3.5 Air Quality

The proposed Access Brown Shaft II area falls within the Highveld Priority Area (HPA).The Highveld area in South Africa is associated with poor air quality and elevated concentrations of criteria pollutants occur due to the concentration of industrial and non-industrial sources. The Minister of Environmental Affairs therefore declared the Highveld Priority Area (HPA) on 23 November 2007.

During the impact assessment it was identified that air quality will be impacted on by the dust and fumes from the proposed Access Brown Shaft II project.

Several activities that may have impacts on the air quality within and around the proposed mining area are currently being conducted i.e. agriculture and mining.

Agricultural related activities require soil to be prepared especially during the planting season. During the preparation of the soils, a substantial amount of dust is produced.

With the above in mind and the fact that the above-mentioned parties will require services e.g. transporting of products to sites and haulage of material in and out of sites, which will result in secondary air pollution, the impacts on air quality might be significant. It must however be mentioned that the magnitude of the impact on air quality from the different parties will not be the same. Some activities will have more significant impact on the air quality than others. It is however not expected that the cumulative impact on air quality would be significant if all parties take reasonable measures to minimise the generation of dust within their operations.

SECTION SIX

Environmental Management Programme