

**Anglo Operations (Pty) Ltd: Khwezela Bokgoni  
Colliery**

**Draft            Environmental            Impact  
Assessment Report for the Post 2A  
Dam Water Management Strategy**

Report date: 6/18/2019

DMR Reference: MP30/5/1/2/3/2/1(307)EM

**SHANGONI**  
*Management Services (Pty) Ltd*



## mineral resources

Department:  
Mineral Resources  
**REPUBLIC OF SOUTH AFRICA**

# Environmental Impact Assessment Report and Environmental Management Programme Report

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

**Name of Applicant** Anglo Operations (Pty) Ltd – Khwezela Bokgoni Colliery  
**Project** Post 2A Dam Water Management Strategy Project  
**Document** Draft Scoping Report  
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**DMR Reference No** **MP30/5/1/2/3/2/1(307)EM**

## IMPORTANT NOTICE

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

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

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



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

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

## **OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS**

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

- (a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
- (b) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
- (c) identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
- (d) determine the—
  - i. nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
  - ii. degree to which these impacts—
    - (aa) can be reversed;
    - (bb) may cause irreplaceable loss of resources, and
    - (cc) can be avoided, managed or mitigated;
- (e) identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
- (f) identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;
- (g) identify suitable measures to manage, avoid or mitigate identified impacts; and
- (h) identify residual risks that need to be managed and monitored.



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## References

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- Shangoni Management Services. 2018. *Anglo American Coal South Africa Khwezela Colliery Review and Update of the Unscheduled Closure Costs as at October 2018, dated November 2018*
- Shangoni Management Services. 2018. *Anglo American Coal South Africa: Khwezela Bokgoni Colliery Post 2A Dam Water Management Strategy Storm Water Management Plan, dated October 2018*
- Wetland Consulting Services (Pty) Ltd. 2018. *Wetland delineation and water use risk assessment report for the post 2A dam water management strategy”, dated November 2018*





## PART A

# SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

## 1. Details of Project Applicant and EAP

### 1.1. Details of the Project Applicant

<b>Name of Mine</b>	Khwezela Bokgoni Colliery
<b>Applicant</b>	Anglo Operations (Pty) Ltd
<b>Postal Address</b>	Private Bag X1; Marshalltown; Johannesburg; 2107
<b>Responsible Person</b>	Dolly Mthethwa
<b>Telephone No.</b>	(013) 693 0256
<b>e-mail address</b>	Dolly.Mthethwa@angloamerican.com
<b>Company Registration No.</b>	1921/006730/07

### 1.2. Details of the EAP

<b>Name of EAP</b>	Shangoni Management Services (Pty) Ltd.: Marvin Grimett
<b>Tel No</b>	(012) 807 7036
<b>Fax No</b>	(012) 807 1014
<b>e-mail Address</b>	marvin@shangoni.co.za

### 1.3. Expertise of the EAP

<b>Name</b>	<b>Qualifications and summary of experience</b>
Brian Hayes	Brian is a registered professional engineer (Chemical) with a master's degree in Environmental Engineering from the University of Nottingham. Brian has 26 years' experience in environmental management and environmental engineering.
Marvin Grimett	Marvin holds an Honour's Degree in Environmental Science from the University of KwaZulu-Natal and has been actively involved in environmental management for the past 6 years. He has been project manager and coordinator on many large environmental authorisations for predominantly industrial and mining clients. Marvin has extensive integrated environmental management experience, including amongst other; Environmental Impact Assessments, Scoping Reports, Basic Assessments, Environmental Management Plans, Environmental Management Programmes, Integrated Water Use Licence Applications, Integrated Water and



Name	Qualifications and summary of experience
	Waste Management Plans, Mining and Prospecting Right Applications and various other Application Forms as part of the Environmental Application Process.

## 2. Description of the property

The general areas surrounding the Khwezela Bokgoni Colliery have been modified to a large extent by mining and agricultural activities. The area in the vicinity of the Khwezela Bokgoni Colliery has low relief with some pan depressions including the nearby Berries Pan and Tweefontein Pan. Surface drainage is expected in a south to south-eastern direction towards the Olifants River, situated on the eastern border of the colliery.

Early topo-cadastral maps indicate that the pre-mining (1960s) land use was agricultural. There is evidence of previous grazing on a number of blocks, as shown by the presence of *Stoebe vulgaris*, that is an indicator of excessive grazing pressure. Invasive wattle and eucalyptus trees were present in the area, and large stands of wattle have been removed as part of the colliery land management strategy. The Khwezela Bokgoni Colliery processing plant and associated infrastructure was commissioned in 1979, and consists of a tip, stockpiles, processing plant and overland conveyors. Mining infrastructure consists of open pits, offices, a sewage plant, workshops, water reticulation pipelines, overhead powerlines and service roads. Table 1 below provides a summary of the properties associated with the proposed application area. Refer also to Figure 1 below for a map showing the farm portions.

*Table 1: Description of the properties applicable to this application*

<b>Farm Name</b>	Portion 1 of the farm Kleinkopje 15 JS; Portion 14 of the farm Klippan 332 JS; Portion 9 of the farm Klippan 332 JS; Portion 8 of the farm Klippan 332 JS; Portion 4 of the farm Klippan 332 JS; and Remainder portion 2 of the farm Klippan 332 JS
<b>Application Area (Ha)</b>	47 196 m of pipeline 5 West Void – 17ha
<b>Magisterial District</b>	eMalahleni Local Municipality; and Nkangala District Municipality.
<b>Distance and Direction from Nearest Town</b>	The project will be situated in the Mpumalanga Province and approximately 15 km south of eMalahleni.
<b>21-digit Surveyor General Code for each farm portion</b>	Portion 1 of the farm Kleinkopje 15 JS - T0IS0000000001500001; Portion 14 of the farm Klippan 332 JS - T0JS00000000033200014; Portion 9 of the farm Klippan 332 JS - T0JS00000000033200009; Portion 8 of the farm Klippan 332 JS - T0JS00000000033200008; Portion 4 of the farm Klippan 332 JS - T0JS00000000033200004; and Remainder portion 2 of the farm Klippan 332 JS - T0JS00000000033200002



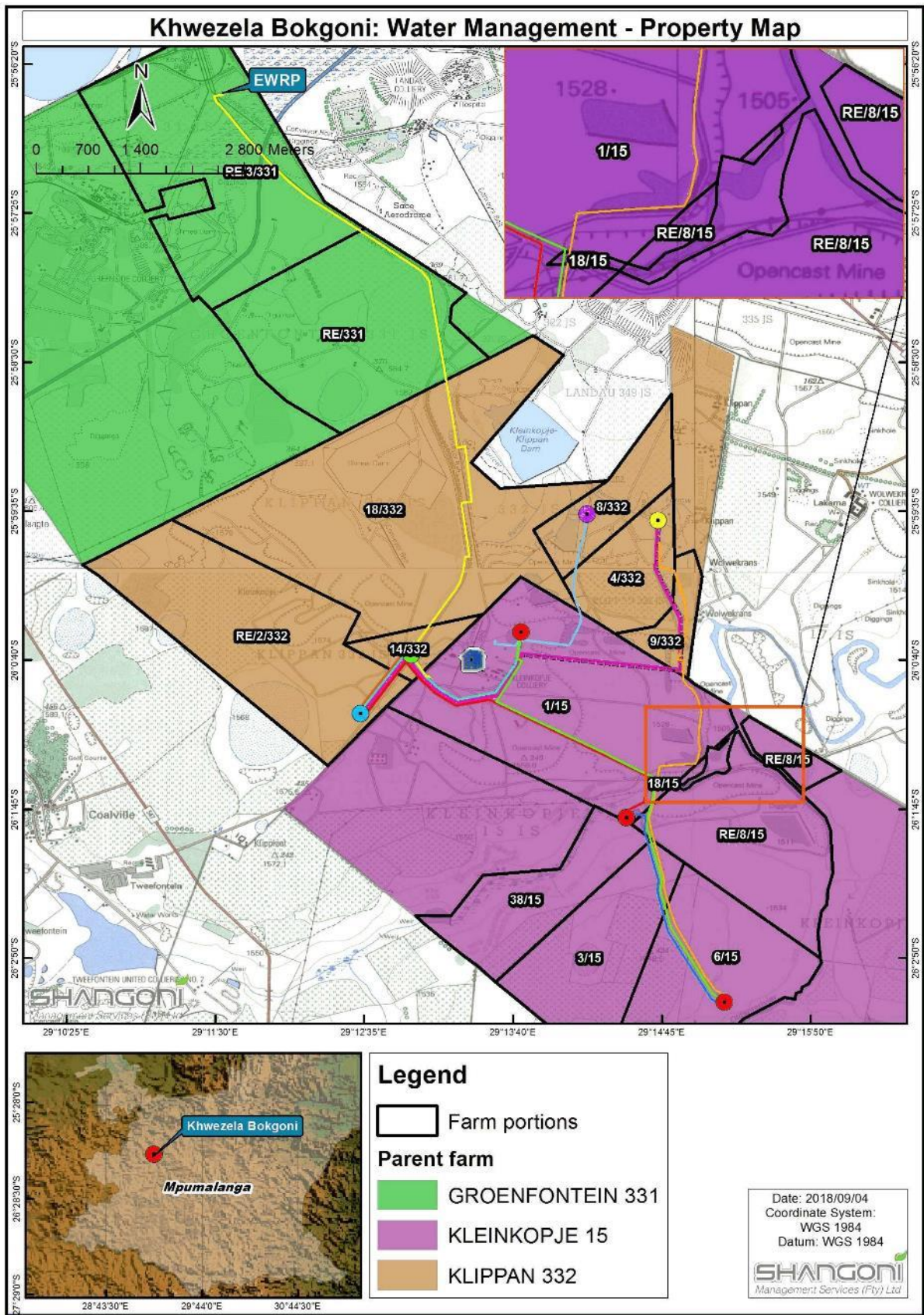


Figure 1: Location and property map



### 3. Locality map

#### 3.1. Magisterial district and administrative boundaries

The Khwezela Bokgoni Colliery is an existing opencast coal mine situated within the Nkangala District Municipality and eMalahleni Local Municipality. The locations of the proposed activities (pipelines and pump stations) applicable application area are presented in Figure 2 below.

Khwezela Bokgoni Colliery falls within the administrative boundaries as presented in Table 2.

Table 2: Administrative boundaries

<b>Province</b>	Mpumalanga Province
<b>District Municipality</b>	Nkangala Magisterial District
<b>Local Municipality</b>	eMalahleni Local Municipality
<b>Ward</b>	30
<b>Department of Mineral Resources (“DMR”) Local Office</b>	DMR – eMalahleni Regional Offices
<b>Department of Water and Sanitation (“DWS”) Local Office</b>	DWS – Bronkhorstspuit Regional Offices
<b>Department of Agriculture Rural Development Land and Environmental Affairs (“DARDLEA”) Local Office</b>	DARDLEA – Mpumalanga
<b>Catchment Zone</b>	Quaternary catchment B11F
<b>Water Management Area</b>	Olifants River Catchment area
<b>Water Forums</b>	Olifants River Catchment Forum

#### 3.2. Location of the mine

The mine is situated in the Mpumalanga Province and approximately 15 km south of eMalahleni. Surrounding towns and settlements include the following of which distances were measured by drawing a straight line from the plant area at the Khwezela Bokgoni Colliery:

- eMalahleni – 15 km north-east;
- Clewer – 14.71 km north-west;
- Ogies – 17.5 km south-west;
- Bronkhorstspuit – 53.21 km north-west;
- Kwa-Guqa – 19.66 km north-west; and
- Kriel – 27.25 km north-east.

#### 3.3. Location of the proposed activities

The location of the proposed activities applied for is indicated in Figure 2.



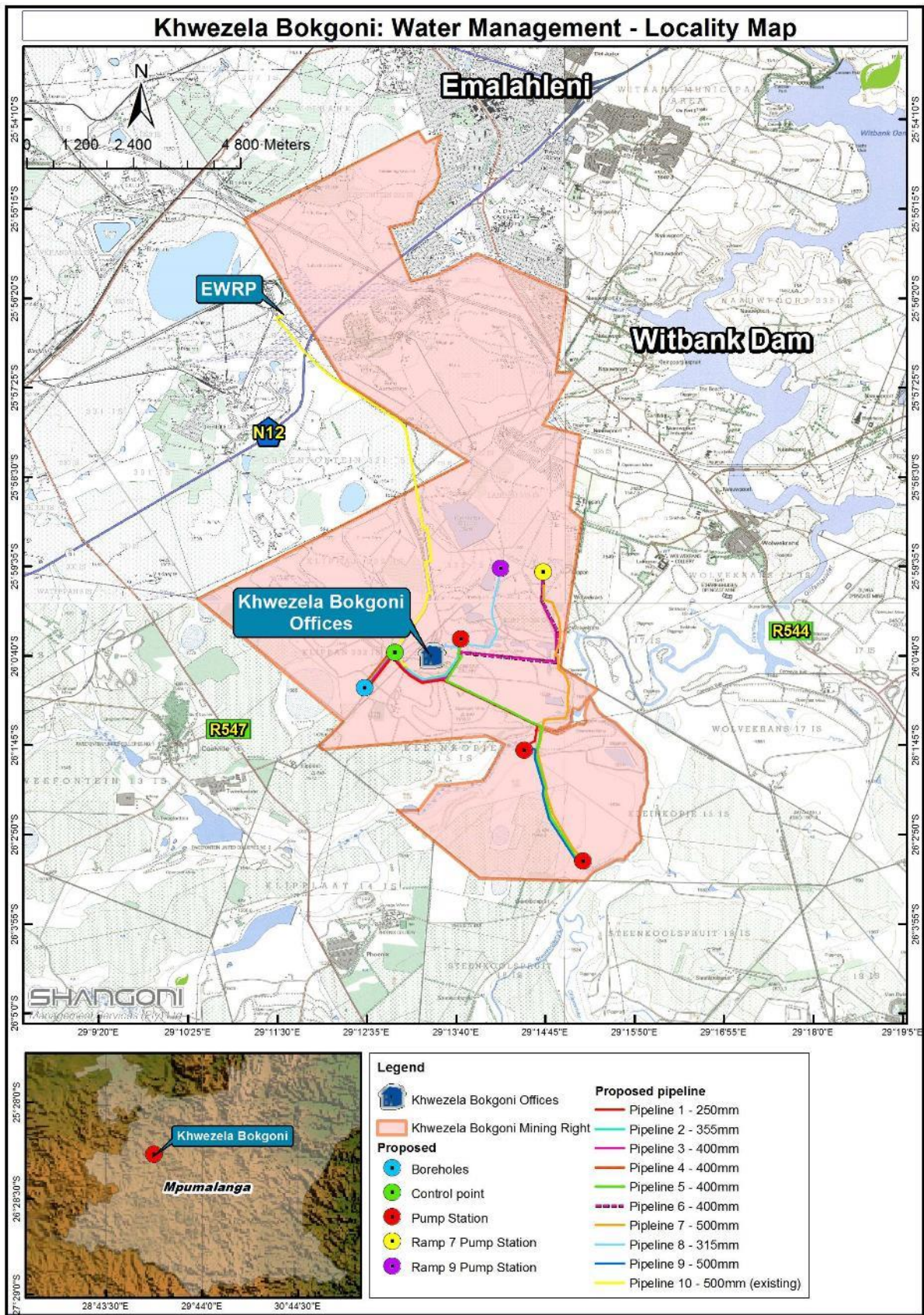


Figure 2: Localities of the proposed activities.



## 4. Description of the scope of the proposed overall activity

### 4.1. Listed and specified activities

Table 3: Activities and listed activities associated with the development

Name of Activity	Aerial Extent of Activity Ha or m <sup>2</sup> or km	Listed Activity (Mark with X)	Applicable Listing Notice (GN R983, GN R984, GN R985)	Waste Management Authorisation (Mark with X)	Listed activity description
Construction of pipelines and associated pump stations	47 196 m of pipeline	X	Activity 10 of Listing Notice 1 (GNR 983 of GG 38282 of 4 Dec 2014, as amended)		<p>The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes –</p> <ul style="list-style-type: none"> <li>(i) with an internal diameter of 0,36 metres or more; or</li> <li>(ii) with a peak throughput of 120 litres per second or more;</li> </ul> <p>excluding where—</p> <ul style="list-style-type: none"> <li>(a) such infrastructure is for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or</li> <li>(b) where such development will occur within an urban area.</li> </ul> <p><u>The Project:</u> The proposed bulk water pipelines will have a total length greater than 1000 metres in length and are greater than 0.36 metres in diameter.</p>
			Activity 12 of Listing Notice 1		The development of—



Name of Activity	Aerial Extent of Activity Ha or m <sup>2</sup> or km	Listed Activity (Mark with X)	Applicable Listing Notice (GN R983, GN R984, GN R985)	Waste Management Authorisation (Mark with X)	Listed activity description
			(GNR 983 of GG 38282 of 4 Dec 2014, as amended)		(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; — excluding— (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; (ee) where such development occurs within existing roads, road reserves or railway line reserves; or



Name of Activity	Aerial Extent of Activity Ha or m <sup>2</sup> or km	Listed Activity (Mark with X)	Applicable Listing Notice (GN R983, GN R984, GN R985)	Waste Management Authorisation (Mark with X)	Listed activity description
					<p>(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.</p> <p><u>The Project:</u> The proposed infrastructure associated with the project will have a physical footprint of greater than 100 square metres within 32 metres of a watercourse, measures from the edge of a watercourse.</p>
			<p>Activity 19 of Listing Notice 1 (GNR 983 of GG 38282 of 4 Dec 2014, as amended)</p>		<p>The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;</p> <p>but excluding where such infilling, depositing, dredging, excavation, removal or moving—</p> <p>(a) will occur behind a development setback;</p> <p>(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;</p> <p>(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;</p> <p>(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or</p>





Name of Activity	Aerial Extent of Activity Ha or m <sup>2</sup> or km	Listed Activity (Mark with X)	Applicable Listing Notice (GN R983, GN R984, GN R985)	Waste Management Authorisation (Mark with X)	Listed activity description
					<p>(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies</p> <p><u>The Project:</u> According to the method statement, pipelines will be buried in a 1 m deep x 1 m wide trench and backfilled with selected gravel material. The excavation and backfilling material will be in excess of 10 m<sup>3</sup> and may occur within a watercourse.</p>
			<p>Activity 11 of Listing Notice 2 (GNR 984 of GG 38282 of 4 Dec 2014, as amended)</p>		<p>The development of facilities or infrastructure for the transfer of 50 000 cubic metres or more water per day, from and to or between any combination of the following —</p> <ul style="list-style-type: none"> <li>(i) water catchments;</li> <li>(ii) water treatment works; or</li> <li>(iii) impoundments;</li> </ul> <p>excluding treatment works where water is to be treated for drinking purposes.</p> <p><u>The Project:</u> Water will be transferred between a combination of impoundments and the eMalahleni Water Reclamation Plant. This activity may not be triggered depending on the amount of water being transferred daily.</p>
			<p>Activity 14 of Listing Notice 3</p>		<p>The development of—</p>



Name of Activity	Aerial Extent of Activity Ha or m <sup>2</sup> or km	Listed Activity (Mark with X)	Applicable Listing Notice (GN R983, GN R984, GN R985)	Waste Management Authorisation (Mark with X)	Listed activity description
			(GNR 985 of GG 38282 of 4 Dec 2014, as amended)		(i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. <u>The Project:</u> The proposed infrastructure associated with the project will have a physical footprint of greater than 10 square metres within 32 metres of a watercourse, measured from the edge of a watercourse.
Storage of mine affected water in 3A North Underground Area and 5 West Void.	5 West Void – 17ha	X	Activity 6 of Listing Notice 2 (GNR 984 of GG 38282 of 4 Dec 2014, as amended)		The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding— (i) activities which are identified and included in Listing Notice 1 of 2014;



Name of Activity	Aerial Extent of Activity Ha or m <sup>2</sup> or km	Listed Activity (Mark with X)	Applicable Listing Notice (GN R983, GN R984, GN R985)	Waste Management Authorisation (Mark with X)	Listed activity description
					<p>(ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies;</p> <p>(iii) the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2 000 cubic metres or less; or</p> <p>(iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day.</p> <p><u>The Project:</u> The project proposes to store water underground and this will require a WUL in terms of Section 21 (g) of the National Water Act (Act No. 36 of 1998).</p>



## 4.2. Description of the proposed activities to be undertaken

The Khwezela Bokgoni Colliery is an existing opencast coal mine situated in close proximity to the town of eMalahleni in the Mpumalanga Province of South Africa. A number of the sections being mined, are mining through old underground bord-and-pillar workings that are economically exploited through the utilisation of opencast dragline mining techniques. In the north of Pit 2A, a second dragline is required to allow for the necessary productivity improvement to sustain economic viability. Mining in the south of Pit 2A is planned to be continued with the Marion 8200 Dragline by means of the current double bench single pass mining method.

The coal mined at the Khwezela Bokgoni Colliery is treated at the on-site coal beneficiation plant. The Khwezela Bokgoni Colliery produces the following products that are sold to both the local and international market: Select coal – Low ash coal product and steam coal product and Non-select coal – Steam coal product.

Refer to Figure 4 below for the layout plan of the proposed activities and related infrastructure.

The project is an extension to the Khwezela Bokgoni Colliery Pit 2A extension project. The mine revised its mine plan to extend mining operations in Pit 2A to include the mining of the coal situated in the area beneath 2A Dam. The mining out of the 2A Dam at Khwezela Bokgoni Colliery will result in a surplus of water, as confirmed by a recent update of the groundwater water balance. The project will focus on the management of water at the operation after mining out of 2A Dam.

It is proposed that mine affected water from Pit 2A is pumped to- and temporarily stored within- the 3A North Underground Area and 5 West Void before being pumped to the eMalahleni Water Reclamation Plant (“EWRP”) for treatment. The proposed water management strategy process is as follows (also refer to Figure 3 below):

### **Surplus water from 2A Dam –**

The extension of mining activities to include the area under 2A Dam will result in the need to temporarily store water from the mining area before being pumped to the EWRP.

### **Temporary storage of the surplus water from the 2A Dam –**

It is proposed that water is temporarily stored within the following areas:

- 3A North Underground Area, and
- 5 West Void.

### **eMalahleni Water Reclamation Plant–**

The process as outlined above will be conducted through the construction of associated infrastructure (pumps and pipelines) to facilitate the movement of water from 2A Dam to the proposed storage areas that will ultimately be pumped to the EWRP for treatment.



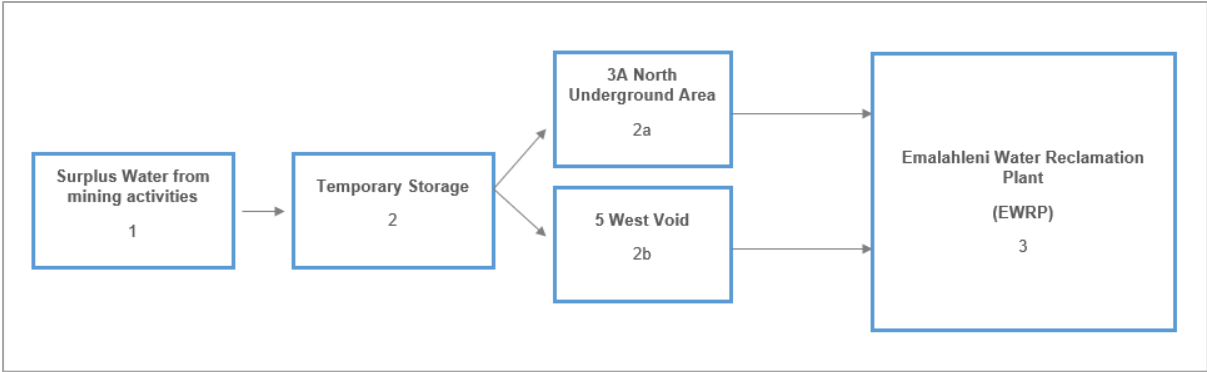


Figure 3: Key process involved in the proposed 2A Dam water management strategy.

### 4.3. Activity infrastructure description

#### 4.3.1 Surface Infrastructure

The main activities and infrastructure that will be used to facilitate the process as outlined above, are as follows:

- Proposed water storage areas: 3A North Underground Area and 5 West Void (existing areas that will be used for storage);
- Proposed 400 mm diameter HDPE pipeline pumping water from 3A North Underground Area to Jacuzzi Arm Tank;
- Control point to pump water to Jacuzzi Arm Tank or to Plant Reservoir;
- Two (2) proposed 400 mm diameter HDPE pipelines pumping water from Ramp 7;
- Proposed 355 mm diameter HDPE pipeline pumping water from Plant Return Water Dams (“PRWDs”);
- PRWDs (existing infrastructure);
- Proposed pump station at the PRWDs;
- Proposed 315 mm diameter HDPE pipeline from Ramp 9 to 3A North Underground Area;
- Proposed Ramp 9 pump station;
- Utilising existing infrastructure at Ramp 7 pump station;
- 400 mm diameter pipeline from Ramp 7 to 3A North Underground Area (existing infrastructure);
- Proposed 500 mm diameter HDPE pipeline from Ramp 7 to 5 West Void;
- Proposed 400 mm diameter HDPE pipeline pumping water from the PRWDs to Ramp 15;
- Proposed 250 mm diameter HDPE pipeline pumping water from 5 West Pollution Control Dam (“PCD”) to 3A North Underground Area;
- Utilising existing infrastructure at 5 West PCD pump station;
- Proposed 500 mm diameter HDPE pipeline pumping water from 5 West Void to 5 West PCD; and
- Proposed pump station at 5 West Void.



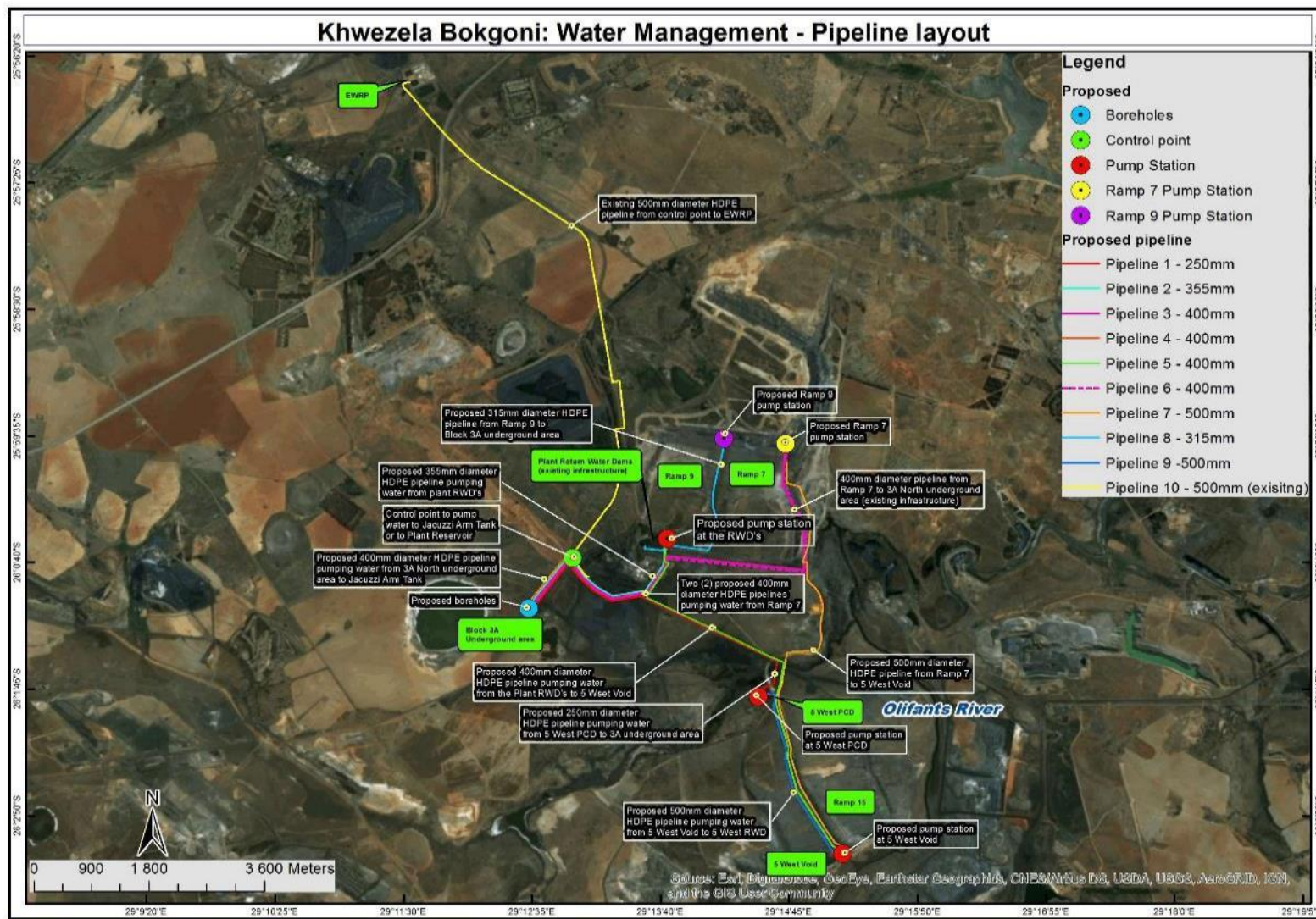


Figure 4: Layout Map of the proposed activities



## 5. Policy and Legislative Context

The following table is a summary of the policy and legislative context applicable to the proposed development.

Table 4: Policy and legislative context

Applicable Legislation and Guidelines used to compile the Report	Reference where applied
(A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process)	(i.e. Where in this document has it been explained how the development complies with and responds to the legislative and policy context)
The Constitution of the Republic of South Africa, 1996.	Throughout this EIAR.
The Mineral and Petroleum Resources Development Act (Act No. 28 of 2002, as amended).	
The Mineral and Petroleum Resources Development Regulations (GN R527 dated 2004).	
The National Environmental Management Act (Act No. 107 of 1998 as amended).	
The Environmental Impact Assessment Regulations (GN R982 dated 2014, as amended).	
The Environmental Impact Assessment Regulation. Listing Notice 2. (GN R984 dated 2014, as amended).	Section 4.1 of this EIAR.
Integrated Environmental Management Guideline: Guideline on Need and Desirability (2017).	Section 6 of this EIAR.
Mining and Biodiversity Guideline: Mainstreaming biodiversity into the mining sector.	Chapters E, F and L of Section 8.4.1; and Section 8.4.4 of this EIAR.
The National Water Act (Act No. 36 of 1998, as amended).	Chapter G and H of Section 8.4.1 of this EIAR.
Regulations on use of water for mining and related activities aimed at the protection of water resources published in terms of the National Water Act under Government Notice 704 of 4 June 1999 (GN R704).	Section 9.9 and Chapter G of Section 8.4.1 of this EIAR.
The National Environmental Management: Biodiversity (Act 10 of 2004, as amended).	Chapter E, F and L of Section 8.4.1 of this EIAR
National Forests Act (Act No.84 of 1998).	



<b>Applicable Legislation and Guidelines used to compile the Report</b> (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process)	<b>Reference where applied</b> (i.e. Where in this document has it been explained how the development complies with and responds to the legislative and policy context)
Alien and Invasive Species Regulations (GN R598 dated 2014).	
Conservation of Agricultural Resources (Act 43 of 1983).	
The National Environmental Management: Air Quality (Act 39 of 2004, as amended).	Chapter I of Section 8.4.1 of this EIAR.
SABS Code of Practice 0103 of 2008: The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication.  SABS Code of Practice 0328 of 2008: Environmental Noise Impact Assessments.	Chapter J of Section 8.4.1 of this EIAR.
National Environmental Management: Waste Act (Act No. 59 of 2008, as amended).	Section 9.9 of this EIAR.
National Heritage Resources Act (Act No. 25 of 1999, as amended).	Chapter K of Section 8.4.1 of this EIAR.
DMR Guideline for Consultation with communities and Interested and Affected Parties. As required in terms of Sections 16(4)(b) or 27(5)(b) of the MPRDA, and in accordance with the standard directive for the compilation thereof as published on the official website of the Department of Mineral Resources.	Section 8.2 and Section 9.7 of this EIAR.
Integrated Environmental Management Information Series. Criteria for determining alternatives in EIA.	Section 8.7 and Section 9.1 of this EIAR.

## 6. Need and Desirability of the Proposed Activities

### 6.1. Need and desirability in terms of the Guideline on Need and Desirability, 2017

The fact that the project is already existing, and that the following section has been completed, this does not serve as motivation for any new activities. In 2017, the Department of Environmental Affairs published an Integrated Environmental Management Guideline, the Guideline on Need and Desirability. The following table indicates on how the guideline requirement were considered in this Environmental Impact Assessment Report.





Table 5: Need and Desirability of the Khwezela Bokgoni Colliery Post 2A Dam Water Management Strategy

Requirement		Part where requirement is addressed/response
1	<b>How will this development (and its separate elements/aspects) impact on the ecological integrity of the area?</b> <sup>1</sup>	<p>Khwezela Bokgoni Colliery is situated within an area vegetated by the Moist Sandy Highveld Grassland vegetation type according to Low &amp; Rebelo (1998) with the most recent vegetation classification, classifying it as Eastern Highveld Grassland (Mucina &amp; Rutherford 2006). The vegetation type is considered to be endangered nationally with none conserved and 55% altered, primarily by cultivation. The conservation status of this vegetation type is very poor, with large parts that are either currently cultivated or have been previously ploughed, and the remaining untransformed vegetation that occurs as patchy remnants that are often heavily grazed.</p> <p>The mine boundary area is situated in an endangered ecosystem. This means that the ecosystem has undergone degradation of ecological structure, function or composition as a result of human intervention, although it is not critically endangered.</p> <p>Vegetation and fauna sensitivity, wetlands and protected areas and conservation planning are described in Chapters E; F; H and M of Section 8.4.1 (Part A) of this EIAR/EMP.</p> <p>Refer also to Annexures C attached to this Report for copies of the specialist studies conducted.</p> <p>There are no protected areas within the direct vicinity of the Khwezela Bokgoni Colliery Post 2A Dam Water Management Strategy Project area. However, the pipelines do cross an unchanneled valley bottom wetland system. Furthermore, the Olifants River is located in close proximity to a pipeline location.</p> <p>The Khwezela Bokgoni Colliery mining area has been impacted by existing mining activities on site, extensive agricultural activities (especially the cultivation of maize) as well as impacts associated with infrastructure (e.g. roads and railways) and urbanisation. Approximately 3 752 ha of the study area have been directly disturbed by surface mining activities, totalling over 44 % of the site. All of these activities have resulted in the extensive transformation of the natural habitats within the study area, as portrayed in the Mpumalanga Biodiversity Conservation Plan's terrestrial</p>
1.1	How were the following ecological integrity considerations taken into account?	
1.1.1	<i>Threatened Ecosystems</i> <sup>2</sup>	
1.1.2	<i>Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure</i> <sup>3</sup>	
1.1.3	<i>Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs").</i>	
1.1.4	<i>Conservation targets</i>	
1.1.5	<i>Ecological drivers of the ecosystem.</i>	
1.1.6	<i>Environmental Management Framework.</i>	
1.1.7	<i>Spatial Development Framework.</i>	

<sup>1</sup> Section 24 of the Constitution and section 2(4)(a)(vi) of NEMA refer.

<sup>2</sup> Must consider the latest information including the notice published on 9 December 2011 (Government Notice No. 1002 in Government Gazette No. 34809 of 9 December 2011 refers) listing threatened ecosystems in terms of Section 52 of National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).

<sup>3</sup> Section 2(4)(r) of NEMA refers.



	Requirement	Part where requirement is addressed/response
		biodiversity assessment (Ferrar et al. 2007) that classifies most of the area as having no natural habitat remaining / heavily modified (refer to Chapter M of Section 8.4.1 (Part A) below).
1.1.8	<i>Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.)</i> <sup>4</sup>	<p>On 4 May 2007 the Minister of Environmental Affairs and Tourism formally declared the eastern part of Gauteng and western part of Mpumalanga an air pollution hotspot, to be known as the “The Highveld Priority Area”, a National air pollution hotspot in terms of Section 18(1) of the NEM:AQA. By declaring a priority area, authorities recognise that air quality within these areas are generally regarded as being poor, and frequently meet or exceed ambient air quality standards.</p> <p>Khwezela Bokgoni Colliery is located in the Highveld Priority Area. This implies that authorities may impose measures on the Khwezela Bokgoni Colliery and other mines and industries within this area in order to allow for improvements in the air quality of the region.</p>
1.2	How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts? <sup>5</sup>	The potential impacts that have been identified and may occur as a result of the proposed activity has been discussed in Section 8.5 (Part A) of this document.
1.3	How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts? <sup>6</sup>	
1.4	What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided	No waste will be generated as a result of this development.

<sup>4</sup> Section 2(4)(n) of NEMA refers

<sup>5</sup> Section 24 of the Constitution and Sections 2(4)(a)(i) and 2(4)(b) of NEMA refer.

<sup>6</sup> Section 24 of the Constitution and Sections 2(4)(a)(ii) and 2(4)(b) of NEMA refer



Requirement	Part where requirement is addressed/response
	<p>altogether, what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?<sup>7</sup></p>
1.5	<p>How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?<sup>8</sup></p> <p>No landscapes and/or sites that constitute the nation's cultural heritage will be affected by the proposed activities, as the areas where the activities will take place are existing disturbed areas.</p> <p>A number of heritage surveys were conducted within and around the Khwezela Bokgoni Colliery mine boundary area. Refer to Chapter N of Section 8.4.1 (Part A) of this report as well as Annexure C1.</p>
1.6	<p>How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?<sup>9</sup></p> <p>No impact to non-renewable resources will occur as a result of the proposed prospecting activities.</p>
1.7	<p>How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the</p> <p>The anticipated impacts that may occur as a result of the proposed activities have been identified and discussed in Section 8.5.</p>

<sup>7</sup> Section 24 of the Constitution and Sections 2(4)(a)(iv) and 2(4)(b) of NEMA refer

<sup>8</sup> Section 24 of the Constitution and Sections 2(4)(a)(iii) and 2(4)(b) of NEMA refer.

<sup>9</sup> Section 24 of the Constitution and Sections 2(4)(a)(v) and 2(4)(b) of NEMA refer



	Requirement	Part where requirement is addressed/response
	resources? What measures were explored to enhance positive impacts? <sup>10</sup>	
1.7.1	<i>Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note: sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life)</i>	Since the proposed project will be associated with a continuation of the mining operation at Khwezela Bokgoni Colliery, the dependency on the use of the resources will continue.
1.7.2	<i>Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources this the proposed development alternative?)</i>	
1.7.3	<i>Do the proposed location, type and scale of development promote a reduced dependency on resources?</i>	
1.8	How were a risk-averse and cautious approach applied in terms of ecological impacts? <sup>11</sup>	Refer to Chapters E, F and L of Section 8.4.1 (Part A) of this EIAR/EMP and Section 8.5 for anticipated impacts.  A conservative approach has been followed in terms of the identification and assessing of environmental impacts associated with the proposed project.
1.8.1	<i>What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?</i>	Refer also to Section 8.6.2 (Part A) of this EIAR/EMP.
1.8.2	<i>What is the level of risk associated with the limits of current knowledge?</i>	
1.8.3	<i>Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?</i>	Low risk as limited knowledge gaps exist

<sup>10</sup> Section 24 of the Constitution and Sections 2(4)(a)(vi) and 2(4)(b) of NEMA refer

<sup>11</sup> Section 24 of the Constitution and Section 2(4)(a)(vii) of NEMA refer.



	Requirement	Part where requirement is addressed/response
1.9	How will the ecological impacts resulting from this development impact on people's environmental right in terms following: <sup>12</sup>	
1.9.1	<i>Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?</i>	
1.9.2	<i>Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?</i>	All anticipated negative and positive impacts associated with the proposed activity have been identified and discussed in Section 8.5 (Part A) below.
1.10	Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	
1.11	Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/targets/considerations of the area?	
1.12	Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations? <sup>13</sup>	Refer to Section 8.7 (Part A) of this report for an assessment of the alternatives identified.
1.13	Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing	A determination of the anticipated impacts(including the residual and cumulative impacts) associated with the proposed activity has been included in Section 8.5 (Part A) of this EIAR/EMP.

<sup>12</sup> Section 24 of the Constitution and Sections 2(4)(a)(viii) and 2(4)(b) of NEMA refer

<sup>13</sup> Section 2(4)(b) of NEMA refer



	Requirement	Part where requirement is addressed/response
	and other planned developments in the area? <sup>14</sup>	
2	<b>“Promoting justifiable economic and social development”<sup>15</sup></b>	
2.1	What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?	
2.1.1	<i>The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area,</i>	
2.1.2	<i>Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.),</i>	
2.1.3	<i>Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and</i>	Refer to Chapter O of Section 8.4.1 (Part A) of this document.
2.1.4	<i>Municipal Economic Development Strategy (“LED Strategy”).</i>	A determination of the anticipated impacts (including the residual and cumulative impacts) associated with the proposed activity has been included in Section 8.5 (Part A) of this document.
2.2	Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area?	
2.2.1	<i>Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?</i>	
2.3	How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities? <sup>16</sup>	Refer to Chapter O of Section 8.4.1 (Part A) of this EAIR/EMP and the Social and Labour Plan Progress Report (2017) attached hereto as Annexure F. Note: The proposed Post 2A Dam Water Management Strategy Project will be a continuation of the current mining activities.
2.4	Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? <sup>17</sup> Will the impact be socially and economically	The negative and positive impacts that have been identified are described in Section 8.5 (Part A) below.  The development will be socially- and economically sustainable as the Life of Mine (at the Pit 2A mining

<sup>14</sup> Regulations 22(2)(i)(i), 28(1)(g) and 31(2)(1) in Government Notice No. R. 543 refer

<sup>15</sup> Section 24 of the Constitution refers.

<sup>16</sup> Section 2(2) of NEMA refers

<sup>17</sup> Sections 2(2) and 2(4)(c) of NEMA refers.



Requirement		Part where requirement is addressed/response
	sustainable in the short- and long-term?	area) will be extended up to 2025. During this period social and economic structures within the local communities will be supported by the mine in terms of job security and social responsibility.
In terms of location, describe how the placement of the proposed development will: <sup>18</sup>		
2.4.1	<i>Result in the creation of residential and employment opportunities in close proximity to or integrated with each other,</i>	As the proposed activity is the extension of the current mining activities, residential opportunities will not be created.  The mine will continue to provide work for employees during the operational phase.  The proposed activity will not impact on the transportation of people.
2.4.2	<i>Reduce the need for transport of people and goods,</i>	
2.4.3	<i>Result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport),</i>	
2.4.4	<i>Compliment other uses in the area,</i>	The current land use at Khwezela Bokgoni Colliery is that of 'mining'.  Local businesses and the existence of settlements and town in close proximity to Khwezela Bokgoni Colliery (and its neighbouring mines) are dependent on the operation of the mines in the area.
2.4.5	<i>Be in line with the planning for the area,</i>	The eMalahleni Local Municipality Spatial Development Framework ("SDF") states the following: " <i>Mining activity and electricity generation are major contributors to the local economy. These southern parts of the municipality form part of the Energy Mecca of South Africa, due to its rich deposits of coal reserves and power stations such as Kendal, Matla, Duvha and Kriel. The mining belt also extends northward towards eMalahleni City. This area is thus characterised by conflicting demand between mining, electricity generation and agriculture. The primary objective should be to prevent mining activity from encroaching onto high potential agricultural land and areas of high biodiversity; and to ensure that the areas of mining activity are properly rehabilitated and that the agricultural value of the land be restored once the mineral resources are depleted.</i>  <i>The vast majority of land in the eMalahleni Local Municipality is classified as medium and high potential soil. Thus, apart from the mining priority areas the remainder of the municipal area is earmarked to retain the current dominant agricultural use, including stock farming (sheep and</i>

<sup>18</sup> Section 3 of the Development Facilitation Act, 1995 (Act No. 67 of 1995) ("DFA") and the National Development Plan refer



Requirement		Part where requirement is addressed/response
		<i>cattle) and maize farming with some irrigated farming along the river drainage basins."</i>
2.4.6	<i>For urban related development, make use of underutilised land available with the urban edge,</i>	Not applicable.
2.4.7	<i>Optimise the use of existing resources and infrastructure,</i>	Khwezela Bokgoni Colliery is an existing mine. A processing plant is also currently operated within the existing mining boundary area. As the proposed project will be a continuation of the current activities, existing infrastructure and resources will be used as far as possible.
2.4.8	<i>Opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement),</i>	
2.4.9	<i>Discourage "urban sprawl" and contribute to compaction/densification,</i>	As mentioned above, Khwezela Bokgoni Colliery is an existing mine. A processing plant is also currently operated within the existing mining boundary area. As the proposed project will be a continuation of the current activities, it is not anticipated that the urban sprawl, the compaction / densification or impacts on spatial patterns will occur as a result of the proposed project.  Existing resources and infrastructure will continue to be used as far as possible.
2.4.10	<i>Contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,</i>	
2.4.11	<i>Encourage environmentally sustainable land development practices and processes,</i>	Refer to Section 9.9 (Part A).
2.4.12	<i>Take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.),</i>	The proposed location of the pipelines and pump stations is based on the locality of the existing pit as well as the 3A North Underground Area and the 5 West Void.
2.4.13	<i>The investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential),</i>	The current mining operation results in high socio-economic returns. As mentioned previously, this project is for the continuation of the existing mining operations.  Refer also to the Social and Labour Plan ('SLP') Progress Report attached hereto as Annexure F.
2.4.14	<i>Impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and</i>	It is not anticipated that the proposed activity will impact on any socio-cultural.  The "sense of place" of the area has also already been impacted on as a result of current mining activities conducted within the area. Therefore, regular passers-by of the area as well as local residents within the area are likely to be desensitised to the mining activities.
2.4.15	<i>In terms of the nature, scale and location of the development promote</i>	It is not anticipated that the proposed activity will result in a more integrated settlement or in additional





Requirement		Part where requirement is addressed/response
	<i>or act as a catalyst to create a more integrated settlement?</i>	negative socio-economic impacts. Settlement patterns will most likely remain unchanged as the proposed project will be a continuation of the current mining activities.
2.5	How were a risk-averse and cautious approach applied in terms of socio-economic impacts? <sup>19</sup>	A conservative approach has been followed in terms of the identification and assessing of environmental impacts associated with the proposed project.
2.5.1	<i>What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?<sup>20</sup></i>	The level of risk associated with the limits of current knowledge is considered to be low.
2.5.2	<i>What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?</i>	
2.5.3	<i>Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?</i>	
2.6	How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following	
2.6.1	<i>Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?</i>	It is believed that no socio-economic related knowledge gaps exist in terms of the proposed project. Also, no uncertainties have been identified. The following assumptions are made: <ul style="list-style-type: none"> <li>• That all socio-economic information provided by the applicant regarding the proposed project is correct;</li> <li>• That the mitigation measures proposed in this report are implemented correctly and are effective;</li> <li>• All research/reference sources are accurate; and</li> <li>• That there will be no significant changes to the proposed project that could affect the findings and recommendations of this report and the EMPr.</li> </ul>
2.6.2	<i>Positive impacts. What measures were taken to enhance positive impacts?</i>	Based on the above descriptions, it is our opinion that the level of risk associated with the limits of current knowledge (in terms of socio-economic aspects) is low.

<sup>19</sup> Section 2(4)(a)(vii) of NEMA refers

<sup>20</sup> Section 24(4) of NEMA refers



	Requirement	Part where requirement is addressed/response
2.7	Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socioeconomic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	The identified impacts of the proposed activities are presented in Section 8.5 (Part A) of this document.
2.8	What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations? <sup>21</sup>	
2.9	What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? <sup>22</sup> Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	Refer to Section 8.7 (Part A) of this report for an assessment of the alternatives identified and their anticipated impacts on the social environment.
2.10	What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination? <sup>23</sup>	Refer to point 2.6 (of this table) above.
2.11	What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle? <sup>24</sup>	The identification of the anticipated impacts has been presented in Section 8.5 (Part A) below. Mitigation measures have also been provided for each potential impact that may occur.
2.12	What measures were taken to:	

<sup>21</sup> Section 2(4)(b) of NEMA refers.

<sup>22</sup> Section 2(4)(c) of NEMA refers.

<sup>23</sup> Section 2(4)(d) of NEMA refers.

<sup>24</sup> Section 2(4)(e) of NEMA refers.



Requirement		Part where requirement is addressed/response
2.12.1	<i>Ensure the participation of all interested and affected parties,</i>	Refer to the Public Participation Report attached hereto as Annexure E.
2.12.2	<i>Provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,<sup>25</sup></i>	
2.12.3	<i>Ensure participation by vulnerable and disadvantaged persons,<sup>26</sup></i>	
2.12.4	<i>Promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means,<sup>27</sup></i>	
2.12.5	<i>Ensure openness and transparency, and access to information in terms of the process,<sup>28</sup></i>	
2.12.6	<i>Ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge<sup>29</sup>, and</i>	
2.12.7	<i>Ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein were be promoted?<sup>30</sup></i>	Refer to the Public Participation Report attached hereto as Annexure E. The Public Participation Report presents the details of all Interested and Affected Parties (“I&APs”) that were identified, how the I&APs were notified and involved in the process, any issues and concerns raised by the I&APs and the final results of the Public Participation Process.
2.13	Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or	Refer to the SLP attached in Annexure F.

<sup>25</sup> Section 2(4)(f) of NEMA refers

<sup>26</sup> Section 2(4)(f) of NEMA refers.

<sup>27</sup> Section 2(4)(h) of NEMA refers.

<sup>28</sup> Section 2(4)(k) of NEMA refers.

<sup>29</sup> Section 2(4)(g) of NEMA refers.

<sup>30</sup> Section 2(4)(q) of NEMA refers.



	Requirement	Part where requirement is addressed/response
	that is proportional to the needs of an area)? <sup>31</sup>	
2.14	What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected? <sup>32</sup>	All contractors, sub-contractors and workers will attend compulsory environmental awareness training and inductions. This training will highlight the dangers associated with the workplace. Procedures relating to environmental risks will also be put in place and will be regularly updated.
2.15	Describe how the development will impact on job creation in terms of, amongst other aspects	
2.15.1	<i>The number of temporary versus permanent jobs that will be created,</i>	Refer to the SLP attached in Annexure F.
2.15.2	<i>Whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area),</i>	
2.15.3	<i>The distance from where labourers will have to travel,</i>	
2.15.4	<i>The location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits), and</i>	
2.15.5	<i>The opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).</i>	
2.16	What measures were taken to ensure:	
2.16.1	<i>That there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment, and</i>	Refer to the Public Participation Report attached hereto as Annexure E Other government departments are included on the list of I&APs and stakeholders and received the notifications of the proposed activity as well as notifications on the availability of the report for review.
2.16.2	<i>That actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?</i>	All applicable environmental legislation was considered during the Scoping process.
2.17	What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public	During the initial Public Participation Process, all issues and concerns raised by the I&APs, stakeholders and the Organs of State are taken into account and responses provided.

<sup>31</sup> Section 2(4)(g) of NEMA refers.

<sup>32</sup> Section 2(4)(j) of NEMA refers



	Requirement	Part where requirement is addressed/response
	interest, and that the environment will be protected as the people's common heritage? <sup>33</sup>	
2.18	Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left? <sup>34</sup>	Mitigation measures for each of the identified impacts have been described in detail in this report. The proposed mitigation measures are realistic to protect both the bio-physical and socio-economic environment in both the short- and long-term.
2.19	What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment? <sup>35</sup>	The applicant will be responsible for the costs of any remediation of pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects.  The Financial Provisioning Report for the proposed project is discussed in Section 20 (Part A) of this report.
2.20	Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations? <sup>36</sup>	The alternatives for the proposed project are described in Section 8.1 (Part A) below and assessed in terms of the following four categories: <ul style="list-style-type: none"> <li>• Environmental;</li> <li>• Technical/Engineering;</li> <li>• Economical; and</li> <li>• Social.</li> </ul>
2.21	Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area? <sup>37</sup>	The anticipated identified impacts have been presented in Section 8.5 below. All residual and cumulative impacts have been described and assessed.

## 7. Period for which Environmental Authorisation is required

The estimated production is 45 Mt (5.1 Mt/a on average). As mentioned above, the Life of Mine for the Pit 2A operations is until 2025. Therefore, the period that the environmental authorisation is required is at least 7 years (from the date of approval provided by the DMR).

<sup>33</sup> Section 2(4)(o) of NEMA refers.

<sup>34</sup> Section 240(1)(b)(iii) of NEMA and the National Development Plan refer.

<sup>35</sup> Section 2(4)(p) of NEMA refers.

<sup>36</sup> Section 2(4)(b) of NEMA refers.

<sup>37</sup> Regulations 22(2)(i)(i), 28(1)(g) and 31(2)(1) in Government Notice No. R. 543 refer.



## 8. Description of the process followed to reach the proposed preferred site

### 8.1. Details of alternatives considered

#### 8.1.1 Alternative 1 – Preferred alternative

The proposed 2A Dam Water Management Strategy Project is an extension to the Khwezela Bokgoni Colliery Pit 2A extension project. The mine revised its mine plan to extend mining operations in Pit 2A to include the mining of the coal situated in the area beneath 2A Dam. The mining out of the 2A Dam at Khwezela Bokgoni Colliery will result in a surplus of water, as confirmed by a recent update of the groundwater water balance. The project will focus on the management of water at the operation after mining out of 2A Dam.

It is proposed that 2A Dam water is temporarily stored within the 3A North Underground Area and 5 West Void before being pumped to EWRP. Both the 3A North Underground Area and the 5 West Void will be required for this project as this increases the storage capacity required for this project. The storage of water in both the 3A North Underground Area and the 5 West Void will ensure that no new infrastructure to store affected water is constructed as these are existing infrastructure. No construction of new affected water storage infrastructure means that the proposed project footprint will be kept to a minimum and the cost of the proposed project will also remain minimal and this would make the proposed project more sustainable.

As mentioned above, the proposed project is an extension of the Pit 2A extension project, therefore, this project will also ensure that the coal reserves within Pit 2A can be mined without any delay due to the mine not having sufficient storage capacity for affected water. The continuation of mining ensures that there is a continuation of the operation of activities and will have a positive effect on the local, regional and national economy.

The proposed pipelines associated with the project will be continuously welded 400/500 mm diameter HDPE CLASS 10 pipes, buried in a 1 m deep x 1 m wide trench backfilled with selected gravel material with a minimum pipe cover of 0.5 m. The option of laying the pipelines above ground is not recommended due to fire, theft and the restriction of natural surface storm water run-off. There will, therefore, be no requirements for pipe anchors and supports. In order to minimise any disturbance to rehabilitated areas, the pipelines will be constructed along the edges of the existing ramps, haul roads, light vehicle gravel roads and through the existing plant area. All pipes crossing the existing gravel mine roads will be accommodated in a heavy-duty concrete interlocking pipe sleeves. Existing storm water culverts will be utilized at any water course crossings and no additional storm water culverts will be required. The pipelines will be constructed on top of the existing culverts and may be partially exposed depending on the depth of the fill material on top of the culverts.



### 8.1.2 Alternative 2 – Not preferred

Regarding the storage of the affected water, an alternative is to temporarily store the affected water within the 3A North Underground Area only before being pumped to the EWRP. This alternative is not the preferred alternative as the capacity of temporarily storing water in the 3A North Underground Area is less compared to that of storing water within both the 3A North Underground Area and 5 West Void. Due to minimal capacity, the operations may have to cease during the rainy season due to excess water within the 2A Pit and this will have a negative effect on the mining operations.

Pumping of affected water to the 3A North Underground Area will mean that there will be less pipelines installed as there will not be a need for pipelines to and from the 5 West Void. Thus, the status quo of the environment will remain as less rehabilitated areas will be re-disturbed.

### 8.1.3 Alternative 3 – Not preferred

Regarding the storage of the affected water, an alternative is to temporarily store the affected water within the 5 West Void only before being pumped to the EWRP. This alternative is not the preferred alternative as the capacity for temporarily storing water in the 5 West Void is less compared to that of storing water within both the 3A North Underground Area and 5 West Void. Due to minimal capacity, the operations may have to cease during the rainy season due to excess water being within the 2A Pit and this will have a negative effect on the mining operations.

Pumping of affected water to the 5 West Void only will mean that there will be less pipelines installed as there will be no need for any pipelines running to and from the 3A North Underground Area. Thus, the status quo of the environment will remain as less rehabilitated areas will be re-disturbed.

### 8.1.4 Alternative 4 – No-go option

Should the pumping of water for temporary storage to the 3A North Underground Area and the 5 West Void as well as the associated pipelines not be approved, this will result in the mine ceasing operations in Pit 2A. Furthermore, the mine would have to invest money to investigate alternate ways to pump the water from the pit as well as construct new water storage facilities. Due to the current economic pressure, this may also result in the loss of jobs.

Khwezela Bokgoni Colliery is actively involved in the local community. The mine encourages small business development in the eMalahleni area that results in localised growth of the economic sector. The mine also assists with education, training, development and sport projects. Should the proposed activities not be approved, the LOM will be significantly impacted and will negatively affect suppliers and contractors in eMalahleni and the Mpumalanga Province.

Should the pumping of water for temporary storage to the 3A North Underground Area and the 5 West Void as well as the associated pipelines not be approved, the *status quo* of the environment will remain. The rehabilitated areas will not be disturbed by construction of trenches for the installation of pipelines. 5 West Void will remain as an unrehabilitated void.



## 8.2. Details of the Public Participation Process Followed

A detailed public participation process was undertaken as part of the initial application, scoping and EIAR/EMP phases for the proposed project. The following has been conducted as part of the Environmental Authorisation Application (proof hereof is included in the Public Participation Report submitted to the DMR along with this Draft Environmental Impact Assessment Report) (attached as Annexure E to this report):

- Advertisements:
  - A Newspaper advertisement was placed in the Witbank News on 16 November 2018 indicating the dates that the Draft Scoping Report was available for comment.
  - A Newspaper advertisement was placed in the Witbank News on 14 June 2019 indicating the dates that this Draft Environmental Impact Assessment Report was available for comment.
- Site Notices:
  - Site notices were placed around the proposed project site as well as at the existing Khwezela Bokgoni Colliery on 16 November 2018 for the Scoping Phase and on 18 June 2019 for the EIAR/EMP Phase.
- Written Notices:
  - Written notices (including Background Information Documents (“BIDs”) were distributed to I&APs.
- Availability of Technical Reports for Public Review
  - The Draft Scoping Report was made available for public and stakeholder review for a period of 30 days (from 16 November 2018 to 6 January 2019). Notices providing the detail of the public viewing station and review period, were sent to registered I&APs via e-mail. This notification also formed part of the above-mentioned advertisement and site notices.
  - The Draft EIAR and EMP will be made available for public and stakeholder review for a period of 30 days (from 18 June 2019 to 17 July 2019). Notices providing the detail of the public viewing station and review period, were sent to registered I&APs via e-mail. This notification also formed part of the above-mentioned advertisement and site notices.

## 8.3. Summary of Issues Raised by I&APs

Table 6 below provides a summary of the comments and issues raised and reaction to those responses.





Table 6: Summary of the issues raised by the I&APs

Interested and Affected Parties	Date Comments Received	Issues Raised	EAPs Response to Issues as Mandated by the Applicant	Section and Paragraph Reference in this Report Where the Issues and or Responses Were Incorporated.
Zenani France Sibanyoni-Jiyane	15 November 2018	<p>We do not have any qualms with the mining company being granted mining permits if compliant with applicable mining legislation, but we humbly request the Department of Environmental Affairs and Department of Mineral Resources to attach the following conditions to the mining licenses:</p> <ul style="list-style-type: none"> <li>• That the mining company is required to formulate the Internal Coal Air Pollution Trust Fund that is aimed to pay for the medical expenses of employees of the company as well as members of community in the mining areas of operation of the company who suffer from illnesses associated with coal air pollution including but not limited to TB, lung cancer, bronchitis and other cardiopulmonary diseases. The Deed of Trust attached hereinafter can be used by the companies.</li> <li>• Compensation of house owners in the areas of operation of the mining companies in the event their houses are affected by blasting.</li> <li>• Lodging of Burial Site Protection Plan, in case of blasting destroying graves.</li> <li>• Compliance with Broad Based Black Economic Empowerment (BBBEE) and</li> <li>• Lodging of Broad Based Black Economic Empowerment Plan.</li> </ul> <p>The aforesaid measure (1) is pursuant to Section 24 (b) of the Constitution Act 200 of 1993 that welcomes legislative and other measures designed to protect the environment for the benefit of the current and future generations. The measure is also pursuant to section 24(a) of the Constitution that states that everyone has a right to clean and healthy environment.</p> <p>It is also in tandem with Section 11 of the Constitution that states that everyone has a right to life. The coal mine pollutants like methane, particulate matter, sulphur dioxide, mercury, dust and carbon emissions will add to the 2 700 premature deaths of people that are recorded in our beloved Republic. The houses of our people will also crack as a result of blasting. These may lead to fatalities as the houses may collapse.</p> <p>The nature and purport of Broad Based Black Economic Empowerment Act, Act 53 of 2003 is that all the levels of Government must ensure that there is compliance with BBBEE prior to any Government Department granting any licenses, concessions or permits.</p>	<p>Good Day Mr. Zenani France Sibanyoni-Jiyane Thank you for submitting your comments through.</p> <p>Please note that the application being submitted is not for a mining permit, but is for the expansion of activities being undertaken at the existing Khwezela Bokgoni Colliery. The nature of the project mainly being the construction of pipelines and associated pump stations for the Post 2A Dam Water Management Strategy. As outlined in the document sent to you, Khwezela Bokgoni Colliery propose to expand the mining operations and thus a strategy has been implemented to deal with the excess water.</p> <p>The mine's number one priority is the safety of mine workers, thus any health issues that the mine workers have are treated by the on-site clinic. Air pollution at the mine is strictly controlled and air quality monitoring is undertaken and monthly reports are generated by an independent consultant.</p> <p>Blast monitoring is also undertaken by an independent consultant and the monitoring is conducted at various points. Should blasts be over the thresholds, an investigation is undertaken. However, the possibility of damage is unlikely due to ground vibration and / or air blast at the monitor locations.</p> <p>All graves and heritage sites are identified by an independent specialist prior to any work being done within any areas. The specialist will provide recommendations as to the process that needs to be undertaken to either protect or remove the graves. All graves and heritage sites are protected by the National Heritage Resources Act (No. 25 of 1999), thus graves are protected and cannot be destroyed due to mining activities.</p> <p>Anglo American is committed to transformation and are currently implementing transformation policies. Good and Services are procured from registered BBBEE suppliers.</p>	Refer to Annexure E



## 8.4. The Environmental Attributes Associated with the Development Footprint Alternatives. A Baseline Environment

### 8.4.1 The type of environment affected by the proposed activity

A baseline description or “*status quo*” of the of the present environmental situation is provided in this part of the document. The following attributes / aspects have been described in detail, in the following respective chapters:

- Chapter A: Geology;
- Chapter B: Climate;
- Chapter C: Topography;
- Chapter D: Soils, land use and land capability;
- Chapter E: Vegetation;
- Chapter F: Fauna;
- Chapter G: Surface water;
- Chapter H: Groundwater;
- Chapter I: Air quality;
- Chapter J: Noise;
- Chapter K: Archaeology and cultural history;
- Chapter L: Sensitive landscapes;
- Chapter M: Visual aspects; and
- Chapter N: Regional socio-economic structure

#### Chapter A: Geology

The 2628 East Rand 1:250 000 geological map indicates that Khwezela Bokgoni Colliery is directly underlain by rocks of the Vryheid Formation (Figure 5) belonging to the Eccca Group of the Karoo sequence of rocks believed to be 400 million years old. The Karoo Supergroup comprises mainly a sedimentary succession of sandstone, siltstone, shale, mudstone, coal, diamictite and tillite. The Eccca Group comprises successions of formations that consists of sandstone, shale and coal.

The thickest portions of the Eccca Group were deposited in the southern Karoo basin in contrast to the relatively thin sequence that is now preserved in the East Rand. This succession of sedimentary rocks generally overly the well-consolidated conglomerates/diamictites of the Dwyka Formation, but in places the Eccca Group rocks rest directly on the felsites and granites of the pre-Karoo Basement rocks.

The sediments of the Vryheid Formation overlie the uneven Dwyka floor, that is controlled by the topography of the pre-Karoo platform upon where the Karoo sediments were deposited. The Vryheid Formation, that is present throughout the Witbank area, attains some 140 m at the thickest point and contains a number of coal seams, of which four (No. 1, 2, 4 & 5 Seams) are considered to have economic potential. The deposition of the Vryheid Formation sediments is largely controlled by the irregular pre-Karoo platform where they were deposited.



The Vryheid Formation consists of mudrock, rhythmite, siltstone and fine to coarse-grained sandstone and includes five mineable coal seams. The generally horizontally disposed sediments of the Karoo Supergroup are typically undulating with a gentle regional dip to the south. The peats (coal) of the Vryheid Formation accumulated in swamps in a cool temperate climatic regime. All five mineable coal seams are present in the study area and are discontinuous due to erosion. Historically, all five seams were mined by underground bord and pillar methods.

Igneous intrusions of late Karoo Supergroup age in the form of dolerite dykes and sills also occur through the sedimentary succession. The sills usually precede the dykes, with the latter being emplaced during a later period of tensional forces within the earth's crust. Tectonically, the Karoo sediments are practically undisturbed. Faults are rare, but fractures are common in competent rocks such as sandstone and coal.

The Ogies dyke is the only significant geological structure in the Khwezela Bokgoni Colliery area and it separates Block 4 East and Block 5 West. Some minor dolerite dykes, sills and normal faulting have been recorded in the Khwezela Bokgoni Colliery area, but these do not have a measurable influence on groundwater flow and mass transport.



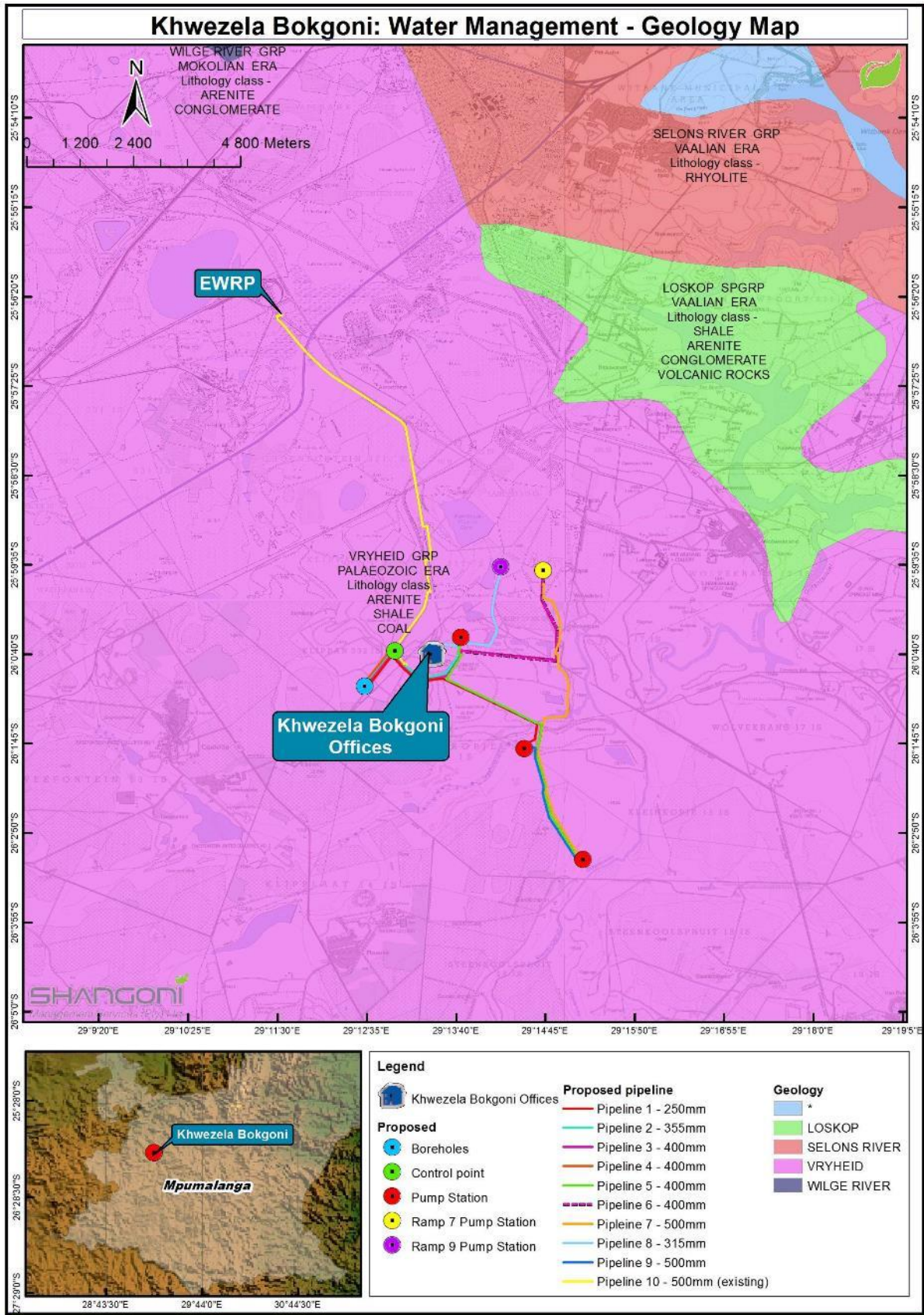


Figure 5: Regional Geology



## Chapter B: Climate

The following sources were consulted for the inclusion of the information contained in this section of this report:

- The report titled: “Anglo American – Kleinkopje Colliery; Integrated Waste Water Management Plan”, dated April 2015 with report no.: KK/IWULA/02/2154 (hereafter referred to as the IWWMP, dated April 2015);
- World Weather Online ([www.worldweatheronline.com](http://www.worldweatheronline.com));
- AGIS ([www.agis.agric.za/agismap](http://www.agis.agric.za/agismap));
- Climate-Data.Org (<http://en.climate-data.org>); and
- Wind data ([www.windfinder.com/windstatistics](http://www.windfinder.com/windstatistics)).

The climate within the area associated with Khwezela Bokgoni Colliery’s location (as well as the proposed pipelines and associated infrastructure) is typically "Highveld", with warm summers (12 to 29 degrees Celsius (°C) range) and cold winters (- 3 to 20 °C range). Frost is usually experienced between May and August. Prevailing winds are northwest and southeast with an average speed of 5.4 km/hour.

### Temperature

The closest officially recognised weather stations where these data are recorded are Carolina and Bethal. Whilst these measurements are not believed to be representative of the eMalahleni area, and are, therefore, not included in this report, they can be made available on request. Data from the Kleinkopje weather station from 1976 to 1986 are included in Table 7 below. Figure 6 below provides the average maximum and minimum temperatures for eMalahleni.

*Table 7: Mean monthly maximum and minimum temperatures from the Kleinkopje weather station (1976 to 1986)*

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Max	25	26	27	27	27	26	24	22	18	18	21	24
Min	11	13	14	15	15	11	8	4	3	2	4	7



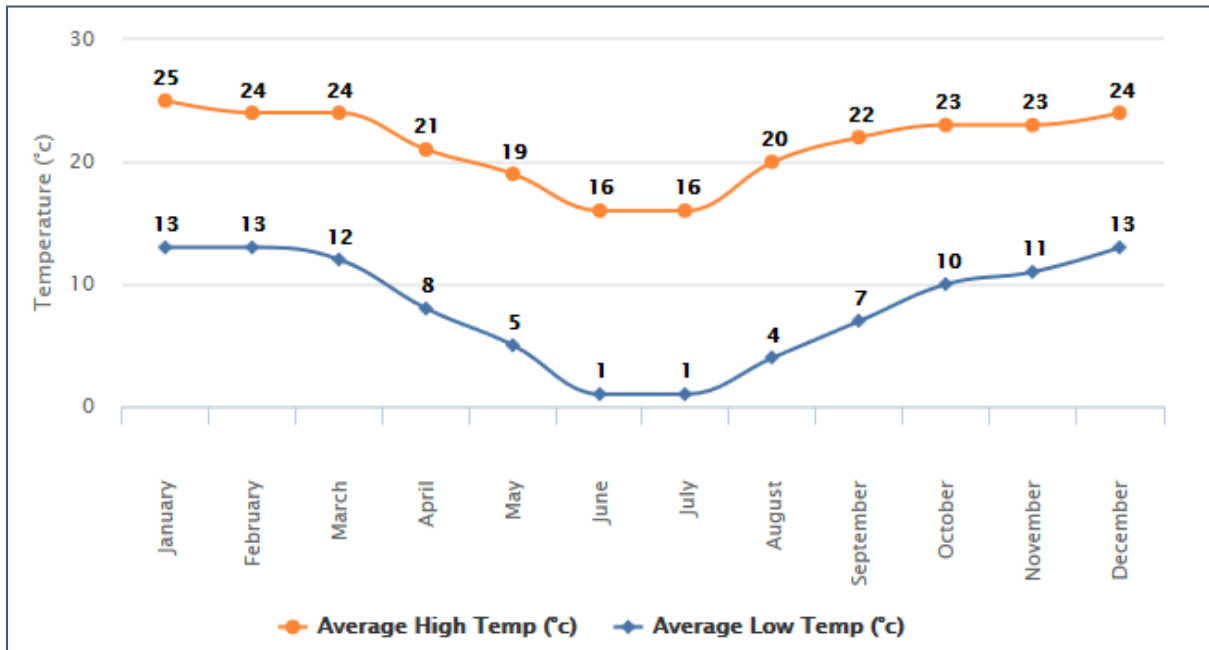


Figure 6: Average high and low temperatures for eMalahleni (source: www.worldweatheronline.com)

**Rainfall**

Rainfall has been recorded on a daily basis for the eMalahleni area. The rain falls predominantly between October and March. The average precipitation per annum is 696 mm while the maximum precipitation per annum measured since local recordings commenced, is 1 032 mm (Witbank / eMalahleni Station - 1917).

The highest monthly precipitation to date is 260 mm (November 1917). A maximum 24-hour precipitation of 94 mm has been recorded (February 1984). Table 8 shows the monthly and annual rainfall recorded at Witbank and Landau III Colliery since recording commenced.

Table 8: Rainfall statistics<sup>38</sup>

Month	Average Monthly		Average Daily	
	Kleinkopje (mm)	Landau(mm)	Kleinkopje (mm)	Date
October	87	7	77	31/10/85
November	132	7	99	30/11/97
December	99	24	57	28/12/86
January	114	77	68	01/01/78
February	101	120	86	11/02/96
March	88	109	71	25/03/95
April	26	133	38	29/04/90

<sup>38</sup> Landau III 1951 – 1986 (Weather station discontinued); Kleinkopje 1978 - 1998



Month	Average Monthly		Average Daily	
	Kleinkopje (mm)	Landau(mm)	Kleinkopje	
			(mm)	Date
May	11	88	17	21/05/83
June	9	75	48	04/06/89
July	5	46	19	25/07/83
August	12	14	34	08/08/83
September	25	7	63	27/09/87

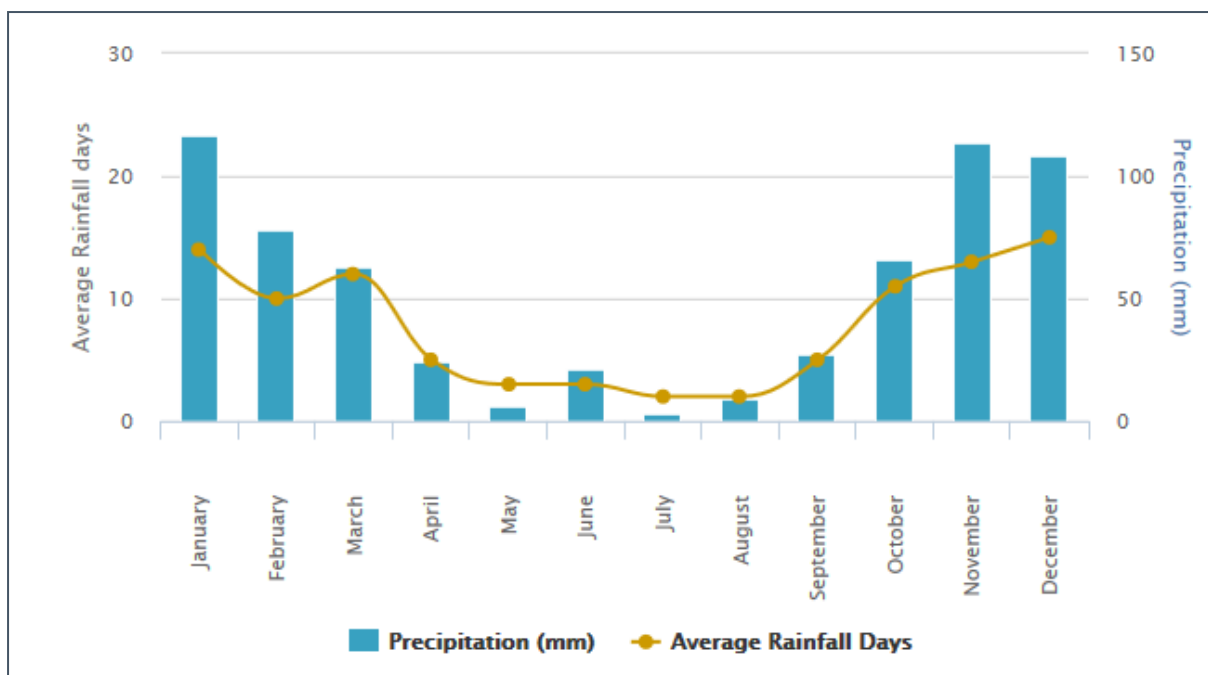


Figure 7: Average rainfall for eMalahleni (source: www.worldweatheronline.com)

**Extreme weather conditions**

Gusting winds are normally experienced during August and September months. Hailstorms are experienced occasionally at the start of the wet season between October and December. Frost is normally experienced in the winter months between May and August.

**Evaporation**

The mean monthly evaporation data from a Symons tank at the Ogies weather station for the period 1910 to 1989 and adjusted A-pan data are shown in Table 9.

Table 9: Mean monthly evaporation (mm) for Ogies weather station, based on the A-pan evaporation data (1910 – 1998)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Tot.
Symons	173	163	179	176	147	145	111	94	76	83	110	143	1600



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Tot.
Adjusted for A-pan	228	209	225	221	183	181	139	122	101	112	149	193	2096
A-pan adjusted for Open Water	141	132	142	150	124	130	95	81	67	65	86	113	1326
A-pan adjusted for Rehabilitated areas – Grassland	160	167	180	177	146	145	97	73	51	56	75	115	1442

### Wind direction and speed

The closest officially recognised weather stations where these data are recorded are Carolina and Bethal. Whilst these measurements are not believed to be representative of the eMalahleni area, and are not included in this report, they can be made available on request. Data from the Kleinkopje weather station from 1976 to 1986 are included in Table 10.

*Table 10: Mean monthly minimum and maximum wind direction and speed from Kleinkopje weather Station (1976 – 1986)*

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wind direction	NW	NW	NW	NE	NE	NE	NE	NW	NW	NW	NW	NW
Speed (m/sec)	8.5	9.11	8.16	7.82	7.40	7.98	5.30	5.17	4.82	5.30	6.59	8.32

The prevailing wind direction throughout the year is from the northwest, although it has been noted that storm winds (high velocity winds) generally blow from the southeast, with the strongest winds occurring in later winter and early spring.

### Chapter C: Topography

Khwezela Bokgoni Colliery is situated on gently undulating terrain with elevations ranging from 1498 to 1590 meters above mean sea level (“mamsl”). Surface runoff flows into marshy pans or tributaries, that in turn flow into either the Tweefonteinspruit or the Olifants River. Figure 8 below illustrates the topography of the area.





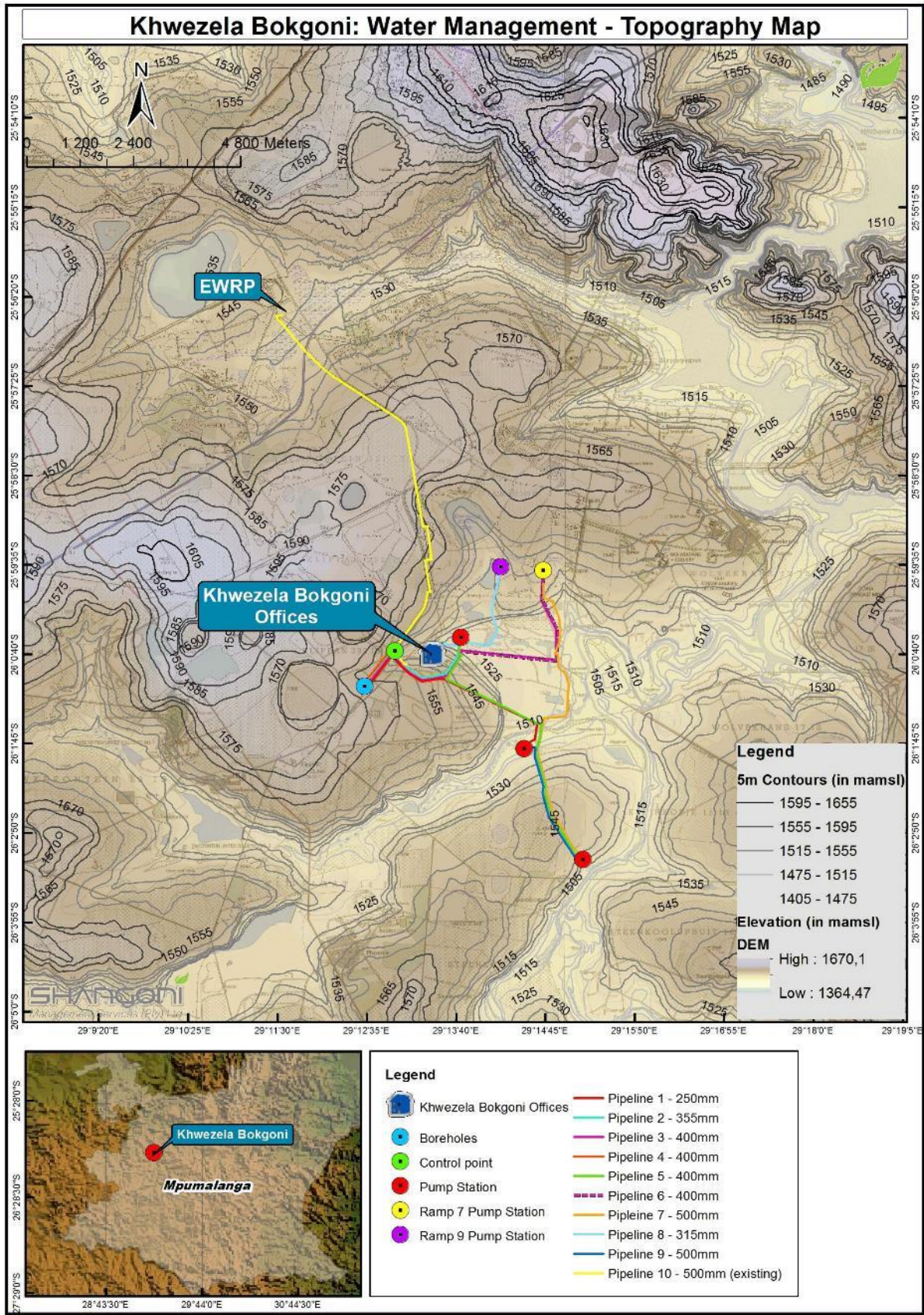


Figure 8: Topography of the area associated with the Post 2A Dam Water Management Strategy Project



## Chapter D: Soil

The soils associated with the location of the proposed Post 2A Dam Water Management Project application area are classified as freely drained, structureless soils that may have restricted soil depth, excessive drainage, high erodibility and low natural fertility (soil code S2) (refer to Figure 9 below).

As per the “*Biodiversity Action Plan for Kleinkopje Colliery*”, dated February 2014, compiled by Digby Wells (refer to Annexure C2), as well as the revised EMPr, dated April 2012, the dominant soil forms in the proposed Post 2A Dam Water Management Project application area are the red Bainsvlei and yellow Avalon.

As mentioned in the EMPR, dated 2012, hydromorphic soils occupied a portion of the Post 2A Dam Water Management Project.

## Chapter E: Vegetation

Information on vegetation as contained under this section has been obtained from the “*Biodiversity Action Plan for Kleinkopje Colliery*”, dated February 2014, compiled by Digby Wells (refer to Annexure C2).

### **Biome and vegetation types**

The study area is situated within the Grassland Biome of South Africa (Rutherford & Westfall, 1986, Mucina & Rutherford, 2006). The Grassland Biome is found on the high central plateau of South Africa, and the inland areas of Kwazulu-Natal and the Eastern Cape. The topography is mainly flat and rolling but includes the escarpment itself.

The vegetation type consists of a simple, single-layered herbaceous community of mainly tussocked grasses, herbs and forbs. High rainfall on the cold, frosty, Mpumalanga highveld, together with sandy soils, controls the distribution of this vegetation type.

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

The study area is situated within an area vegetated by the Moist Sandy Highveld Grassland vegetation type according to Low & Rebelo (1998) with the most recent vegetation classification, classifying it as Eastern Highveld Grassland (Mucina & Rutherford 2006). The vegetation type is considered to be endangered nationally with none conserved and 55 % altered, primarily by cultivation. The conservation status of this vegetation type is very poor, with large parts that are either currently cultivated or have been previously ploughed, and the remaining untransformed vegetation that occurs as patchy remnants that are often heavily grazed.



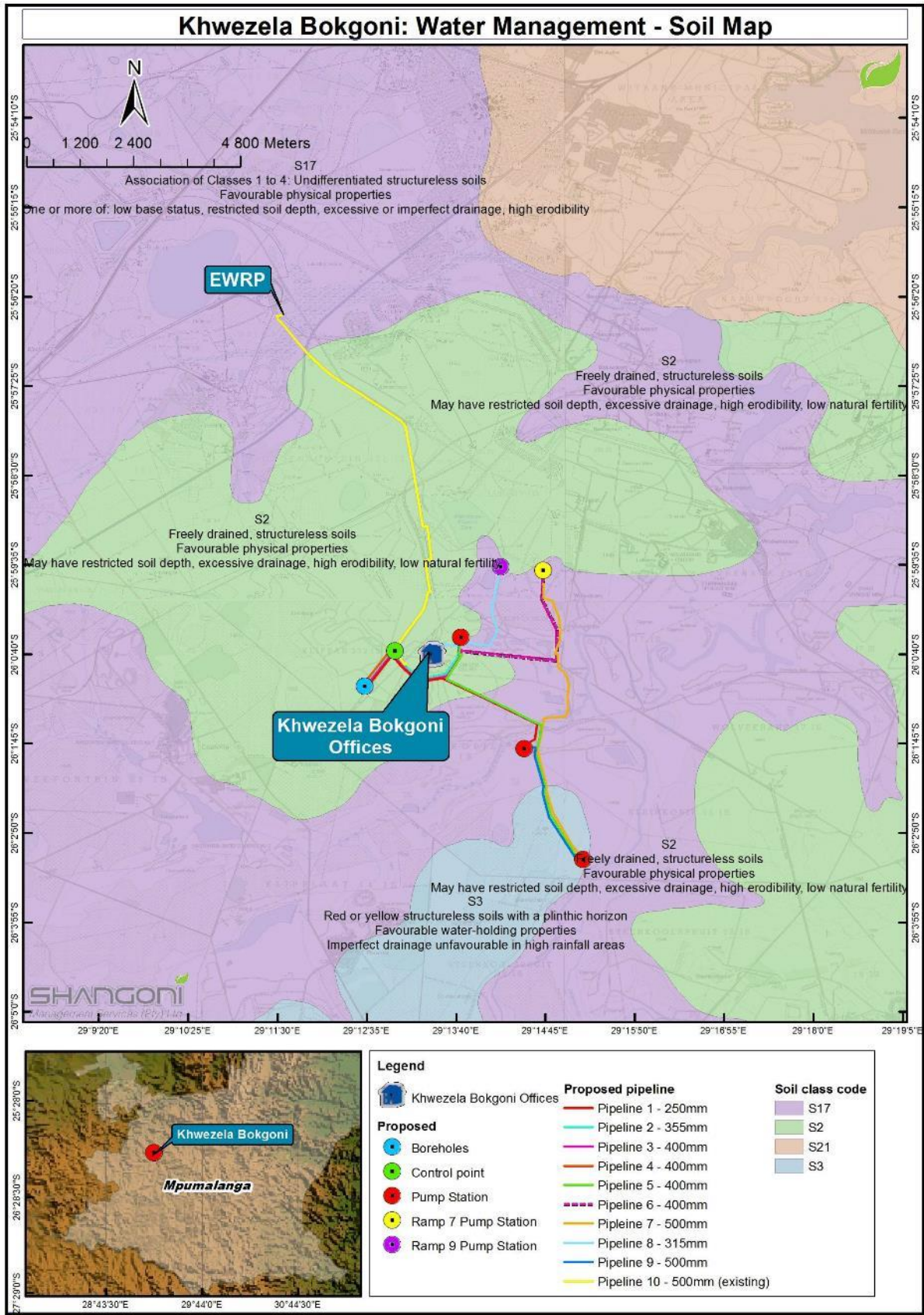


Figure 9: General soil map



Moist Sandy Highveld Grassland is dominated by the grasses *Eragrostis plana*, *Eragrostis curvula*, *Heteropogon contortus*, *Trachypogon spicatus* and *Themeda triandra*. Acocks (1988) describes the same area as Bankenveld and considers it to be a sour vegetation type where forbs play an important part. He described three variations of which the eastern variation occurs in the study area. This variation occurs on flattish sandy country where the dominant species include *Tristachya leucothrix*, *Eragrostis racemosa*, *Heteropogon contortus*, *Trachypogon spicatus*, *Digitaria tricholaenoides*, *Themeda triandra* and others. *Tristachya biseriata* may be abundant on ridges.

The mine boundary area is situated in an endangered ecosystem. This means that the ecosystem has undergone degradation of ecological structure, function or composition as a result of human intervention, although it is not critically endangered.

### **Dominant species**

Important taxa that may be present in the project area include:

**Graminoids:** *Aristida aequiglumis*; *A.congesta*; *A.junciformis* subsp *galpinii*; *Brachiaria serrate*; *Digitaria monodactyla*; *D.tricholaenoides*; *Elionurus muticus*; *Eragrostis chloromelas*; *E.curvula*; *E.plana*; *E.racemosa*; *E.sclerantha*; *Heteropogon contortus*; *Loudetia simplex*; *Monocymbium cerasiiforme*; *Setaria sphacelata*; *Sporobolus africanus*; *S.pectinatus*; *Themeda triandra*; *Trachypogon spicatus*; *Tristachya leucothrix*; *T.rehmannii*; *Alloteropsis semialata*; *Andropogon appendiculatus*; *A.schirensis*; *Bewsia biflora*; *Ctenium concinnum*; *Diheteropogon amplexans*; *Eragrostis capensis*; *E.gummiflua*; *E.patentissima*; *Harpochoa falx*; *Panicum natalensis*; *Rendlia altera*; *Schizachyrium sanguineum*; *Setaria nigrirostris*; *Urelytrum agropyroides*.

**Herbs:** *Berkheya setifera*; *Haplocarpha scaposa*; *Justicia anagalloides*; *Pelargonium luridum*; *Acalypha angustata*; *Chamaecrista mimosoides*; *Dicoma anomala*; *Euryops gilfillanii*; *E.transvaalensis*; *Helichrysum aureonitens*; *H.caespitium*; *H.callicomum*; *H.oreophilum*; *H.rugulosum*; *Ipomoea crassipes*; *Pentanisia prunelloides*; *Selago densiflora*; *Senecio coronatus*; *Vernonia oligocephala*; *Wahlenbergia undulata*.

**Geophytic Herbs:** *Gladiolus crassifolius*; *Haemanthus humilis*; *Hypoxis rigidula*; *Ledebouria ovatifolia*.

**Succulent Herbs:** *Aloe ecklonis*

**Low Shrubs:** *Anthospermum rigidum* subsp. *pumilum*; *Stoeboe plumosa* (*Mucina and Rutherford, 2006*)



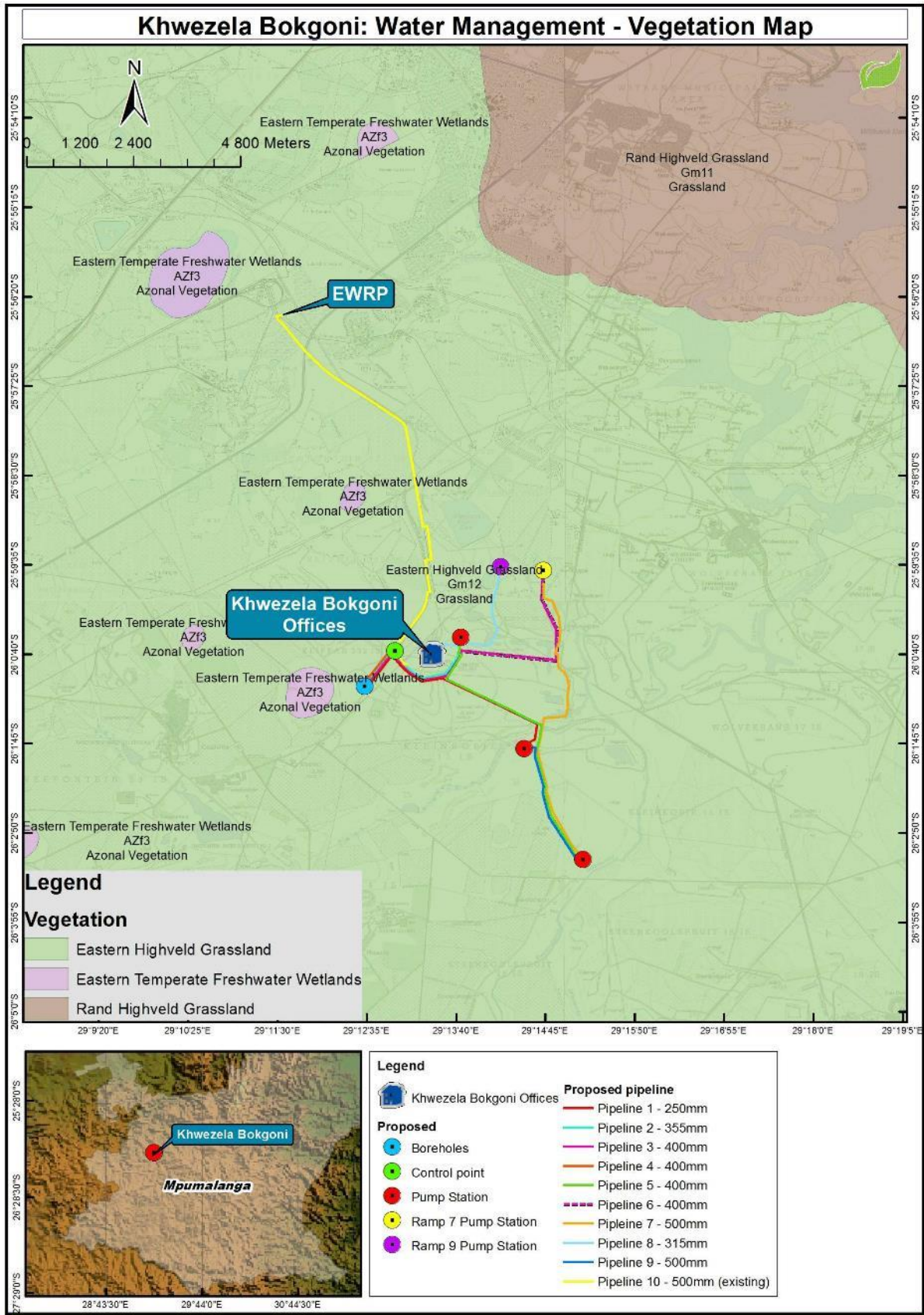


Figure 10: General vegetation of the area



### Threatened Flora

A list of threatened species that are likely to occur within the project area is shown in Table 11. Only one species *Gladiolus macneillii*, that is included even though it does not occur on the National Herbarium of Pretoria (PRE) Computerised Information system (PRECIS) list for the area, is endangered, and may require special measures to protect any populations that are positively identified. The remainder of the threatened species are in the vulnerable and near threatened categories indicating that conservation efforts aimed at the level of habitat conservation are adequate in the surface rights area.

Table 11: Threatened species that are likely to occur on the Khwezela Bokgoni Colliery surface rights area (Source: Digby Wells, 2014)

Scientific Name	Common Name
<i>Gladiolus macneillii</i>	Gladiolus
<i>Gladiolus rufomarginatus</i>	
<i>Gladiolus varius</i>	
<i>Satyrium microrrhynchum</i>	Orchid
<i>Ledebouria appresifolia</i>	Ledebouria
<i>Eulophia leachii</i>	Orchid
<i>Gladiolus vernus</i>	Gladiolus
<i>Kniphofia triangularis</i>	Red hot poker
<i>Nerine gracilis</i>	Nerine

### Medicinal Plants

According to the PRECIS list one medicinal plant may occur on the Khwezela Bokgoni Colliery surface rights area. However, this species was not found during the field visit. Refer to Table 12 below.

Table 12: Medicinal plants found on the Khwezela Bokgoni Colliery surface rights area (source: Digby Wells, 2014)

Scientific name	Common name	Uses	Habitat	Observed
<i>Hypoxis hemerocallidea</i>	<i>Gifbol</i>	Medicinal	Grassland	No, related species <i>Hypoxis interjecta</i> was observed.

### Invader or exotic species

The Khwezela Bokgoni Colliery surface rights have been extensively invaded by alien plants in places particularly wattles as indicated in Table 13. In 1995 PPRI issued a report entitled 'Management Plan for the Control of Alien Plants at Kleinkopje' by P Campbell and D Naude. The study found that the main alien species within the area include: Black and silver wattle; Eucalyptus species; Wild tomato;



Bugweed; Bitter apple; Pluisbossie; Prickly Pear; Sesbania; Pampas grass; Pine species; Weeping willow; Peach trees; Blackwood trees; and Poplar trees. Species noted during the Biodiversity study conducted in 2013 are listed in Table 13.

Table 13: Alien plants found on the Khwezela Bokgoni Colliery Surface rights area (source: Digby Wells, 2014)

Scientific Name	Common Name	Status	Habitat
<i>Acacia mearnsii</i>	Black Wattle	Transformer declared (category 2)	and weed Invades most habitats, particularly watercourses, roadsides, disturbed grassland.
<i>Acacia dealbata</i>	Silverwattle	Category 2	Invades most habitats, particularly watercourses, roadsides, disturbed grassland.
<i>Acacia decurrens</i>	Greenwattle	Category 2	Invades most habitats, particularly watercourses, roadsides, disturbed grassland.
<i>Solanum sisymbriifolium</i>	Wild tomato	Declared.	Invades disturbed landscapes such as road sides, cultivated fields, disturbed grassland.
<i>Tagetes minuta</i>	Kakiebos	Declared weed	Invades disturbed grassland, cultivated land, roadsides.
<i>Eucalyptus camaldulensis</i>	Red river gum	Transformer declared (category 2)	and invader Invades forest gaps, plantations, watercourses and roadsides.
<i>Bidens pilosa</i>	Blackjack	Cosmopolitan weed	Invades cultivated land, disturbed watercourses and grasslands
<i>Cirsium vulgare</i>	Scottish thistle	Declared weed	Invades grasslands, roadsides, old lands, vleis, wetland margins
<i>Argemone mexicana</i>	Mexican Poppy	Declared weed	Invades roadsides, wastelands, river margins, cultivated lands.
<i>Solanum mauritanum</i>	Bugweed	Category 1 invader, agricultural weed.	Invades disturbed grassland, cultivated



Scientific Name	Common Name	Status	Habitat
			land, roadsides, plantations.
<i>Solanum elaeagnifolium</i>	Bitter apple	Category 1 invader, agricultural weed.	Invades disturbed grassland, cultivated land, roadsides, plantations.
<i>Opuntia ficus-indica</i>	Prickley Pear	Category 1, invader	-
<i>Lopholaena coriifolia</i>	Pluisbossie	Not listed	-
<i>Sesbania punicea</i>	Sesbania	Category 1, invader	-
<i>Cortadaria selloana</i>	Pampas grass	Category 1, invader	-
<i>Pinus patula</i>	Patula Pine	Category 2, invader	Grassland, Forest margins, road cuttings
<i>Salix Babylonica</i>	Weeping Willow	Category 2, invader	Waterways
<i>Prunus persica</i>	Peach	Not listed	Roadsides, riverbanks, waste places, urban areas.
<i>Acacia melanoxylon</i>	Blackwood	Category 2, invader	Roadsides, riverbanks, waste places, urban areas
<i>Populus canescens, P. deltoids, P. nigra</i>	Poplar	Declared invader category 2)	Invades riverbanks and marshes

## Chapter F: Fauna

Information on fauna as contained under this section has been obtained from the “*Biodiversity Action Plan for Kleinkopje Colliery*”, dated February 2014, compiled by Digby Wells (refer to Annexure C2).

### Commonly occurring species

The Khwezela Bokgoni Colliery provides varied habitats for a number of species, despite the terrestrial ecology of the area being largely modified. The species present are, however, lower than would be expected of a pristine area that is reflective of a history of anthropogenic activity that has negatively impacted biodiversity within the area.

The natural areas that exist within the area provide habitat for these species, while the transformed areas may provide a source of food. Natural areas are priorities for conservation of species and should be maintained in order that biodiversity is enhanced. Wetlands are particularly high priority natural areas as a result of the significant role they play in provision of habitat and support of Biodiversity furthermore, they provide potential habitat for the Red Data listed amphibian, the Giant Bullfrog. Furthermore, the wetland areas provide habitat for the owl species that are planned to be reintroduced to the area.

Mining and agriculture have transformed much of the natural vegetation, that has resulted in alteration of the natural ecology, however, positive outcomes have been that different species have colonised in





these areas that formerly did not provide suitable habitat, such as the Giant Kingfisher and Black Sparrow-hawk. These species are comfortably sustained in these locations; however, their habitat could be vastly improved in a number of situations through various means. Habitat improvement could be initiated through various activities such as increased 'natural' areas, corridor creation, decreased disturbances to habitat, water quality improvement and rehabilitation. Furthermore, mechanisms such as bat boxes and owl boxes could be implemented in order to attract species to the area.

Faunal surveys revealed that black-backed jackal, yellow mongoose, and scrub hare inhabit the natural areas. Evidence in the form of spoor, quills, droppings, soil mounds and grass clippings indicated the presence of porcupine, Cape clawless otter, common duiker, Hottentot golden mole, Highveld gerbil, and vlei rat.

### Protected faunal species

Protected faunal species that could occur in the area are outlined in Table 14 below. The vegetation type determines which animals can be supported on the land area, Figure 10 details the vegetation types (as referred to in the Biodiversity Action Plan, dated 2014) present on Khwezela Bokgoni Colliery.

Table 14: Protected fauna species that could possible occur in the area associated with the proposed project (Source: Digby Wells, 2014)

Scientific Name	Common Name	Observed	Habitat on Site	
<b>Mammal Species</b>				
<i>Chrysospalax villosus</i>	Rough-haired Golden Mole	No	All natural sites	
<i>Orycteropus afer</i>	Ardvark	No	All natural sites	
<i>Proteles cristatus</i>	Aardwolf	No	All natural sites	
<i>Poecilogale albinucha</i>	African Striped Weasel	No	All natural sites	
<i>Atelerix frontalis</i>	Southern African Hedgehog	No	All natural sites	
<i>Felis serval</i>	Serval	Yes	All natural sites	
<i>Mystromys albicaudatus</i>	Whitetailed Mouse	No	All natural sites	
<b>Reptile Species</b>				
<i>Python sebae</i>	African Python	Rock	No	All natural sites
<i>Tetradactylus africanus</i>	Beyer's Seps	Longtailed	No	All natural sites
<i>Homoroselaps dorsalis</i>	Striped Snake	Harlequin	No	All natural sites



Scientific Name	Common Name	Observed	Habitat on Site
<b>Bird Species</b>			
<i>Podica senegalensis</i>	African Finfoot	No	Pans/Wetlands/River
<i>Circus ranivorus</i>	African Marsh Harrier	No	Pans/Wetlands/River/Grassland
<i>Geronticus calvus</i>	Bald Ibis	Yes	Grasslands and agriculture for feeding, requires cliffs for breeding.
<i>Circus maurus</i>	Black Harrier	No	Pans/Wetlands/River/Grassland.
<i>Ciconia nigra</i>	Black Stork	No	Pans/Wetlands/River/Grassland. Requires cliffs and gorges for breeding.
<i>Glareola nordmanni</i>	Blackwinged Pranticole	No	Pans/Wetlands/River/Grassland.
<i>Anthropoides paradiseus</i>	Blue Crane	Yes	Pans/Wetlands/River/Grassland. Feeding and breeding.
<i>Eupodotis caerulescens</i>	Blue Korhaan	No	Pans/Wetlands/River/Grassland. Feeding and breeding.
<i>Spizocorys fringillaris</i>	Botha's Lark	No	Pans/Wetlands/River/Grassland. Feeding and breeding
<i>Balearica regulorum</i>	Crowned Crane	No	Pans/Wetlands/River/Grassland. Feeding and breeding.
<i>Tyto capensis</i>	Grass owl	No	Pans/Wetlands/River/Grassland. Feeding and breeding
<i>Phoenicopterus ruber</i>	Greater Flamingo	No	Wetland/Pan areas
<i>Alcedo semitorquata</i>	Halfcollared Kingfisher	No	Pans/Wetlands/River/Grassland. Feeding and breeding
<i>Phoenicopterus minor</i>	Lesser Flamingo	No	Wetland/Pan areas
<i>Phoenicopterus ruber</i>	Greater Flamingo	Yes	Wetland/Pan areas, 2A dam, Klippan discard dump
<i>Falco naumanni</i>	Lesser Kestrel	No	Pans/Wetlands/River/Grassland. Feeding and breeding
<i>Pelecanus rufescens</i>	Pinkbacked Pelican	No	Wetland/Pan areas
<i>Sagittarius serpentarius</i>	Secretary Bird	Yes	Pans/Wetlands/River/Grassland. Feeding and breeding
<i>Neotis denhami</i>	Stanley's Bustard	No	Pans/Wetlands/River/Grassland. Feeding and breeding



Scientific Name	Common Name	Observed	Habitat on Site
<i>Grus carunculata</i>	Wattled Crane	No	Pans/Wetlands/River/Grassland. Feeding and breeding
<i>Eupodotid cafra</i>	Whitebellied Korhaan	No	Pans/Wetlands/River/Grassland. Feeding and breeding
<i>Mycteria ibis</i>	Yellowbilled Stork	No	Pans/Wetlands/River/Grassland. Feeding and breeding

## Chapter G: Surface water

Information on surface water was sourced from the following documents:

- The report titled: “*Anglo American – Kleinkopje Colliery; Integrated Waste Water Management Plan*”, dated April 2015 with report no.: KK/IWULA/02/2154 (hereafter referred to as the IWWMP, dated April 2015);
- The report titled: “*Kleinkopje Colliery revised and consolidated EIA and EMP, report prepared for Anglo American Operations Limited – Thermal Coal*”, with report No 414908, compiled by SRK Consulting and dated April 2012 (here after referred to as the revised EMP, dated April 2012); and
- The report titled: “*Anglo Coal Kleinkopje Colliery - Annual Water Quality Assessment Report*”, dated December 2015 (for the period January – November 2015), compiled by Aquatico Scientific (attached as Annexure C3).

### Catchment area and watercourses

The locations associated with the proposed pipelines and associated pump stations are situated in quaternary catchment B11F (refer to Figure 11 below), that forms part of the Olifants River catchment area. The Olifants River, that is part of the regional drainage network of the province, leaves the Colliery boundaries at the Wolverkrans weir (1,503 masl).

The Standerspruit previously traversed the area that is now referred to as the Pit (Block) 2A mining area. A watercourse alteration was originally constructed in the Standerspruit in 1998 before mining commenced at Khwezela Bokgoni Colliery. The channel diverts clean surface runoff from the plant area and catchments upslope of its position. Due to commencement of opencast mining operations in Pit 2A, a subsequent watercourse alteration was constructed. This subsequent watercourse alteration, that was completed early in 1994, is situated north of the original watercourse alteration. The construction of the Block 2A dam necessitated some modifications to this watercourse alteration. Further modifications were done in 1999. These modifications entailed the re-routing of a section of the diversion around the advancing mining operation.

### Mean annual runoff

Mean annual runoff (“MAR”) is based on the relevant quaternary catchment runoff as obtained from the WR2005. The MAR values are presented in the Table 15 below. The MAR for the afore-mentioned watercourse alteration is indicated in Table 16 below.



Table 15: Mean Annual Runoff for quaternary catchment based on the WR2005

Catchment	Total Area Km <sup>2</sup>	Nett Area Km <sup>2</sup>	MAR 10 <sup>6</sup> m <sup>3</sup> /a	Unit 10 <sup>6</sup> /m <sup>3</sup> /a/km <sup>2</sup>	MAR
B11F	368	337	15.7	0.046	

Table 16: Watercourse alteration flow volumes calculated with the WRSM90

Criteria (volumes in million m <sup>3</sup> )	Catchments 1, 2, 3, 4a, 4b, 5, 6
Area (km <sup>2</sup> )	16.15
MAR	0.79
Wettest year (1917 – 1918)	3.37
Driest year (1932 – 1933)	0.08

#### Average dry weather flow

The average dry weather flows for the catchment was again derived from the monthly quaternary flow data set derived in the WR2005 Report. Refer to Table 17 below.

Table 17: Computed dry weather flows of the relevant catchment

Catchment	Flow m <sup>3</sup> /m	Flow l/s
Quaternary B11F	130.3	50.3

#### Surface water use

The main categories of water use within the surrounding area are:

- Industrial;
- Potable;
- Agricultural;
- Aquatic; and
- Recreational

The Witbank Dam, being the receiving water body, starts directly below the Wolwekrans weir, that is regarded as the position that the Olifants River leaves the property. The main water users extracting or utilising water from the Witbank Dam are:

- Highveld Steel and Vanadium Corporation;
- Eskom;
- eMalahleni Municipality; and
- Recreational and aquatic life.



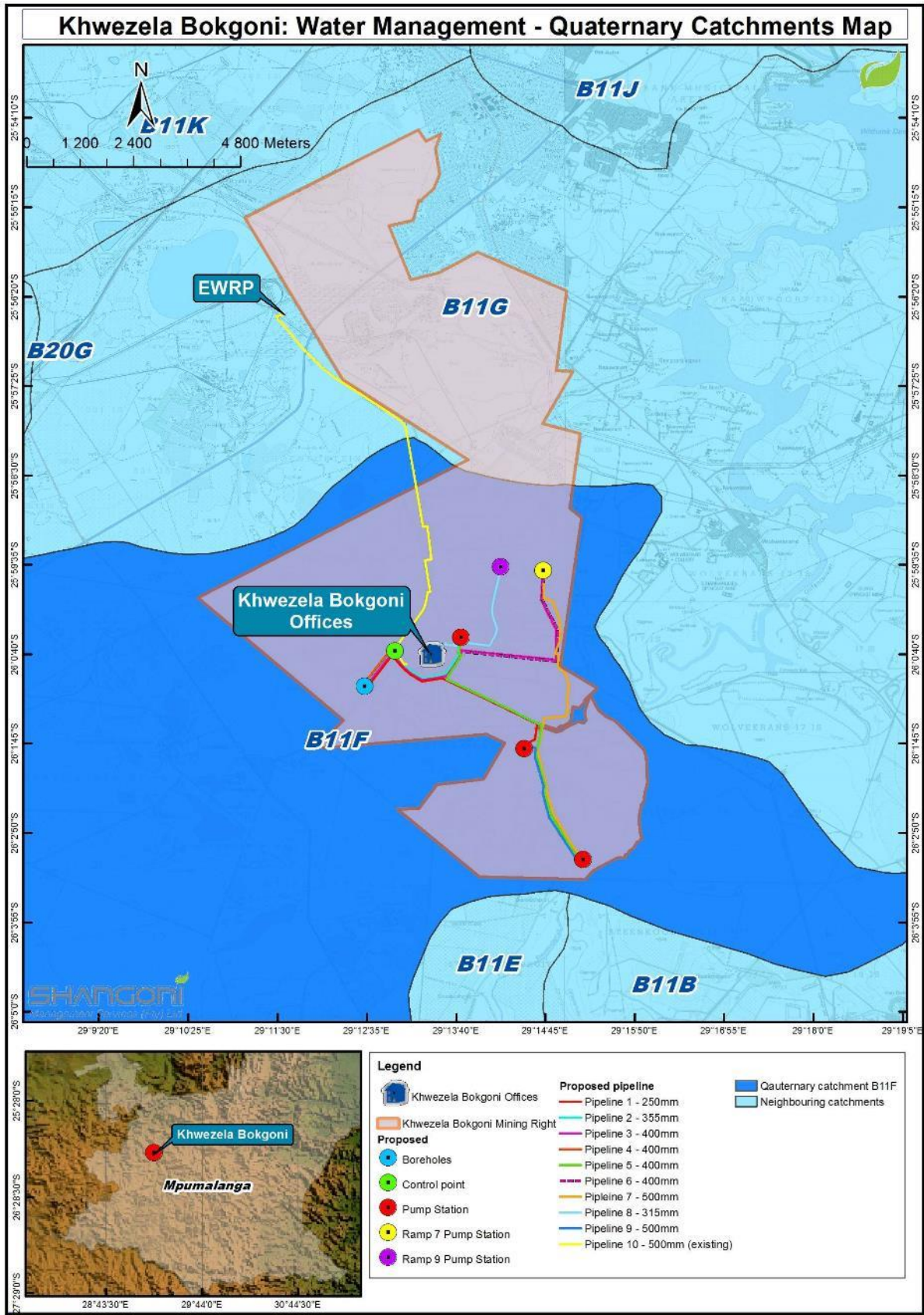


Figure 11: Quaternary catchment relevant to the proposed project

### Surface water quality

Surface water quality monitoring programme



Khwezela Bokgoni Colliery has contracted Aquatico Scientific (Pty) Ltd. to conduct drinking water and surface water monitoring. The Annual Water Quality Report (AWQR) dated December 2017 describes the results of the water monitoring programme from January to December 2017. As indicated in the AWQR, the water monitoring localities of various variables were compared to that of the limits as set in SANS 241 – 1:2015 (Drinking Water Limits) and the Khwezela Bokgoni Colliery Integrated Water Use Licence (IWUL), dated December 2011 (Licence No. 04/B11J/AFGJ/1416).

Table 18 below provides a description of the surface water and process water monitoring localities. Furthermore, the surface water monitoring localities are indicated in Figure 12, and the process water monitoring localities are indicated in Figure 13 below.

*Table 18: Description of the surface and process water monitoring localities at Khwezela Bokgoni Colliery*

Monitoring Locality	Description
<b>Surface Water Monitoring Localities</b>	
WP042	Olifants River In
RW004	Olifants River Out
WP037 Upstream	Upstream of WP037
WP037	Tweefontein Spruit in
WP039	Tweefontein Spruit above 5 West HD
WP040	Tweefontein Spruit Out
WP074	Stander Spruit
WP033	North East Spruit Out
WP012	Naauwpoort Spruit where entering KK
WP008	Naauwpoort Spruit at Klipfontein Dump
WP011	Landau Under Highway Culvert
WP029	Naauwpoort Spruit Out
<b>Process Water Monitoring Localities</b>	
WP083	Klippan Return Water at Penstock
WP093	Clarified Tanks – Thickener Dam
WP095	Klippan Toe Seep
WP009	2A Dam
RW011A	Eriicson Dam 1
RW011B	Arms Tank
RW011C	Erickson Dam 2
RW003	Plant Return Water Dam



Monitoring Locality	Description
WP096	Oil Separator
WP097	Oil Separator
WP036	Klipfontein Toe Trench

### Surface water quality monitoring results

#### *Physical Water Quality:*

The majority of surface water localities can be described as neutral in terms of pH values obtained during the annual sampling period of 2017. The only exception was locality WP008 that could be described as acidic. Similarly, the majority of localities could also be described as non-saline except for localities WP039 and WP008 (very saline) as well as localities WP037, WP037 Upstream and WP040 (saline). Classification based on total hardness showed that water from the surface water localities ranged from slightly hard to extremely hard.

#### *Chemical Water Quality:*

Locality WP042 was the only surface water locality that could be classified as Ideal water quality in terms of the chemical variables analysed. Localities WP012 and WP029 could be classified as Good water quality while localities WP037, WP037 Upstream and WP033 could be classified as Marginal water quality. The majority of the localities could be classified as either Poor or Unacceptable water quality due to elevated sulphate, calcium and manganese concentrations. The most problematic locality still appears to be locality WP008 that could be classified as Unacceptable water quality. This was a result of extremely high sulphate concentrations coupled with high calcium and metals concentrations as well as an acidic pH.

#### *Bacteriological Water Quality:*

The majority of surface water localities could be classified as either Poor or Unacceptable water quality during the 2017 monitoring period. The most problematic locality, WP029, had extremely high faecal coliform concentrations on multiple occasions during the 2017 annual period.



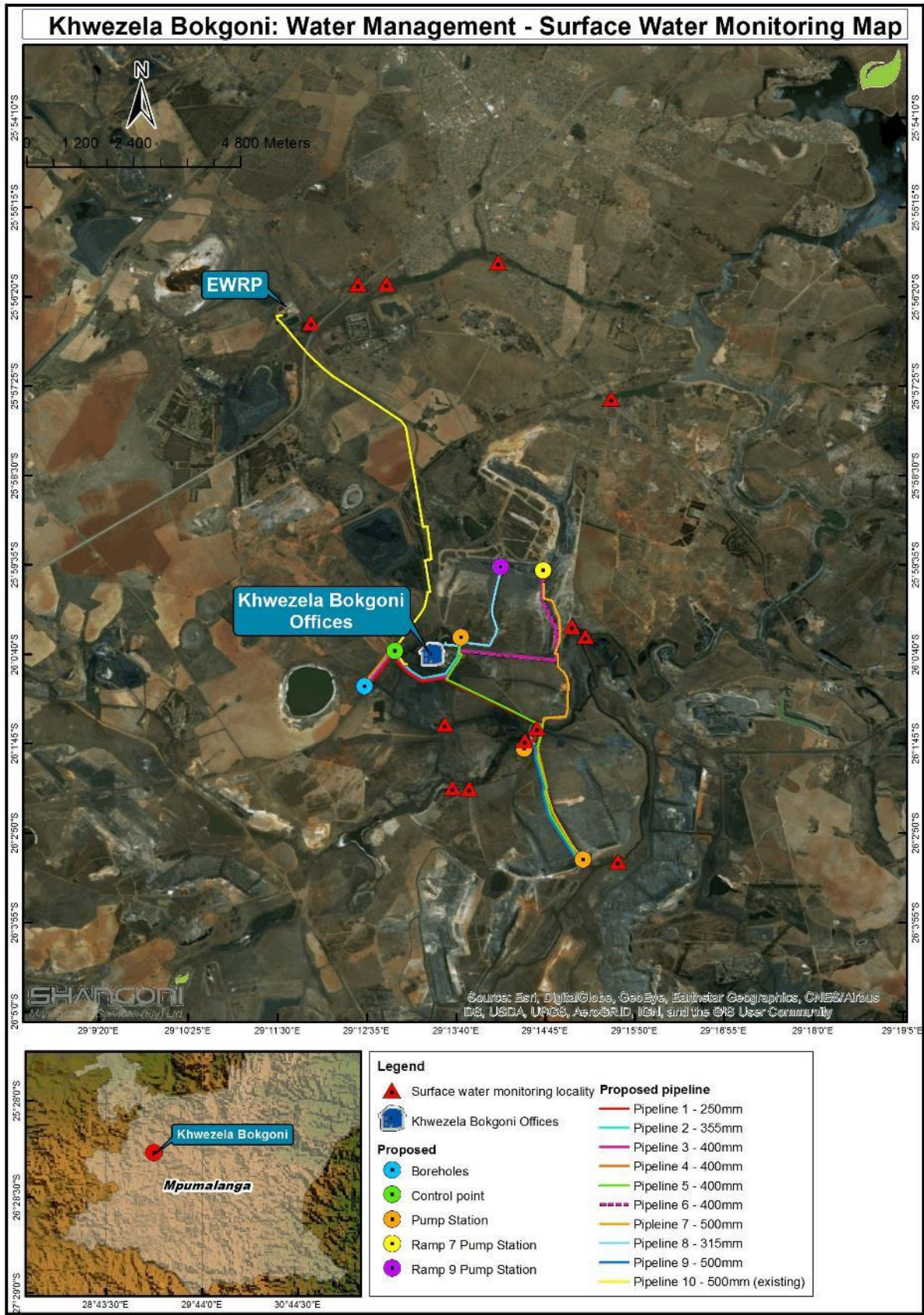


Figure 12: Surface Water Monitoring Points





## Process Water Quality Monitoring Results

### *Physical Water Quality*

The majority of water from the process water localities could be classified as neutral, extremely saline and extremely hard (refer to Table 4 in Annexure C3).

### *Chemical Water Quality*

In terms of the analysed chemical variables, all of the process water localities could be classified as Unacceptable water quality (refer to Table 4 in Annexure C3). This was due to high concentrations of sulphate, calcium and magnesium.

### *Bacteriological Water Quality*

All of the process water localities could be classified as either Poor or Unacceptable water quality as high faecal coliforms were detected at each sampling point (refer to Table 8 in Annexure C3). Localities RW003, RW011, RW011B, RW011C, WP083, WP093 and WP009 could be classified as Poor water quality. The most problematic localities (WP095, WP096 and WP097) could be classified as Unacceptable water quality as numerous faecal coliforms were present on multiple occasions.

## Resource class and river health

In South Africa, a river health classification scheme is used to standardise the output of different river systems. The document titled “*Resource Directed Measures for Protection of Water Resources: River Ecosystems Version 1.0.24*”, dated September 1999, compiled by the Department of Water and Sanitation (DWS), provides the indexes of Attainable Ecological Management Classes as shown in Table 19 below. Each index is calibrated so that its results can be expressed in terms of ecological and management perspectives.

Table 19: Resource classes as set out by the Department of Water and Sanitation

River Class	Health	Ecological perspective	Management perspective
Natural / Excellent (Class A)		No or negligible modification of in-stream and riparian habitats and biota.	Protected rivers; relatively untouched by human hands; no discharges or impoundments allowed.
Good (Class B)		Ecosystems essentially in good state; biodiversity largely intact.	Some human-related disturbance but mostly of low impact potential.
Fair (Class C)		A few sensitive species may be lost; lower abundances of biological populations are likely to occur, or sometimes, higher abundances of tolerant or opportunistic species occur.	Multiple disturbances associated with need for socio-economic development, e.g. impoundment, habitat modification and water quality degradation.
Poor (Class D)		Habitat diversity and availability have declined; mostly only tolerant species present; species present are often diseased; population dynamics have been disrupted (e.g. biota can no longer reproduce or alien species have invaded the ecosystem).	Often characterised by high human densities or extensive resource exploitation. Management intervention is needed to improve river health – e.g. to restore flow patterns, river habitats or water quality.



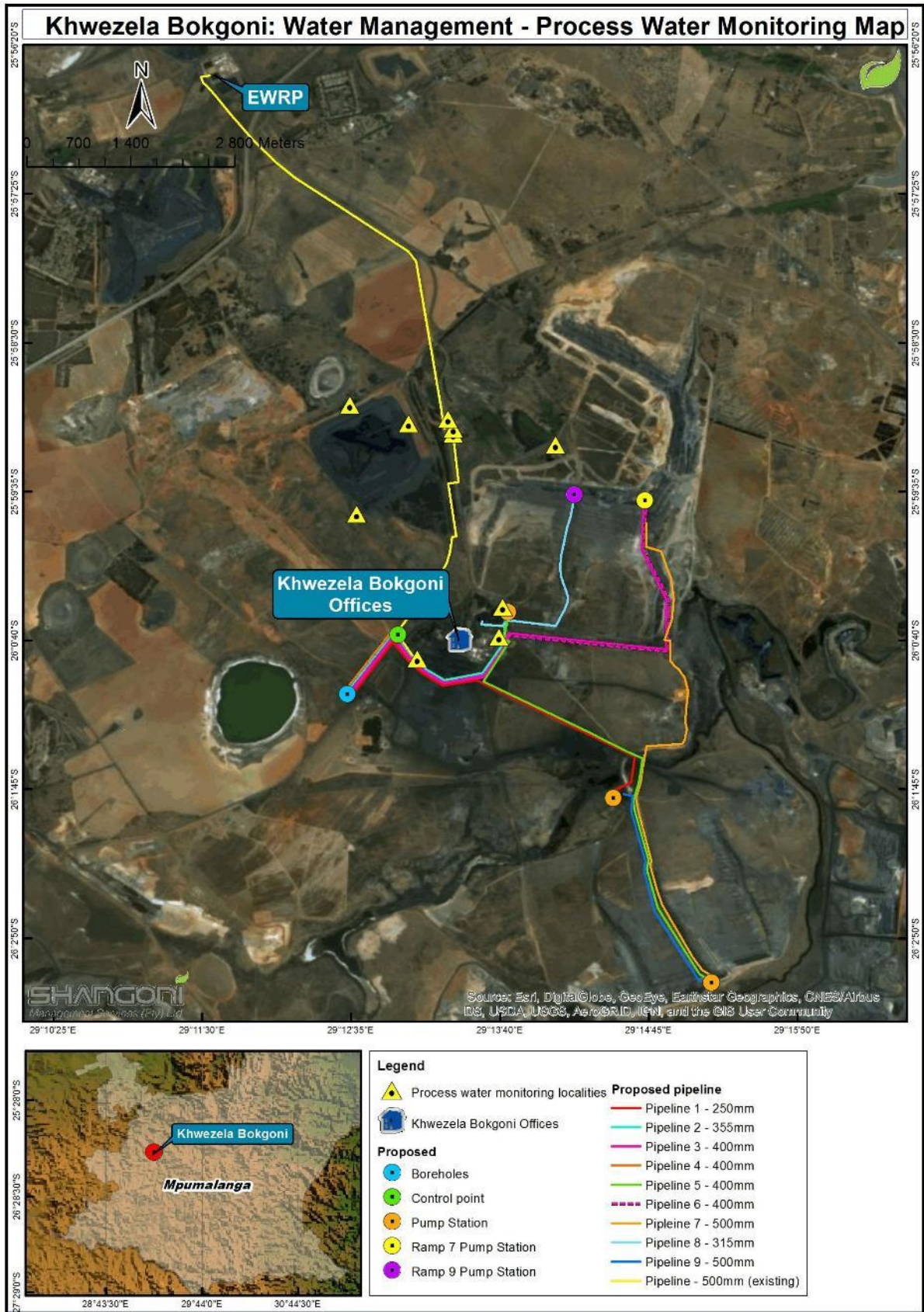


Figure 13: Process Water Monitoring Points



The Upper reach of this section of the Olifants River Catchment falls into the Ecological Management Class D as defined in Table 19 above

*Aquatic environment*

The information contained in this section of this report was sourced from the following document:

- The report titled: “*Biomonitoring and toxicity assessment of the Tweefonteinspruit, Naauwpoortspruit and Olifants River*”, dated December 2015 and compiled by Nepid Consultants (refer to Annexure C4).

Biomonitoring is conducted at Khwezela Bokgoni Colliery on a bi-annual basis (during the winter and summer months). Biomonitoring was undertaken at six sites (Table 20). Photographs of the biomonitoring sites are shown in Appendix B of Annexure C4.

*Table 20: Details of monitoring sites in the vicinity of Khwezela Bokgoni Colliery*

Code	Name	Wetland Type
WP012	Naauwpoortspruit IN	Un-channelled Valley Bottom
WP029	Naauwpoortspruit OUT	Un-channelled Valley Bottom
WP037	Tweefonteinspruit IN	Un-channelled Valley Bottom
WP040	Tweefonteinspruit OUT	Un-channelled Valley Bottom
WP042	Olifants River IN	Lowland River
RW004	Olifants River OUT	Lowland River

**Results**

*Surface Water Quality:*

Surface water quality in December 2015 showed a general improvement compared to the previous survey, conducted in June 2015. The improvement is attributed to a single and localised rainfall event that took place 42 days before the field survey. However, stormwater runoff that is likely to have been associated with this rainfall event contributed to elevated turbidity in the Tweefonteinspruit and Olifants River.

*Benthic Diatoms:*

Summary results of diatoms recorded in December 2015 are shown in Table 21, and detailed data are presented in Annexure C4.

*Table 21: Summary results - Diatoms*

Site	No. species	SPI score	Class	Category	PTV (%)	Valve deformities (%)
WP042	28	10.9	Moderate quality	C/D	32.3	1



Site	No. species	SPI score	Class	Category	PTV (%)	Valve deformities (%)
RW004	45	9.4	Poor quality	D	28.5	0.75
WP037		13	Moderate quality	C	20.8	0
WP040		8.2	Poor quality	D	39.9	0
WP012	18	6	Bad quality	E	80.3	1.25
WP029	14	4.6=8	Bad quality	E/F	79.3	1

*Aquatic Macro Invertebrates:*

The diversity of aquatic macroinvertebrates in Olifants River in December 2015 was similar at the two sites, with 8 taxa recorded upstream, and 10 taxa recorded downstream. Similar results were recorded during the previous survey. This was despite cessation of flow in the Olifants River for a period of 30 days in October/November 2015. The most sensitive taxon at both sites was freshwater shrimp (Atyidae), has a moderate sensitivity score of 8/15.

These shrimps were moderately abundant at both sites. The proportion of air-breathing taxa was the same at the two sites (50%). The results show that there was no measurable difference in the composition or abundance of aquatic macroinvertebrates at the two monitoring sites.

*Toxicity:*

Toxicity tests conducted in December 2015 indicated an increase in overall toxicity throughout the area, with all sites having some degree of toxicity, and seven sites (50%) classified as Highly Toxic. By contrast, the previous survey recorded no toxicity at eight sites, and two sites (14%) were classified as Highly Toxic (Table 4-2 in Annexure C4).

**Chapter H: Wetlands and other surface water features**

The proposed project is within 500 m of various water courses as can be seen in Figure 14 below. The Olifants River and the Tweefonteinspruit are located to the east of the project. The proposed pipelines will traverse the Tweefonteinspruit, however, the spruit will not be affected as the pipelines will traverse the spruit utilising existing road and box culvert crossings. An Unchanneled Valley Bottom Wetland, that is adjacent to the Return Water Dam, will be affected as the pipelines may traverse a portion of this. As such, an application for a Section 21 c & i (of the NWA, 1998) WUL will be applied for.

A Seep and a Pan are located to the north of the proposed project site, however, these will not be affected. A Return Water Dam is located within the project boundary and adjacent to the above mentioned Unchanneled Valley Bottom Wetland. The 2A Dam is located within 500 m of the proposed project, however, this project addresses removing the water from the 2A Dam as the area beneath the Dam will be mined out.



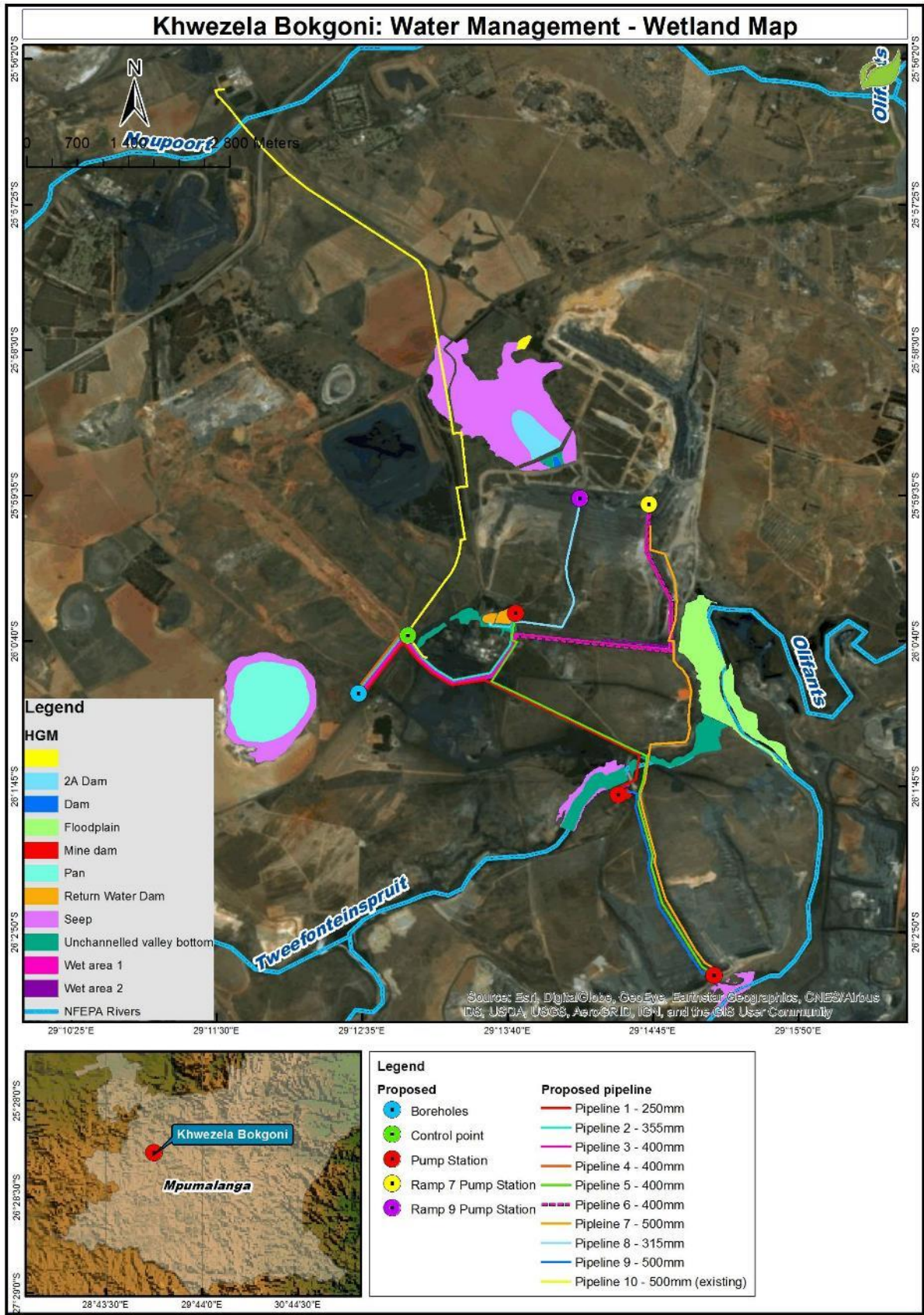


Figure 14: Delineated wetlands within the project area



## Chapter I: Groundwater

Information on surface water was sourced from the following documents:

- The report titled: “Anglo American Coal South Africa– Bokgoni Colliery; Geohydrological Impact Assessment for the Post 2A Dam Water Management Strategy”, by Shangoni AquScience

### **Aquifer Classification and Management**

According to the regional aquifer classification map of South Africa, the aquifers underlying by the study area are classified as minor. The aquifers are low to moderately-yielding systems with variable water quality. The DWS has furthermore characterised South African aquifers based on the rock formations where it occurs together with its capacity to transmit water to boreholes drilled into specific formations. The water bearing properties of rock formations in South Africa can be classified into four classes defined as:

- Class a – Intergranular:
  - Aquifers associated either with loose and unconsolidated formations such as sands and gravels or with rock that has weathered to only partially consolidated material.
- Class b – Fractured:
  - Aquifers associated with hard and compact rock formations where fractures, fissures and/or joints occur that are capable of both storing and transmitting water in useful quantities.
- Class c – Karst:
  - Aquifers associated with carbonate rocks such as limestone and dolomite where groundwater is predominantly stored in and transmitted through cavities that can develop in these rocks.
- Class d - Intergranular and fractured:
  - Aquifers that represent a combination of Class a and b aquifer types. This is a common characteristic of South African aquifers. Substantial quantities of water are stored in the intergranular voids of weathered rock but can only be tapped via fractures penetrated by boreholes drilled into the fractured aquifer.

The study area is directly underlain by rocks of the Vryheid Formation. The Vryheid Formation consists predominantly of thick beds of yellowish to white cross-bedded sandstone and grit alternating with beds of soft sandy shale. The Ecca Group overlies the Dwyka Group (tillites) of rocks.

Khwezela Bokgoni Colliery is in a d3 aquifer class region. The groundwater yield potential is classed as low to medium on the basis that most of the boreholes on record in vicinity of the study area produce between 0.5 and 2.0 l/s. Higher yields do sporadically occur where groundwater is held in good water yielding fractures created by intrusive dykes and major faulting zones. However, these are rare and not believed to be present in the Khwezela Bokgoni Colliery area.



According to the regional aquifer classification map of South Africa, the surrounding Karoo aquifer has been identified as a minor aquifer with good groundwater quality (<300 mg/l TDS) and a medium to high vulnerability.

In order to achieve the Groundwater Quality Management Index a points scoring system as presented in Table 22 to 24 was used.

Table 22: Ratings for the Aquifer System Management and Second Variable Classifications

Class	Points	Study Area
<b>Aquifer System Management Classification</b>		
Sole Source Aquifer System	6	
Major Aquifer System	4	
Minor Aquifer System	2	2
Non-Aquifer System	0	
Special Aquifer System	0-6	
<b>Second Variable Classification (weathered/fractured)</b>		
High	3	
Medium	2	
Low	1	1

Table 23: Ratings for the Groundwater Quality Management (GQM) Classification System

Class	Points	Study Area
<b>Aquifer System Management Classification</b>		
Sole Source Aquifer System	6	
Major Aquifer System	4	
Minor Aquifer System	2	2
Non-Aquifer System	0	
Special Aquifer System	0-6	
<b>Second Vulnerability Classification</b>		
High	3	
Medium	2	
Low	1	1

The occurring aquifer/s in terms of the above definitions, is classified as *minor*. The vulnerability, or the tendency or likelihood for contamination to reach a specified position in the groundwater system after introduction at some location above the uppermost aquifer, in terms of the above, is classified as



medium. The level of groundwater protection based on the Groundwater Quality Management Classification:

Table 24: GQM index for the study area

GQM Index	Level of Protection	Khwezela Bokgoni Colliery
<1	Limited	
1-3	Low level	
3-6	Medium level	4
6-10	High level	
>10	Strictly non-degradation	

The ratings for the Aquifer System Management Classification and Aquifer Vulnerability Classification yield a Groundwater Quality Management Index of 4 for the study area, indicating that a medium level of groundwater protection is required (Table 4). Reasonable and sound groundwater protection measures are required to ensure that no cumulative pollution affects the aquifers.

In terms of DWS's overarching water quality management objectives which is: i) protection of human health; and ii) the protection of the environment, the significance of this aquifer classification is that if any potential risk exist, measures must be triggered to limit the risk to the environment, which in this case is the protection of the: i) underlying weathered and fractured aquifers; and ii) Tweefonteinspruit and Olifants River draining the project area.

**General Aquifer Characteristics**

The geohydrological regime in the Khwezela Bokgoni Colliery mining area is made up of three aquifer systems, although they are regarded as the same type of aquifer (double porosity aquifer). For this study an aquifer is defined as a geological formation or group of formations that can yield groundwater in economically useable quantities. According to this definition of an aquifer, only the weathered-fresh interface or fractures in the hard rocks below the weathered zone can be defined as aquifers. The shallow aquifer in the weathered zone is very important from the perspective of environmental water balance and water movement through the landscape. The weathered zone and its interaction with the unsaturated zone (e.g. soil water and vadose) is still an important contributor to water problems at Khwezela Bokgoni Colliery.

Three undisturbed aquifers are distinguished in the study area:

- Shallow weathered unconfined aquifer in the Eccca, Vryheid Formation;
- Fractured confined or semi-confined aquifer in the Eccca, Vryheid Formation; and
- Fractured Pre-Karoo aquifer.

Two disturbed artificial aquifers (mine created) are distinguished in the study area:

- Underground mine voids; and
- Backfilled opencast pits.





### *Shallow Karoo Weathered Aquifer*

The first system is a shallow unconfined aquifer that occurs in the transitional soil and weathered bedrock zone or sub-outcrop horizon. Usually this layer is poorly developed and is generally not considered as an aquifer given its inability to sustain reasonable or useful quantities of groundwater.

Rain water recharges into the weathered sediments and is deflected on top of the fresh sediments. It then flows laterally until it reaches opposing groundwater flow, usually from the other side of a stream. At streams, groundwater is forced to the surface.

This aquifer generally has low yields, typically in the range of 0.1 l/s with phreatic water levels sometimes occurring on un-weathered bedrock or clayey layers. Where consideration of the shallow aquifer system becomes important is during seepage estimations into voids and mass transport simulations from mine-induced contamination sources, because a lateral seepage component in the shallow water table zone in the weathered zone often occurs. Because of its shallow position and direct interaction with the surface, this aquifer has characteristics of a primary type aquifer.

This shallow unconfined system has very low hydraulic conductivities and transmissivities and will yield very little groundwater and can thus not be regarded as an aquifer or be exploited as such. Yields of less than 0.1 l/s are expected.

### *Fractured Confined to Semi-Confined Karoo Aquifer*

The second aquifer system is the fractured Karoo rock-type aquifer where groundwater yields, although more heterogeneous, can be higher than the weathered zone aquifer. This aquifer system usually displays semi-confined or confined characteristics with piezometric heads often being significantly higher than the water-bearing fracture position. The aquifer forms in transmissive fractures in the consolidated and mostly impervious bedrock. The fractures may occur in any of the co-existing host rocks due to different tectonic, structural and depositional processes. The chances of intersecting a water-bearing fracture by drilling decreases rapidly with depth. At depths deeper than 30 m, water-bearing fractures with significant yields were observed to be spaced at 100 m or greater. Scientific siting of production boreholes is necessary to intersect these fractures.

A combination of fracture flow and porous flow mechanisms exists, a phenomenon that typically occurs in sandstone and shale. Sandstone has an inherent permeability of its own, and water can, to a lesser or greater extent, flow around the grains within the sandstone, all depending on their degree of cementation. All sandstones in South Africa are fractured. These fractures are usually the dominant flow mechanism within sandstone. When a pollutant enters a sandstone aquifer, the fractures within the sandstone will be the dominant mechanism along which the contaminant will be transported. Groundwater is thus confined to joints and fractures, and the matrix rock usually has a very low hydraulic conductivity and low yield. Higher yields do occur especially where dolerite intrusions (of Karoo age) have resulted in significant fracturing of the host rock.

Aquifer thickness in a fractured rock aquifer is virtually impossible to determine because the actual aquifer consists of fractures with any orientation, dip, strike or aperture. As a compromise, the aquifer



thickness in the coal mining environment is often taken as the difference between the estimated static water level of the aquifer and the base of the lowest mined coal seam.

The fractured rock aquifer is a more reliable source of groundwater compared to the weathered zone aquifer although salinity may be somewhat higher due to longer exposure times of the water with the rock. Yields from this aquifer would be enough to supply drinking, sanitation and irrigation (small scale) water for a household but would not be enough to be exploited for mining related process water. Typical characteristics of the fractured flow aquifer are:

- They are present as either confined or semi-confined aquifers. In the former instance, the aquifer is overlain by sediments or rock of a confining nature, thus limiting direct recharge from rainfall;
- They are shallow systems, usually less than 60 m thick, with a maximum of 200 m in exceptional instances;
- Although deeper fracture flow systems do exist, the quality of the water within the deeper systems is generally not acceptable for human consumption;
- Low hydraulic conductivity ( $<0.001$  m/d) are typical but can be highly heterogeneous with yields ranging from 0.5 to 2 l/s;
- Higher yields are typically associated with higher hydraulic conductivities along shallow coal seams and at contact zones with intrusive rocks;
- The contact zones of dolerite dykes and sills with the host rock provide preferential flow paths, while the dolerite itself is rather impermeable or semi-permeable (hydraulic conductivity of  $8.6E-4$  m/d or  $1E-8$  m/s). This setting promotes groundwater flow along, but not across the dykes or sills. Depending on the residence time of the water in the aquifer, groundwater quality can be poor.
- They contain between 0.001 – 0.1% water by aquifer volume.;
- Recharge from rainfall is generally low ranging between 1 - 4% of the ("MAP");
- Characteristics of the aquifer vary greatly over short distances due to fracture heterogeneity;
- Contaminant transport through fracture flow aquifers is comparatively fast;
- There is hardly any attenuation of pollutants in fractures; and
- Borehole yields from fracture flow aquifers vary greatly within a few metres.

The Eccca overlies the Dwyka tillite that may form a separate aquifer but because of its negligible aquifer forming properties it is generally discussed as one with the Eccca aquifer. The aquifer permeability of the Dwyka tillite is estimated to be between 0.0002- and 0.015 m/d. Due to its low hydraulic conductivity, the Dwyka tillite forms a hydraulic barrier between the overlying mining activities and the basal floor.

#### *Pre-Karoo Basement Aquifer*

The pre-Karoo rocks, consisting mainly of felsites of the Bushveld Igneous Complex, are present below the Dwyka group tillites. Groundwater is mostly present in very small and low yielding fractures. The pre-Karoo is considered not to be a reliable source of groundwater given its great depth, compactness of the host rock and inability to fracture, inferior quality associated with felsites and granites (mostly fluoride), and low recharge because of the overlying impermeable Dwyka tillite. However, reliable sources of groundwater may be encountered on bedding plane fractures or lithological contact zones.



### *Artificial Aquifer – Underground Mine Voids*

Open mine voids were created in all mineable four seams by historical underground mining at Khwezela Bokgoni Colliery. The mine voids are essentially an artificial high porosity and permeability network superimposed on the natural fractured Karoo rocks, with effective porosities and permeabilities dependent on the deployed mining method and stopping ratio (e.g. around 60% for bord-and-pillar).

Water will continue to drain into the mine void until it is again fully flooded, usually long after mining has ceased. This creates a negative pressure and the voids act as sinks.

The coal pillars remaining underground typically contain pyrite and weathering of the pillars often result in acid mine water with high sulphate (SO<sub>4</sub>) content and high concentrations of mobile iron (Fe), manganese (Mn) and other trace metals. All the workings will eventually go through an acid phase and will continue until all pyrite is exhausted. However, because of the negative pressure created, a pollution plume will not develop during the operational phase, unless water is pumped out and disposed of on surface. Only after mining has been completed in an area and when fully flooded, water pressure in the mine may build up higher than water levels in the surrounding sediments. If the water level is recovered to pre-mining levels and equilibrated, polluted water from the mine will then seep into adjacent strata.

Seepage and decanting of mine water can be prevented by ensuring that water levels in a mine do not rise into the weathered zone. During operational phases of mining, water levels at Khwezela Bokgoni Colliery can be kept below decant or seepage level by dewatering and pumping water to EWRP. One of the water management strategies of the mine to deal with surplus water that is currently stored in 2A Dam, is to pump it underground to 3A North Underground Area.

### *Artificial Aquifer – Backfilled Opencast Pits*

The shallow strip-mining method applied at Khwezela Bokgoni Colliery entails the continuous backfilling of mined out areas with compacted discard and spoil material (rehabilitated by dressing with a layer of soil and seeding); creating a highly altered artificial mine aquifer or hydrostratigraphic unit behind the active mining window. The porosity, storability and hydraulic conductivity of the backfilled material is obviously different from the in-situ Karoo sediments and give rise to a unique artificial hydrostratigraphic unit embedded within the former mine voids. Highly variable hydraulic properties related to variably sized backfill material and/or different compaction rates are expected. Hydraulic conductivities can range anything between 1 and 10 m/d and recharge and effective porosities of up to 30% can be expected. These properties are evidently substantially altered from the undisturbed aquifer properties.

### **Aquifer Recharge**

Recharge is defined as the addition of water to the saturated zone, either by the downward percolation of precipitation or surface water and/ or the lateral migration of groundwater from adjacent aquifers.

The groundwater recharge was estimated using the RECHARGE programme, that includes using qualified guesses as guided by various schematic maps.

According to the various sources used, the recharge of the study area varies between 3% and 4.86% with an average (harmonic mean) recharge of 3.95% of MAP. In general, recharge into the Karoo



sandstones are relatively low with various factors controlling the recharge but typically range between 1 and 4% of MAP. However, the presence of intrusive bodies or faulting zones may exert a significant influence on the rate of recharge to the subsurface since they provide preferential pathways along which water can rapidly infiltrate from surface to the underlying aquifer.

### Geochemical Characterisation

No groundwater monitoring is currently undertaken in underground workings at Khwezela Bokgoni Colliery but it is expected that the quality will be relatively similar to the workings at Khwezela North, Navigation Colliery and Greenside as discussed by Delta H (2016). Based on worst case scenarios, underground water quality at Khwezela Bokgoni Colliery is expected to range, for pH, between 2.3 and 6.3, and for sulphate between 1800 mg/l and 5 000 mg/l. These values are a clear indication of pyrite oxidation and Acid Mine Drainage (“AMD”) reactions occurring within the system – chemical reactions that will continue until all the pyrite has been oxidised.

### Water Quality

An extensive surface and groundwater monitoring programme are undertaken by the mine. Quarterly groundwater quality and water levels are performed by Aquatico and the results are reported in quarterly and annual reports, the latter by a specialist geohydrologist. Water management scenario has been proposed to manage excess water generated by the mine, that is currently stored in 2A Dam. The management scenario will entail pumping of excess water to various holding facilities prior to pumping to EWRP as needed. These holding systems include the PRWD and subsequent usage at the plant, temporary storage in 3A North Underground Area and pumping to EWRP and/ or usage in the plant, and/ or storage in Pit 5 West and intermediary storage in 5 West Void. Most of the water that is stored in 2A Dam is from dewatering of the 2A opencast section.

#### *2A Dam water sources and quality*

The water contained in 2A Dam is analysed on a quarterly frequency by Aquatico with identification WP009. Averaged data for the most previous 12 datasets, from March 2015 to December 2017, is shown in Table 25 and discussed below.

*Table 25: Averaged water quality for 2A Dam (Aquatico, 2017)*

Parameter	Unit	Averaged data (2015-2017)
pH		7.18
EC	mS/m	366
TDS	mg/l	3563
Total hardness	mg CaCO <sub>3</sub> /l	2763
Ca	mg/l	530
Mg	mg/l	341
Na	mg/l	38.4
K	mg/l	20.5



Parameter	Unit	Averaged data (2015-2017)
Alkalinity	mg/l	74.2
Cl	mg/l	9.56
SO <sub>4</sub>	mg/l	2556
NO <sub>3</sub>	mg N/l	4.68
NH <sub>4</sub>	mg N/l	2.22
PO <sub>4</sub>	mg P/l	0.022
F	mg/l	1.04
Al	mg/l	0.004
Fe	mg/l	0.005
Mn	mg/l	2.14

The data in Table 25 shows that 2A Dam is characterised by very high salinity that is mostly contributed to by SO<sub>4</sub>, followed by Ca and Mg. Sulphate within the dam water is very high with an average concentration of 2556 mg/l while Ca and Mg is also relatively high with averages of 530 mg/l and 341 mg/l. The pH is circum-neutral with an average of 7.18 but has been as low as 4.0 during the past two years. Nitrate (NO<sub>3</sub>) and NH<sub>4</sub>, is relatively raised at 4.68 and 2.22 mg N/l, respectively while PO<sub>4</sub> remains in the low ranges. Aluminium (Al) and Fe recorded in very low concentrations due to the circum-neutral pH, but soluble F and Mn levels are relatively raised with averages of 2.14 mg/l and 1.04 mg/l, respectively.

The general quality profile of 2A Dam can be described as affected mine water that is characterised by circum-neutral water (occasionally acidic), high to elevated levels of TDS, total hardness, SO<sub>4</sub>, Ca, Mg and Mn.

*Ground Water Quality*

Eight (8) boreholes were monitored during the 2017 monitoring year. A locality map showing the monitoring borehole distribution in relation to the mine and infrastructure is presented in Figure 15. Not all boreholes as shown in Figure 15 were monitored as some were recorded as ‘demolished’ or ‘no access’. Average data recorded during the 2017 monitoring period is tabulated in Table 26.



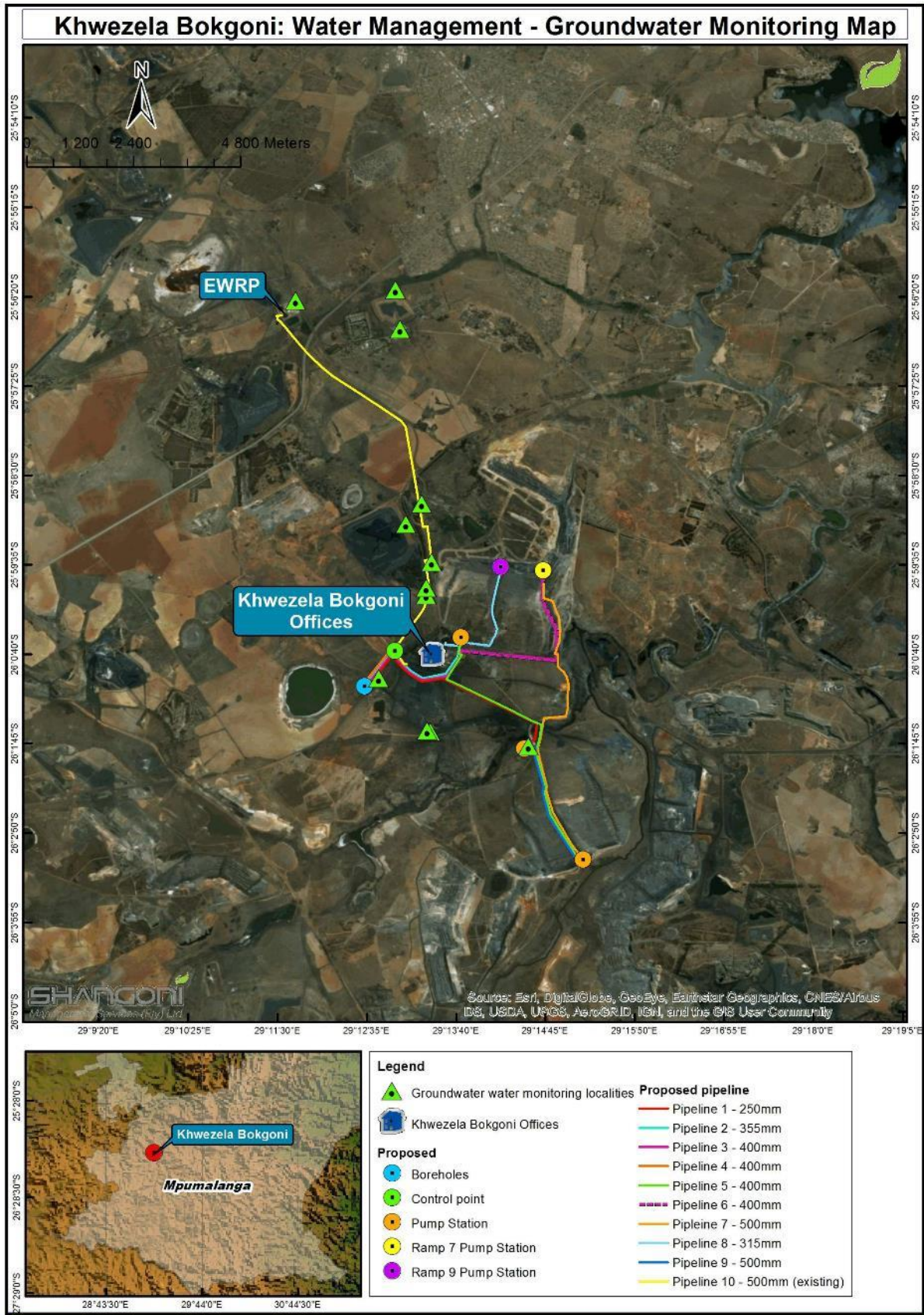


Figure 15: Groundwater Monitoring Localities



Table 26: Average concentrations of indicator chemical parameters for the 2017 monitoring year

Borehole	pH	TDS mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	CL mg/l	SO <sub>4</sub> mg/l	NO <sub>3</sub> mg/l	F mg/l	Fe mg/l	Mn mg/l
KKW13	5.4	2254	518	426	33	12	7.9	2719	0.42	0.20	BDL	1.5
KKW14	6.9	1288	379	165	14	6.9	4.7	1346	1.0	0.15	BDL	0.49
KKW42	7.2	574	89	65	35	1.4	7.9	400	0.31	0.27	BDL	0.05
KLAN D01	7.5	135	16	11	7.8	3.3	5.2	56	0.25	0.19	BDL	0.03
KLPF01	4.8	1193	181	180	16	6.2	13	1211	2.8	1.5	2.1	16
KLPF02	5.4	236	43	12	11	2.4	6.2	122	3.4	0.24	BDL	0.17
RCO 01	6.1	897	155	156	10	12	3.0	914	0.46	0.15	0.03	6.8
RCO 02	6.7	22	1.0	0.5	2.4	2.1	2.5	5.9	0.60	0.12	BDL	0.004

Three boreholes, KLPF01, KLPF02 and KLAND01 were monitored within the Landau Dump III area. Based on the data in Table 26 the groundwater quality in vicinity of Landau III dump can be summarised as follows:

- Groundwater quality vary from good (KLAND01) to very poor (down gradient direction in KLPF01);
- The dump area has a definite negative impact on the groundwater quality in the area;
- Acidic pH values were recorded in KLPF01 and KLPF01 over the monitoring period with averages of 4.8 and 5.2, respectively indicating groundwater affected by AMD;
- High to elevated concentrations of F, Fe and Mn were recorded in KLPF01 due to the acidity;
- Sulphate (SO<sub>4</sub>) and Mg are the dominating ions in KLAND01 and KLPF01, while the groundwater in KLPF02 is dominated by SO<sub>4</sub> and Ca; and
- Sulphate (SO<sub>4</sub>) is the main indicator of pollution in a coal mining environment and during the 2017 monitoring year, elevated SO<sub>4</sub> concentrations confirmed definite negative impacts from the mining activities.

Boreholes, KKW13, KKW14 and KKW42 are in vicinity of Klippan Dump, 2A Dam, Block 2A South and Block 3A North. Based on the average data as in Table 26, the following:

- Groundwater from KKW13 and KKW14, downgradient from the historic opencast mine, recorded acidic pH (KKW13 only) and high to elevated levels of TDS, SO<sub>4</sub>, Ca, Mn and Mn;
- KKW42 is located further north and is less impacted but is dominated by SO<sub>4</sub>, although to a lesser extent; and
- Impacts from the mining activities are evident within these boreholes, especially groundwater from KKW13.



Two boreholes, RCO01 and RCO02 were monitored within the Block 5W mining area in the 2017 monitoring period. Based on the data in Table 10 the following:

- RCO01 recorded a raised TDS level that is largely contributed to by  $\text{SO}_4$  and to a lesser extent by Ca and Mg;
- Very high soluble Mn levels were recorded for RCO01 during the 2017 monitoring year with an average of 6.8 mg/l; and
- Good water quality was recorded in RCO02 with low to very low levels of mineralisation.

#### *Underground Void Water Quality*

Numerous studies have indicated that the coal being mined contains pyrite and the coal pillars created underground will be oxidised through air flow, and eventually the workings will go through an acid phase until all pyrite is exhausted. Near the end of this phase, the pH of the mine water will be as low as 2.5-3.5, bringing about significantly higher treatment cost. The only buffering material in the mines will lie in the clay minerals (kaolinite, montmorillonite, illite). These react so slowly that they will only become effective once all the pyrite has been oxidized. The final pH of the mine water is likely to be around 5.5, where the clay minerals will buffer the mine water.

The time scale when this will all happen will range from tens of years to millions of years. We can safely assume that the  $\text{SO}_4$  production rate at any mine will be a typical decay curve, i.e. with a half-life and an extended date for total oxidation. At the current rate of  $\text{SO}_4$  production for a typical opencast mine such as at Khwezela Bokgoni Colliery, it is envisaged that the half-life period can be measured in hundreds or thousands of years. Currently, it is expected that underground water quality at Khwezela Bokgoni Colliery will have raised mineralisation and total dissolved solids, with the majority being contributed to by  $\text{SO}_4$ , Ca and Mg, be slightly acidic in pH in the range of 5.5 to 6.0, and relatively raised Fe and Mn. Sulphate is expected to range between 1800 mg/l and 5000 mg/l, at places. Refer to Section 7 of Annexure C8 for a more detailed discussion on the geochemistry and water quality predictions of void-filled water.

#### *Receiving Surface Water Quality*

Tweefonteinspruit water quality as monitored by Aquatico at WP037, WP039 and WP040 contains elevated levels of TDS with  $\text{SO}_4$  being the major contributor to the high salt load. Between points WP37 (upstream) and WP39 (downstream) the water quality deteriorates substantially most notably in terms of  $\text{SO}_4$ , EC/TDS, F, Fe and Mn with Block 5 West being the most likely source.

The Olifants River flows in a north-eastern direction and is located to the immediate south of Block 5 West and Block 2A. Two monitoring points are located on the Olifants River, one upstream (WP042) and the other downstream (RW004) relative to Block 5 West and Block 2A. The upstream locality, WP042 recorded good water quality during the 2017 monitoring period with no indication of mining related or any significant trends other than seasonal influences. However, no qualification or quantification of mining related impacts is possible since the downstream locality RW004 was not sampled during the 2017 monitoring year due to accessibility issues. It is imperative that this monitoring





point be reinstated into the programme as currently no quantification of impacts can be made on the Olifants River.

## Chapter J: Air quality

WSP Environmental (Pty) Ltd has been appointed by Anglo American Coal SA to monitor particulate concentrations and maintain a dust fallout network in and around Khwezela Bokgoni Colliery. The air quality monitoring report for April 2018 is attached in Annexure C5.

The Dust Fallout (“DFO”) monitoring network located in and around the Khwezela Bokgoni Colliery, enables the assessment of the current levels of nuisance dust against the National Environmental Management: Air Quality Act (“NEM:AQA”) National Dust Control Regulations (GNR 827). The ASTM D1739 reference method, as required in the National Dust Control Regulations, makes use of fallout gauges (dust buckets) that are essentially open containers, filled with distilled water and algaecide, and left at designated sites for a stipulated timeframe to collect deposited particles. Important to note is that compliance with the National Dust Control Regulations is only assessed with fallout levels obtained from single fallout units and not with directional units as motivated in Annexure C5.

Reporting of dust fallout, PM<sub>10</sub> and PM<sub>2.5</sub> concentrations is conducted on a monthly basis.

Dust fallout monitoring at the Khwezela Bokgoni Colliery is conducted at twelve locations, with three of these locations also equipped with directional units. The 5 West Pan, A-Stockpile, Olifant's Weir, Ramp 10, Rehab Offices, DMX Company, North East Pit 2 and Power Line were decommissioned in July 2017 with new locations Du Plessis Farm, Mine Offices, South East Mine Residue Deposit (“MRD”), North MRD and West MRD being established. Monitoring locations A-Side Tip, Magazines and Klippan Gate were decommissioned during December 2017. Particulate matter is monitored using two Topas units mounted on mobile solar-powered trailers. Figure 16 graphically illustrates all monitoring locations, distinguishing between dust buckets and the monitoring trailers.



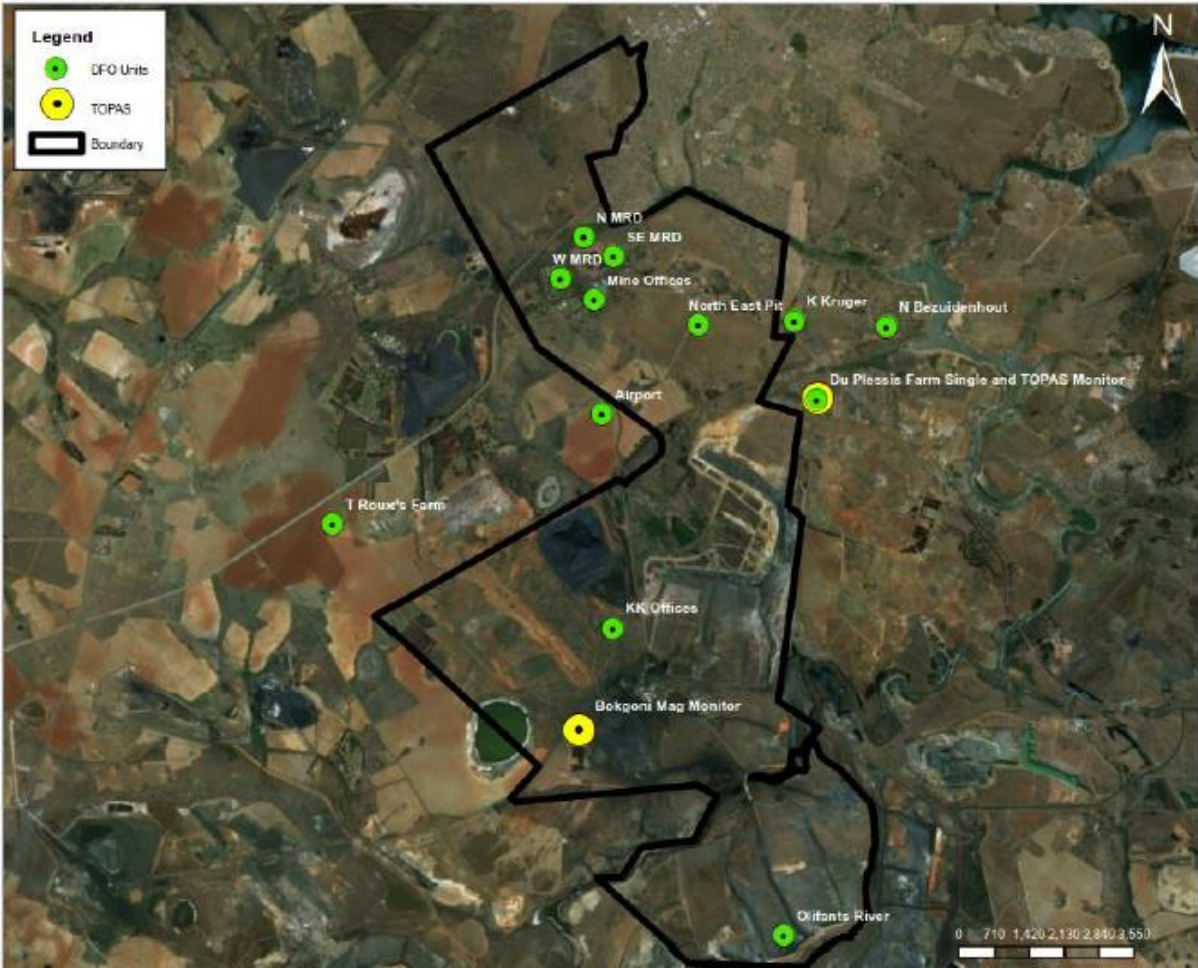


Figure 16: Location of Dust Fallout Monitoring Units (source: WSP Environmental; April 2018)

Figure 6 of the April 2018 monitoring report in Annexure C5 presents the dust fallout results for 2018. Refer also to Figure 17.

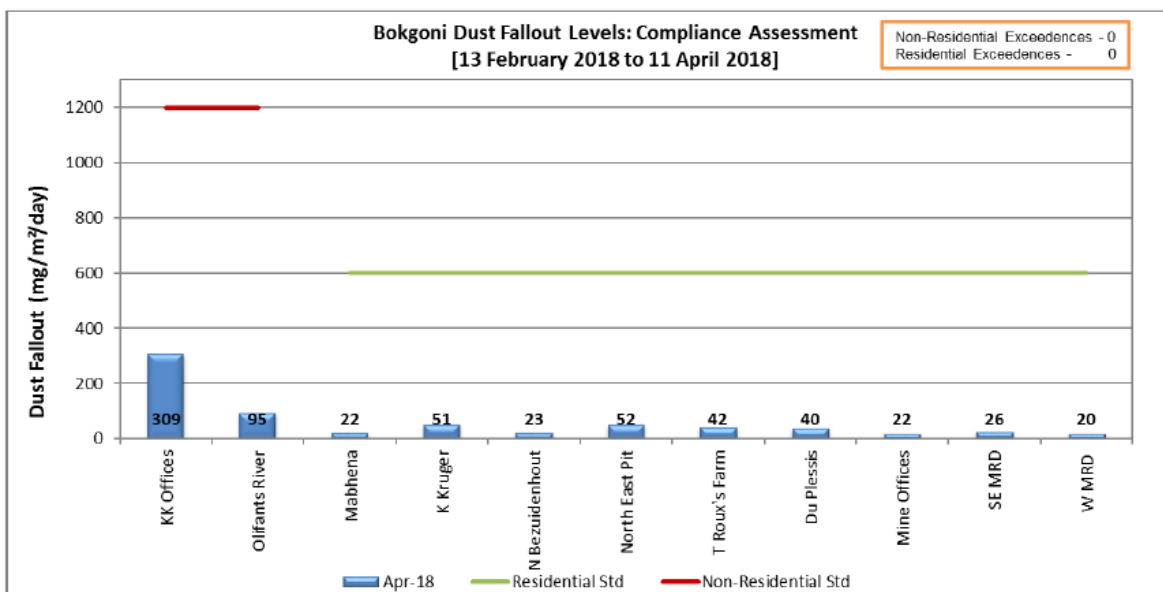


Figure 17: Single sampling unit dust fallout results at Khwezela Bokgoni Colliery for the monitoring period (source: WSP Environmental; April 2018)



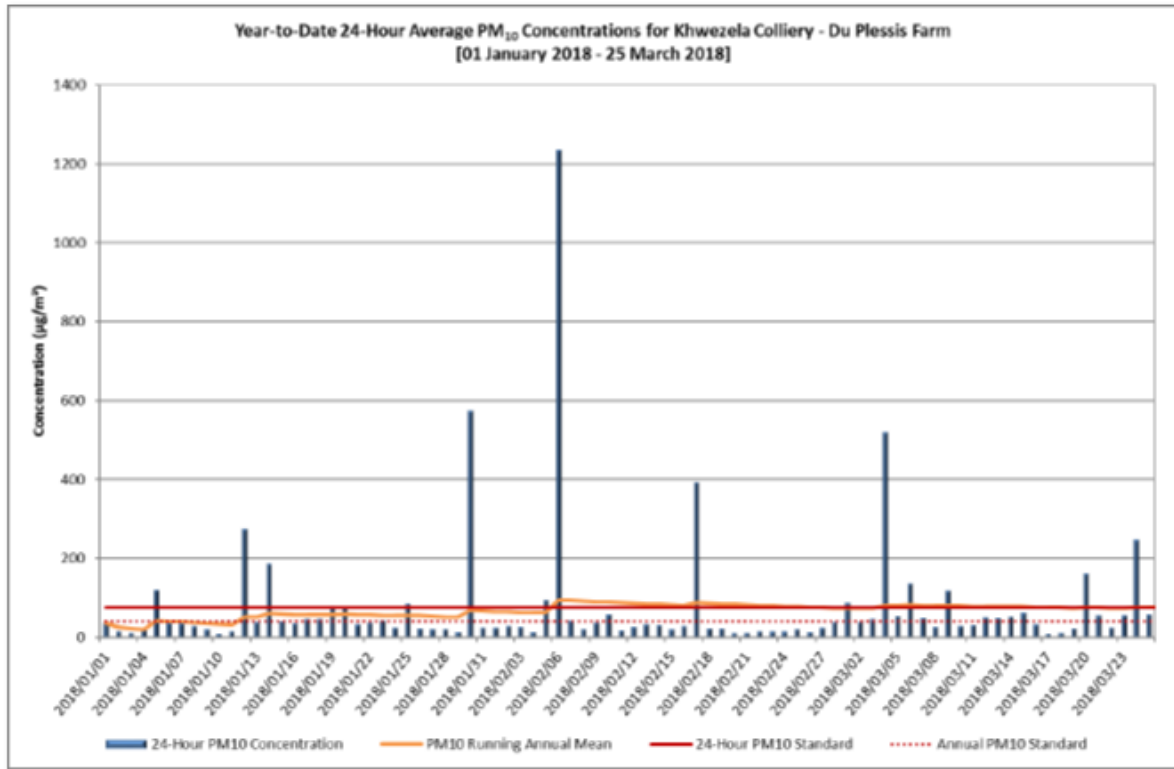


Figure 18: Year-to-date daily average PM<sub>10</sub> concentrations at the Du Plessis Farm TOPAS Monitor (source: WSP Environmental; April 2018)

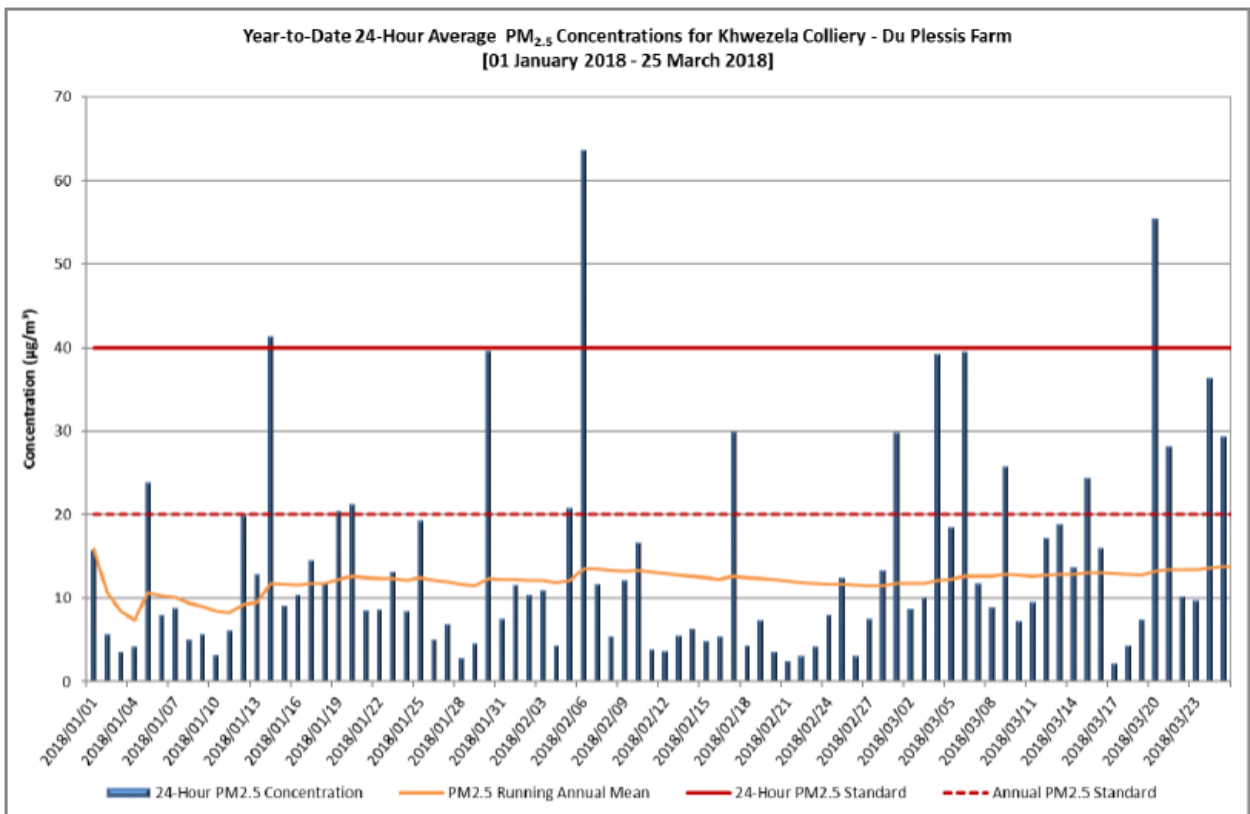


Figure 19: Year-to-date daily average PM<sub>2.5</sub> concentrations at the Du Plessis Farm TOPAS Monitor (source: WSP Environmental; April 2018)



## Chapter K: Noise and vibration

Information contained in this section of this report was sourced from the following document:

- The report titled: “*Kleinkopje Colliery revised and consolidated EIA and EMP, report prepared for Anglo American Operations Limited – Thermal Coal*”, with report No 414908, compiled by SRK Consulting and dated April 2012 (here after referred to as the revised EMP, dated April 2012);
- The report titled: “*Kleinkopje Colliery 2A Pollution Control Dam Relocation Project: Draft Environmental Impact Assessment and Environmental Programme Report*”; dated May 2012 and compiled by WSP Environmental; and
- The report titled: “*Report: Ground Vibration and Air Blast Monitoring: Anglo American, Thermal Coal – Khwezela Colliery*”, dated August 2018, compiled by Blast Management and Consulting (refer to Annexure C6).

Routine monitoring of blast noise and vibrations emanating from opencast blasts is conducted at strategic points along mine boundaries and at selected residences of neighbouring farms. No major issues have been noted or experienced. Due to the distance between the Khwezela Bokgoni Colliery operations and the southern suburbs of eMalahleni (Witbank), the potential impact of noise and vibration on surrounding residents is low (WSP Environmental; 2012).

### Noise

High ambient noise levels exist in the area due to several major noise emitters including:

- Major coal mining activities;
- The N12 highway;
- The R547 road;
- Road connecting the R544 and R547 past Khwezela Bokgoni Colliery; and
- Residential areas with villages associated with the mines.

### Ground Vibration and Air Blast

Blast Management and Consulting (Pty) Ltd has been contracted to monitor ground vibration and air blast on a continuous basis at Khwezela Bokgoni Colliery. Six Instantel Seismographs are fitted to permanent position stations on the Khwezela Bokgoni Colliery property and surrounding area.

The monitoring positions are seen in Table 27.

Table 27: Ground Vibration and Air Blast monitoring locations

Seismograph Location Description	Seismograph Serial Number
Benicon Offices	BE12518
Dam wall	BE13809
Du Plessis farm	BE16087
Greenside Village	BE10255



Seismograph Location Description	Seismograph Serial Number
Kruger House	BE13079
West Side Perimeter	BE11476

Ground vibration and air blast was monitored for the month and data analysed. Results recorded on the monitors are presented in this report. During August 2018 the ground vibration levels recorded were within the set limits of 12.5 mm/s and within the safe blasting criteria. Nine air blast events at the dam wall were higher than 134 dB but is of no concern, the events at the public installations all were below the accepted levels currently applied in South Africa of 134 dB.

Refer to Annexure C6 for more detailed information

#### Chapter L: Visual

The Khwezela Bokgoni Colliery mining areas (and thus also the proposed pipelines and associated pump stations) are not situated immediately adjacent to any recognised tourist routes. Ongoing rehabilitation activities reduce the visual impact of the mine, and dust suppression techniques are employed on all coal transfer points to reduce dust visibility from the N12 route.

#### Chapter M: Protected areas and conservation planning

Information on protected areas and conservation planning as contained under this section has been obtained from the following sources:

- The report titled: “*Biodiversity Action Plan for Kleinkopje Colliery*”, dated February 2014, compiled by Digby Wells (refer to Annexure C2); and
- The report titled: “*Wetland delineation and assessment for Khwezela Bokgoni Colliery*”, dated November 2018 and compiled by Wetland Consulting Services (Pty) Ltd.

#### **Mpumalanga C-plan and Biodiversity Sector Plan**

The Mpumalanga Biodiversity Sector Plan (“MBSP”) is a high-resolution, up-to-date biodiversity plan that identifies a network of Critical Biodiversity Areas (“CBAs”) and Ecological Support Areas (“ESAs”) that:

- Achieve national and provincial biodiversity targets on the least amount of land possible;
- Minimise conflict between conservation and other forms of land use;
- Favour areas that are important for water security;
- Promotes connectivity and adaptation to climate change across the landscape; and
- Can be used at a scale suitable for local and district-level planning.

The purpose of the biodiversity sector plan is to ensure that spatial biodiversity priorities are effectively incorporated into land use and development planning, environmental assessments and authorisations, and natural resource management within provincial and local levels of government.



Critical Biodiversity Areas are those terrestrial and aquatic areas whose safeguarding is critically required in order to meet biodiversity pattern and process thresholds. They are identified through a systematic biodiversity planning process and represent the most efficient (least land-hungry) option to meeting thresholds. Systematic Biodiversity Planning aims to meet predefined biodiversity thresholds for both pattern and processes and by doing so in the most efficient network possibly, it implies that the loss of a CBA implies either that the thresholds can never be met or that a more land hungry network will be now be needed to meet the same threshold.

**The categories on the CBA Maps are:**

**Protected Areas:** formally declared except for mountain catchment areas due to their lack of promulgated regulations and resultant low level of protection afforded.

**CBAs:** As described above, they include terrestrial and aquatic areas as well as the riparian buffers around aquatic CBAs.

**Ecological Support Areas:** aquatic features directly and indirectly impacting on aquatic CBAs.

**Other natural areas:** If we are able to secure all of our CBAs, then we can afford to lose these areas. In other words, these are the preferred areas for sustainable development and according to data that was known at the time of the analysis, are not important from a biodiversity perspective.

**No natural and Urban:** No biodiversity value remains.

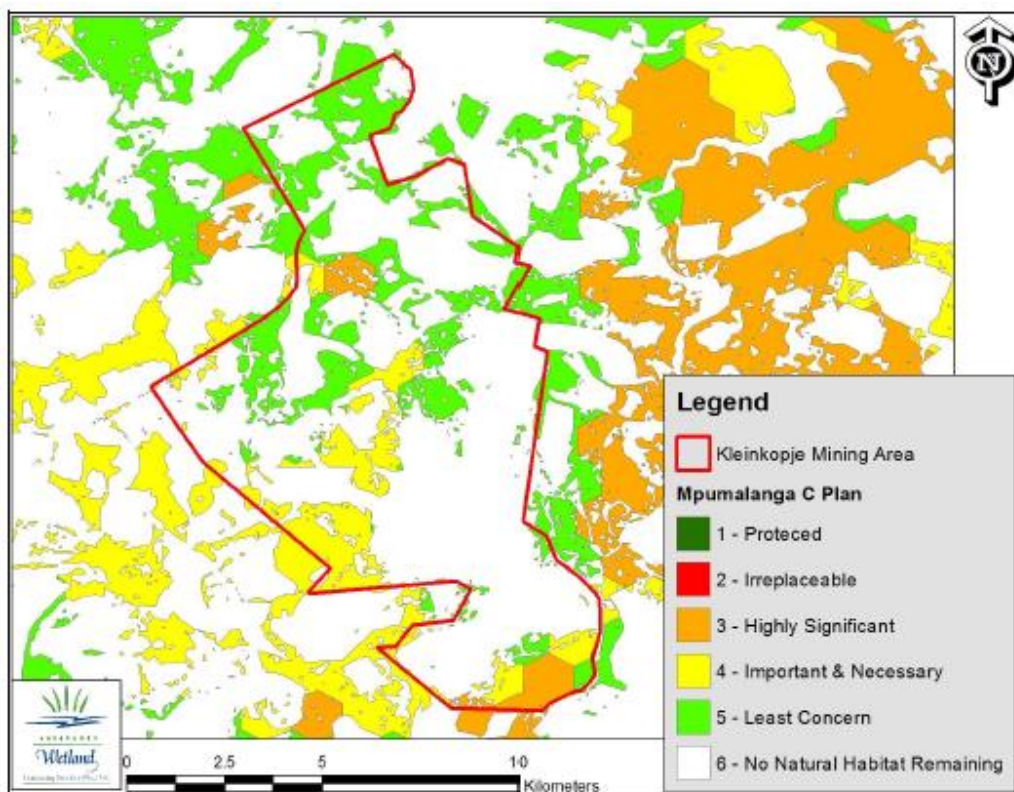


Figure 20: Mpumalanga Conservation Plan (Wetland Consulting Services, 2013)

The Khwezela Bokgoni Colliery mining area has been heavily impacted by existing mining activities on site, extensive agricultural activities (especially the cultivation of maize) as well as impacts associated



with infrastructure (e.g. roads and railways) and urbanisation. Approximately 3 752 ha of the study area have been directly disturbed by surface mining activities, totalling over 44 % of the site. All of these activities have resulted in the extensive transformation of the natural habitats within the study area, as portrayed in the Mpumalanga Biodiversity Conservation Plan's terrestrial biodiversity assessment (Ferrar et al. 2007) that classifies most of the area as having no natural habitat remaining / heavily modified (Figure 21 below).

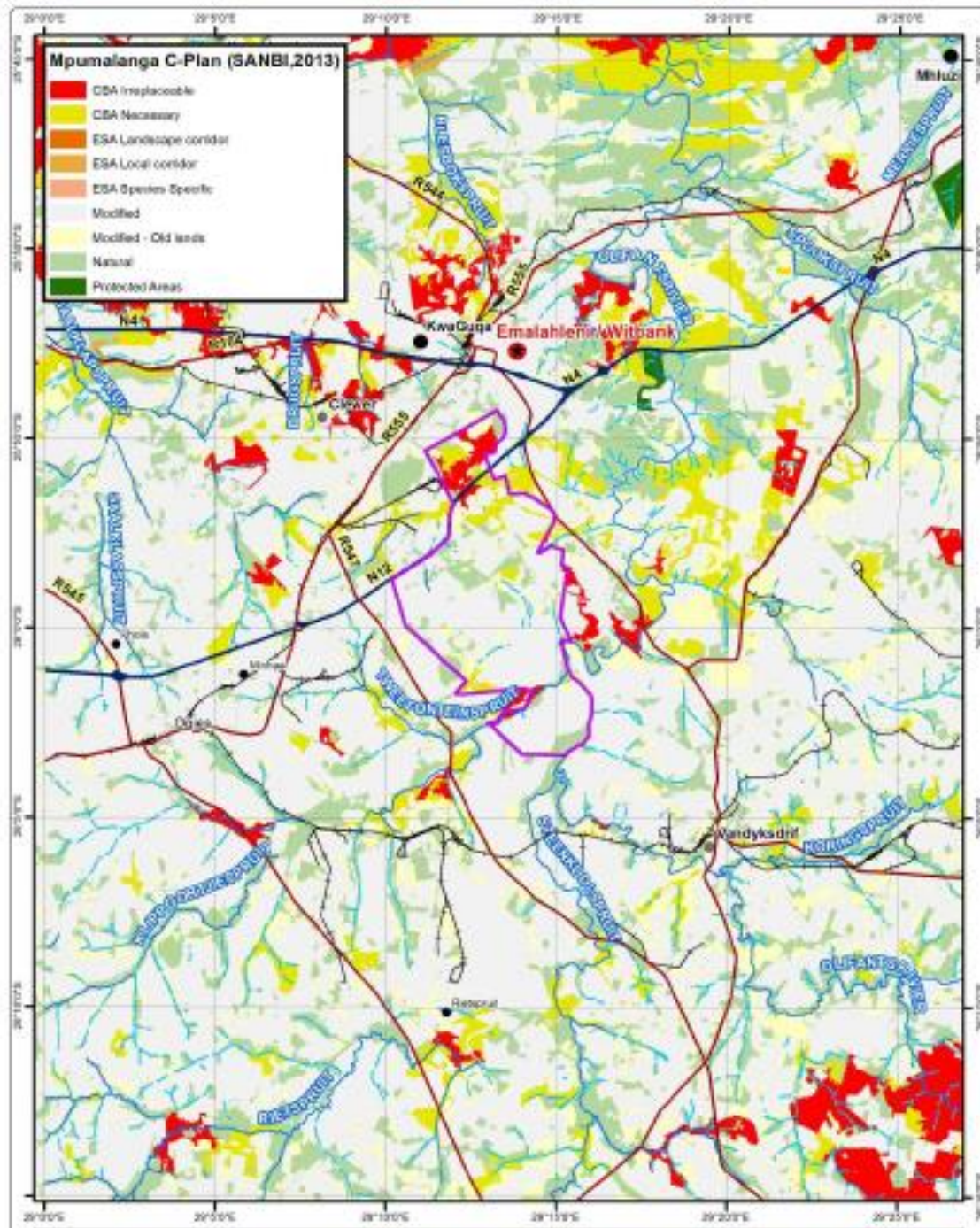


Figure 21: Mpumalanga Conservation Plan (Digby Wells, 2014)



## Chapter N: Sites of archaeological and cultural importance

Information contained in this section of this Scoping Report was sourced from the following documents:

- The report titled: “*Kleinkopje Colliery: Phase 1 Identification survey of historical sites*”, dated July 1993 and compiled by A.C. van Vollenhoven;
- The report titled: “*Phase 1 Archaeological Impact Assessment of the farms Klippan 332 JS, Groenfontein 331 JS, and Klipfontein 322 JS near Witbank, Mpumalanga Province*”, dated September 2010 and compiled by Khudzala Antiquity (J.P. Celliers) (available upon request); and
- The report titled: “*A report on a Phase 1 Heritage Impact Assessment (HIA) for a proposed pipeline and two dams to be constructed at Kleinkopje Colliery close to eMalahleni*”, dated January 2012, compiled by A.C. van Vollenhoven (refer to Annexure C1).

### **Sites of archaeological importance identified as part of the initial Heritage Survey, dated 1993**

The following sites were identified within the Khwezela Bokgoni Colliery mine boundary area (specifically within the vicinity of the Block 2A mining area) during the survey conducted by A.C. van Vollenhoven in 1993:

- Farm houses:

A number of farm houses were identified situated on the eastern side of Block 2A. The farm houses were (at that time) used as residences. Although older than 50 years (at that time), none of the houses were architectural features of particular importance.

- Graves:

A neat graveyard was found just east of the farm houses. All the graves were (at the time of the survey) marked and most of them were older than 50 years.

The remainder of the heritage sites were identified in the 5 West Block and include graves and a kraal.

All the above-mentioned heritage sites are situated outside of the proposed Pit 2A Extension area (application area). Furthermore, the closest heritage site (farm house) to the Pit 2A location is approximately 1.0 to 1.5 km away.

### **Sites of archaeological importance identified as part of the Phase 1 Archaeological Impact Assessment of the farms Klippan 332 JS, Groenfontein 331 JS, and Klipfontein 322 JS, dated 2010**

Six sites were documented that has characteristics of previous human settlement or activity. None of these are considered to be of archaeological value. All the documented sites are located on small portions of the farms Klippan 332 JS and Groenfontein 331 JS. Site WK 1 is a formal graveyard with approximately 147 marked and unmarked graves. This site is considered to be of high significance. Sites WK 2 – WK 6 are regarded as being of low significance primarily because they are not regarded as being of archaeological or historic significance, they were observed and assessed.





**Sites of archaeological importance identified as part of the Phase 1 Heritage Impact Assessment for the proposed pipeline and two dams project, dated 2012**

During the above-mentioned survey, no sites of cultural heritage significance was located in the area(s) associated with the proposed pipeline and dams. Refer to Annexure C1.

**Chapter O: Regional socio-economic structures**

The information provided under this section has been sourced from the “SLP Annual Progress Report for Khwezela Bokgoni Colliery”, dated 2015 (attached hereto as Annexure F) as well as the eMalahleni Local Municipality Integrated Development Plan (“IDP”) 2016/17 (IDP, 2016/17).

**Demographic profile**

*Population size*

According to Stats SA (2011 Census) 395 466 people were recorded in 2011 that is 30.2% of Nkangala's population and 9.8% of Mpumalanga Province. eMalahleni is ranked number 3 in the whole province in terms of population, that grew by 43.1% between 2001 & 2011 while annualised population growth rate was measured at 3.6%.

Table 28: Population size (source: IDP, 2016/17)

Demographic indicators	Stats SA Census 1996	Stats SA Census 2001	Stats SA Census 2011	Share of Nkangala's figure	Share of Mpumalanga's figure	Ranking highest (1) – lowest (18)
Population number	236 040	276 413	395 466	30.2%	9.8%	3
Annual growth rate		1.58	3.58			
Area size (km <sup>2</sup> )			2 677.67	16.0%	3.5%	13
Population per km <sup>2</sup>			148			

**Composition**

*Gender distribution*

Table 29: Gender distribution (source: IDP, 2016/17)

Gender	1996	2001	2011
Males	51.73%	50.91%	52.79%
Females	48.27%	49.09%	47.21%

The above table indicates an increase of males and decrease of females between 2001 and 2011. This is largely due to the nature of industries around the municipality area that tend to be more male oriented.

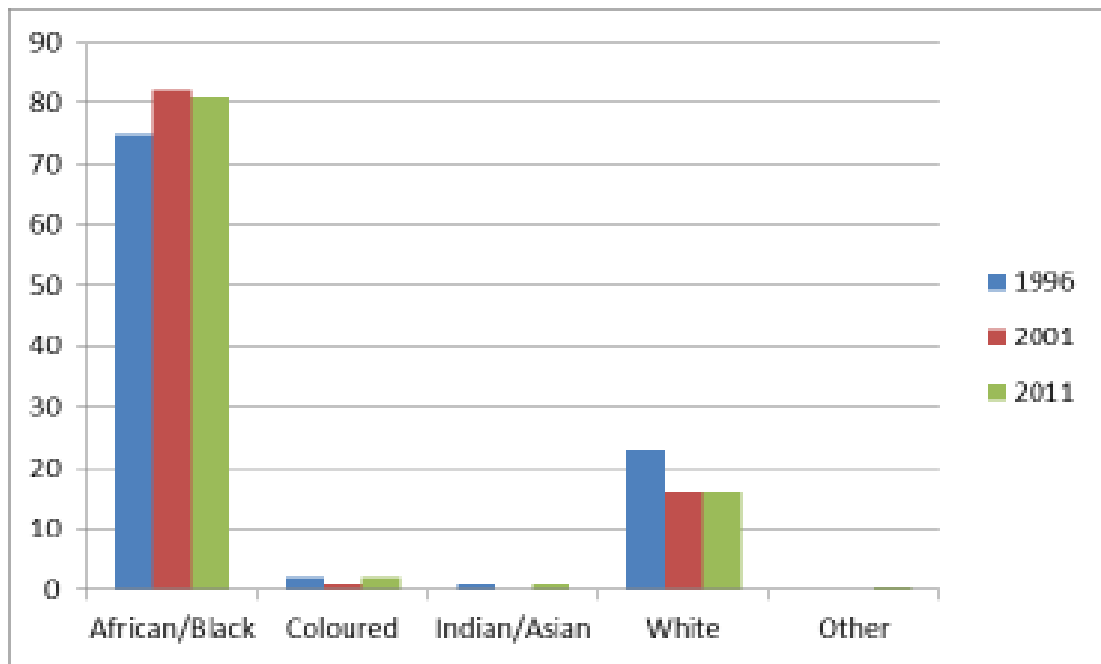


*Population Groups*

*Table 30: Population age groups (source: IDP, 2016/17)*

Population group	1996	2001	2011
% Population (0 – 14 years)	29	28	25
% Population (15 - 64 years)	67	69	71
% Population (65+ years)	4	3	4
% Population (14 - 35 years)	43	42	43
% Persons with disability	5		5

The above table reveal the economical active populations (15-64 years) as represent the highest percentage of 71%.



*Figure 22: Racial groups (IDP, 2016/17)*

eMalahleni is composed of all racial groups with 321,668 Black African, Coloured 6 717, Indian or Asian 3562, White and Other 1, 626. The table above shows that in 2001 and 2011 there was slight decrease of Africans and a slight increase of Coloureds, with the white population group remaining the same. African/Blacks are 81, 3%, 0, 9% Asians, 1, 7% Coloured, 15, 7% Whites and 0, 4% Others.



*Economic indicators*

The municipality is expected to record a Growth Domestic Product (“GDP”) growth of 3.3% per annum over the period 2011-2016. The historic growth rate is 2.8% per annum for the period 1996-2011. eMalahleni contributed 17.9% to the provincial economy in 2011. Gross Value Added (“GVA”) in 2011 was R40.5 billion at current prices and R19.9 billion at constant 2005 prices, that is third largest economy in the province.

*Labour indicators*

Unemployment rate in eMalahleni decreased since 2001. The below table show the unemployment rate of 27.3 % (strict definition) in 2011 – 52 114 unemployed as a percentage of the economically active population of 190 662 – decreasing trend.

Table 31: Labour indicators (source: IDP, 2016/17)

Labour indicators	Census 2001	Census 2011	Share Nkangala's figure	of Ranking: Best (1) – worst (18)
Working group	190 882	238 768		
Economically active population / labour force	124 371	190 662		
Number of employed	76 668	138 548	39.0%	
Number of unemployed	47 703	52 114	34.2%	
Unemployment rate (%)	38.4%	27.3%		8

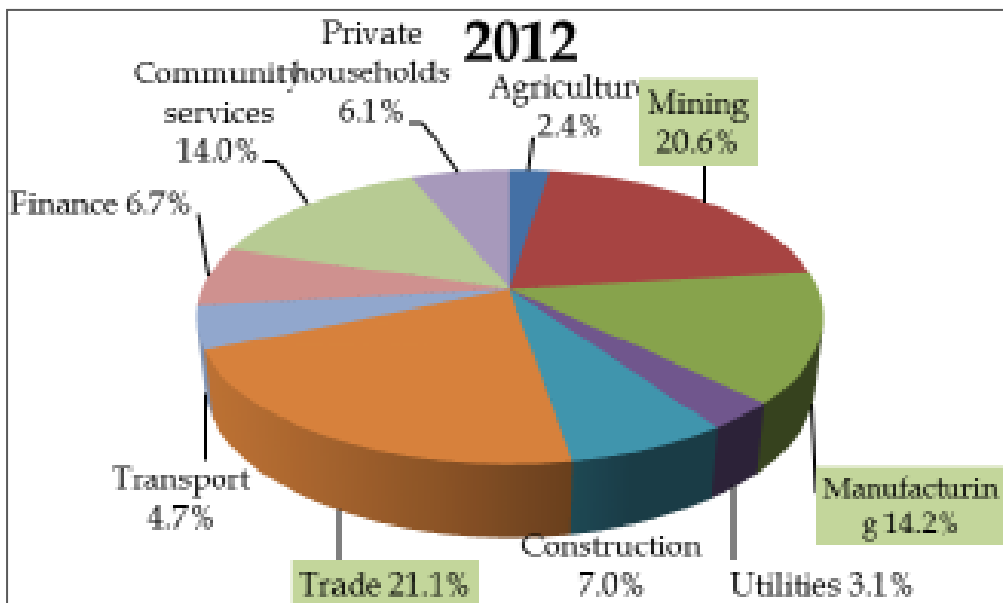


Figure 23: Industries (IDP, 2016/17)



The leading industry in terms of employment is trade with 21.1%, followed by mining 20.6% and manufacturing 14.2%. Since 2001 there has been an increasing role/share of mining, construction, community services & finance as employer and a decrease in the role/share of trade, manufacturing, transport, agriculture, private households and utility.

*Education Indicators*

*Table 32: Education indicators (source: IDP, 2016/17)*

Labour indicators	Census 2001	Census 2011	Better (+) or worse (-) than Nkangala	Better (+) or worse (-) than Province	Ranking: Best (1) – worst (18)
Number of people 20+ with no schooling	24 908	14 993			11
Population 20+ with no schooling (%)	14.5%	5.8%	(+)(11.5%)	(+)(14.1%)	1
Population 20+ with matric and higher (%)	31.9%	45.3%	(+)(39.7%)	(+)(38.7%)	3
Functional literacy rate (%)	73.9%	86.0%	(+)(79.0%)	(+)(76.9%)	1

*Household profile and services*

Table 33 below indicates an increase in the number of households in eMalahleni since 1996 and 2011. The ownership on houses is decreasing since 1996. The decrease in % of ownership implies that the eMalahleni people prefer buying houses in other areas. In terms of 2011 statistics there are 38 519 owned and fully paid houses, 15 798 owned but not yet paid off, 22 874 occupied rent-free and rented is 39 463.

*Table 33: Household trends (source: IDP, 2016/17)*

	1996	2001	2011
Number of households	56 349	82 298	119 874
Annual growth rate of households (%)		3.79	3.76
Average household size	4.01	3.22	3.25
% Ownership (houses)	75	55	45



Table 34: Basic Service Infrastructure Indicators (source: IDP, 2016/17)

Basic Service Infrastructure indicators	Census 2001	Census 2011	Better (+) or worse (-) than Nkangala	Better (+) or worse (-) than Province	Ranking: Best (1) – worst (18)
% of households in informal dwellings	26.0%	19.3%	(-) (13.8%)	(-) (10.9%)	14
% households with no toilets	8.0%	3.1%	(+) (3.8%)	(+) (7.2%)	3
% households with connection to piped (tap) water: on site and off site	93.8%	94.8%	(+) (92.7%)	(+) (87.4%)	8
% households with electricity for lighting	70.3%	73.4%	(-) (85.7%)	(-) (86.4%)	17
% households with weekly municipal refuse removal	64.2%	67.2%	(+) (48.3%)	(+) (42.4%)	7

#### 8.4.2 Description of the current land uses

Early topo-cadastral maps indicate that the pre-mining (1960s) land use was agricultural. There is evidence of previous grazing on a number of blocks, as shown by the presence of *Stoebe vulgaris*, that is an indicator of excessive grazing pressure. Invasive wattle and eucalyptus trees were present in the area, and large stands of wattle have been removed as part of the colliery land management strategy.

The Khwezela Bokgoni Colliery processing plant and associated infrastructure was commissioned in 1979, and consists of a tip, stockpiles, processing plant and overland conveyors. Mining infrastructure consists of open pits, offices, a sewage plant, workshops, water reticulation pipelines, overhead powerlines and service roads.

The site identified for the proposed location of the pipeline and associated pump stations falls on previously disturbed land that has been rehabilitated.

Refer to the Master Layout Plan (Figure 24) below for a visual representation of the current mining infrastructure on-site.



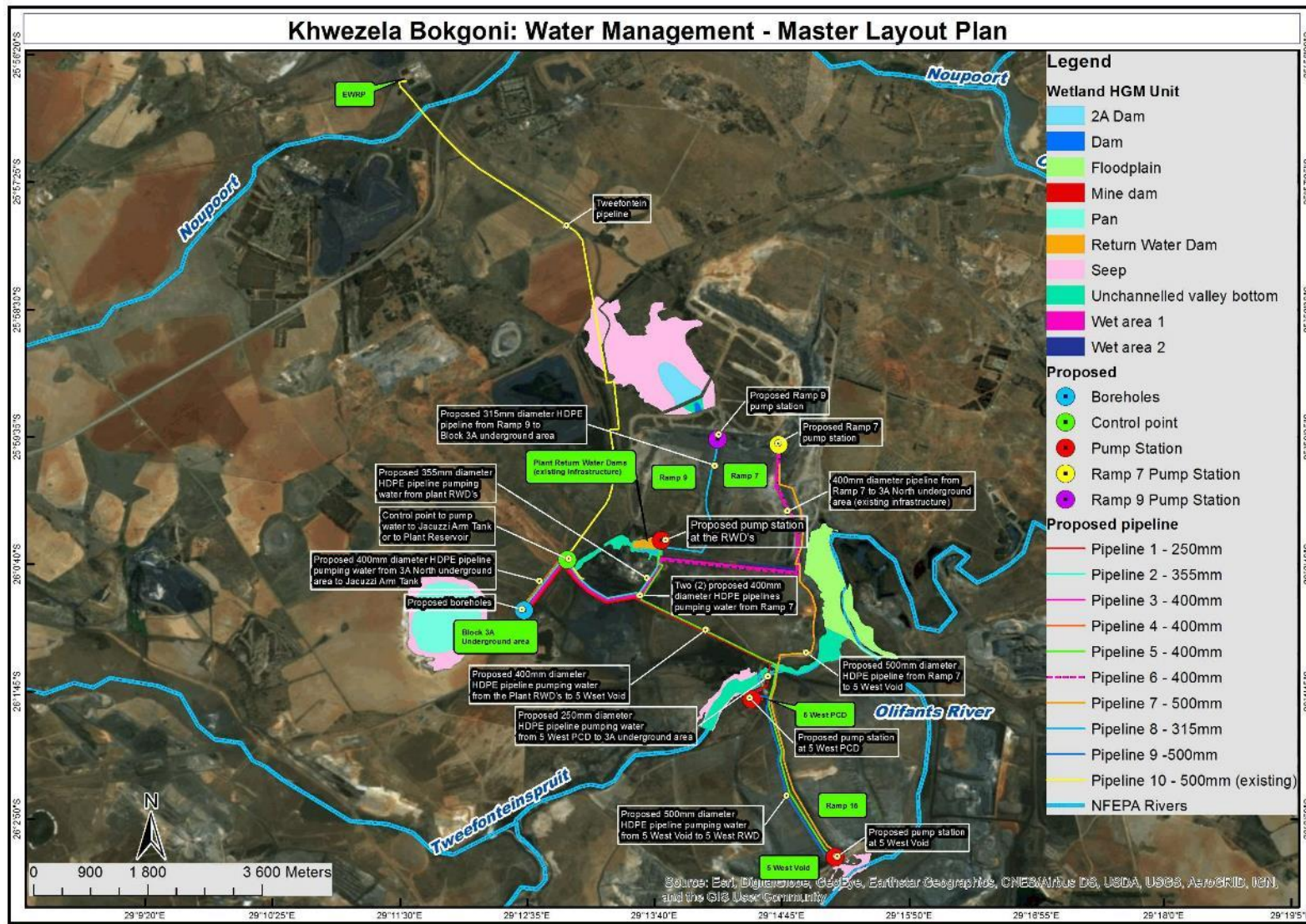


Figure 24: Master Layout Plan showing existing infrastructure and activities on-site in relation to the proposed project site(s)



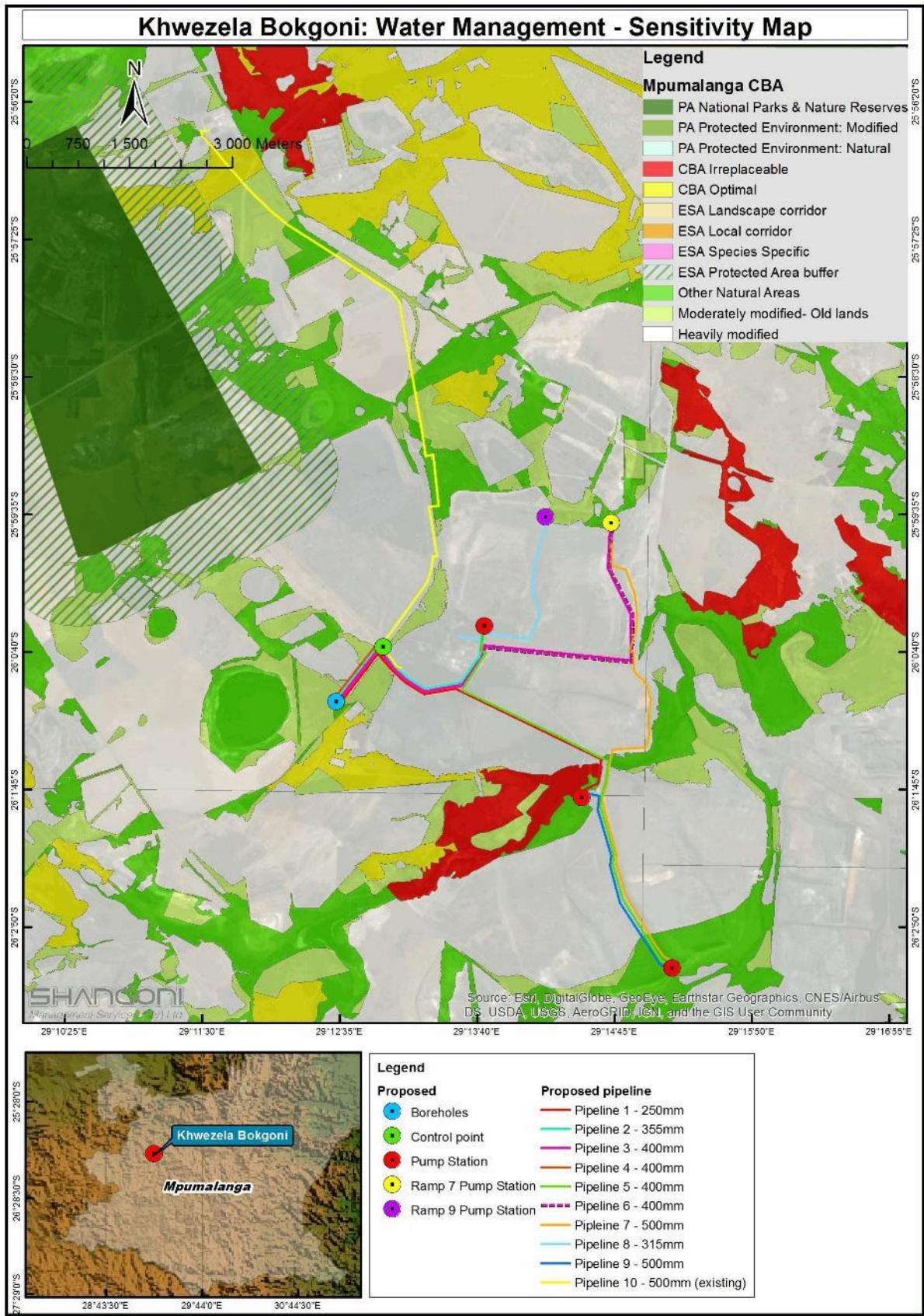


Figure 25: Environmental features (Sensitivity map) in relation to proposed site layout plan



## 8.5. Impacts and Risks Identified

A detailed risk assessment has been undertaken, as contained in Annexure G. The following table contains all the potential impacts identified for the activities described in the initial site layout.

*Table 35: Impacts and Risks identified including mitigation/management measures*





NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT			PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			Impact Description	Reversibility	Irreplaceable loss			Probability	Magnitude	Significance			Probability	Magnitude	Significance			
1	Geology	Pumping of affected water into 3A North Underground Area and 5 West Void.	The pumping of water underground may affect the stability of the geology due to the weathering and erosion.	Reversible	High Degree	Operational, Decommissioning	17 Ha	5	3	H	Control	The velocity of affected water pumped into 3A North Underground Area and 5 West Void should be minimised to decrease the possibility of erosion and weathering.	4	2	M	Geology to remain stable and prevent sinkholes	Geological surveys (Quarterly).	1 Year



NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT			PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			Impact Description	Reversibility	Irreplaceable loss			Probability	Magnitude	Significance			Probability	Magnitude	Significance			
2	Topography	Earthworks excavation and of for trench pipeline.	Altered runoff patterns, leading to increased erosion and sedimentation of freshwater habitat.	Reversible	Low Degree	Construction	46 196 m	4	2	M	Control, Remedy	<ul style="list-style-type: none"> <li>Earthworks to be limited to areas required for construction of pipelines and associated pump stations.</li> <li>Drainage lines to be reinstated and rehabilitated upon completion of construction.</li> </ul>	2	2	L	To prevent alterations of natural topography of the area.	General implementation of activities taking Mining and Biodiversity Guidelines into account.	1 Year



NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT			PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			Impact Description	Reversibility	Irreplaceable loss			Probability	Magnitude	Significance			Probability	Magnitude	Significance			
3	Soils	<ul style="list-style-type: none"> <li>Clearance of vegetation.</li> <li>Removal and stockpiling of topsoil.</li> <li>Construction of pipelines and associated pump stations.</li> <li>Earthworks and excavation of trench for pipeline.</li> </ul>	<ul style="list-style-type: none"> <li>A loss of microbes and viable seed may occur as a result of the temporary stockpiling of topsoil.</li> <li>The removal of topsoil may result in the mixing of the horizons of the soil that will have an impact on the fertility and production potential of the soil.</li> <li>The temporary stockpiling of topsoil may result in a decrease in the fertility of the soil and the leaching of minerals due to exposure of the soil to elements.</li> <li>Soil pollution due to hazardous chemical substances including fuel greases and oils used on site.</li> <li>Erosion due to pipe bursts.</li> <li>The ineffective handling of hydrocarbon spillages may lead to the contamination of soil, surface water and ground water resources.</li> </ul>	Reversible	Low Degree	Construction and Decommissioning	46 196 m	3	3	M	Control, Remedy	<ul style="list-style-type: none"> <li>Topsoil and subsoil are to be excavated and stockpiled separately.</li> <li>Erosion preventative measures should be implemented on stockpiles.</li> <li>Temporary stockpiles are to be exposed to the elements for as minimal time as possible i.e. excavation to only take place just before pipeline is installed and backfilling to commence immediately upon installation of pipeline.</li> <li>Immediately clean all spillages of fuels, lubricants and other petroleum-based products</li> <li>Regular inspection of pipelines.</li> <li>All hydrocarbon spills to be cleaned up immediately and the area suitably rehabilitated.</li> </ul>	2	2	L	<ul style="list-style-type: none"> <li>To prevent the loss of valuable topsoil.</li> <li>To prevent soil contamination and to conserve surface and ground water resources as well as to prevent impact on downstream water users</li> </ul>	Rehabilitation monitoring to be undertaken by suitably qualified rehabilitation specialist (in consultation with ecologist).  General implementation of activities taking Mining and Biodiversity Guidelines into account.	1 Year



NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT			PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			Impact Description	Reversibility	Irreplaceable loss			Probability	Magnitude	Significance			Probability	Magnitude	Significance			
4	Land Capability	<p>Pumping of affected water into 3A North Underground Area and 5 West Void.</p> <p>Construction of pipelines and associated pump stations.</p>	<p>Since Khwezela Bokgoni Colliery will be pumping water to the existing 3A North Underground Area and 5 West Void, that are areas that have been previously disturbed and where the land capability has already been altered, no additional changes in land capability will take place during the Construction or Operational Phases.</p>															
5	Fauna and Flora	<ul style="list-style-type: none"> <li>Clearance of vegetation</li> <li>Removal and stockpiling of topsoil.</li> <li>Earthworks and excavation of trench for pipeline</li> </ul>	<ul style="list-style-type: none"> <li>Spread of alien invasive plant species from the transformed areas to the natural vegetation.</li> <li>Disturbance of sensitive vegetation.</li> <li>Damage to natural habitat due to construction activities and consequential displacement of faunal species.</li> <li>Revegetation of areas disturbed during construction</li> </ul>	Reversible	Low Degree	Construction, Decommissioning	17 Ha 46 196 m	4	2	M	Control	<ul style="list-style-type: none"> <li>Alien invasive species should be removed (prioritising NEMBA category 1A &amp; B species).</li> <li>Any sensitive vegetation present on site must be demarcated to avoid disturbance.</li> <li>Construction activities should be restricted to the development footprint.</li> <li>Ensure immediate re-vegetation of disturbed areas following completion of construction activities.</li> </ul>	2	2	L	To preserve and protect indigenous fauna and flora.	<p>Rehabilitation monitoring to be undertaken by suitably qualified rehabilitation specialist (in consultation with ecologist).</p> <p>General implementation of activities taking Mining and Biodiversity Guidelines into account.</p>	1 Year



NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT		PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION	
			Impact Description	Reversibility			Irreplaceable loss	Probability	Magnitude			Significance	Probability	Magnitude				Significance
6	Sensitive landscapes (including wetlands)	<ul style="list-style-type: none"> <li>Construction of pipelines within wetland habitat.</li> <li>Construction of pipelines within 500 m regulated area but outside wetlands.</li> </ul>	<ul style="list-style-type: none"> <li>Alteration/damage to banks.</li> <li>Disturbance and loss of biodiversity &amp; habitat.</li> <li>Dust generation.</li> <li>Compaction of wetland sediments.</li> <li>Spillages and leaks from machinery and equipment.</li> <li>Water quality impact.</li> </ul>	Reversible	Low Degree	Construction	46 196 m	4	3	H	Control	<ul style="list-style-type: none"> <li>Regular inspections of pipelines</li> <li>Appropriate storm water management features should be installed.</li> <li>Pipelines must cross the Tweefonteinspruit via the existing haul road crossings. No new excavations or disturbances within the wetland.</li> <li>Laydown areas and construction camps must be located outside delineated wetland habitat.</li> <li>Limit earthworks to the immediate footprint required for construction.</li> </ul>	3	2	M	To protect wetland and sensitive areas.	Bio-monitoring (Bi-annual). Groundwater monitoring (Quarterly). Surface water monitoring (monthly).	1 Year



NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT			PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			Impact Description	Reversibility	Irreplaceable loss			Probability	Magnitude	Significance			Probability	Magnitude	Significance			
7	Sensitive landscapes (including wetlands)	<ul style="list-style-type: none"> <li>Operation of pipeline within wetland habitat</li> <li>Operation of pipelines within the 500 m regulated area but outside wetland habitat</li> </ul>	<ul style="list-style-type: none"> <li>Water quality deterioration due to leaks or pipe bursts.</li> <li>Erosion due to pipe bursts.</li> </ul>	Reversible	Low Degree	Operational	46 196 m	4	3	H	Control	<ul style="list-style-type: none"> <li>The pipeline must include flow monitoring technology that will allow for leaks and pipe bursts to be identified immediately.</li> <li>Pumping must be stopped immediately following identification of a leak or burst.</li> <li>Relevant authorities must be notified within 24 hours of any pipe burst or significant leak.</li> <li>Immediate clean-up and repair of any erosion damage caused by pipe bursts.</li> <li>Regular inspections of the pipeline to ensure optimal operation and to check for any erosion damage along the route.</li> <li>Inspections to be undertaken as walkdown surveys within wetland areas.</li> </ul>	3	2	M	To protect wetland and sensitive areas.	Bio-monitoring (Bi-annual). Groundwater monitoring (Quarterly). Surface water monitoring (monthly).	1 Year



7	Ground water	Storage of surplus water in underground and opencast voids	<ul style="list-style-type: none"> <li>The shallow weathered and unconfined aquifer is highly susceptible to pollution from surface.</li> <li>Artificial recharge could increase the water levels and pressures greater than ambient, which could result in the 'unlimited' migration of water and pollutants within the weathered aquifer.</li> </ul>	Reversible	Low Degree	Operational	17 Ha	2	3	M	Control	<ul style="list-style-type: none"> <li>Control water levels at elevations lower than the surrounding strata to prevent mine water from entering adjacent aquifer/s.</li> <li>The absolute critical water levels in 5 West Void is 1502 mamsl and 3A North underground 1533 mamsl. Water levels must be kept well below these levels, i.e., critical water levels plus buffer.</li> <li>Water levels in underground compartments must be measured frequently to ensure that levels are controlled efficiently and kept well below absolute critical levels and/ or surrounding water levels.</li> <li>Monitor groundwater quality frequently to act timeously if pollution is detected outside of the active mining area.</li> <li>Monitor surface water in Tweefonteinspruit and Olifants River in up- and downstream localities on a regular basis.</li> <li>Do not allow spillage or seepage of affected mine water into the receiving surface water environment.</li> </ul>	2	2	L	To minimise the extent of disturbance of the aquifer and to limit degeneration of groundwater quality and quantity.	Groundwater monitoring (quarterly)	1 year
8	Ground water	Pumping of affected water into 3A North Underground	At the LoM, when all mining has ceased at Khwezela Bokgoni Colliery, the water in the underground compartments begin to	Reversible	Low Degree	Closure	17 Ha	3	4	H	Control	<ul style="list-style-type: none"> <li>A rehabilitation plan must be implemented, and the plan should be done in the line with the contents of</li> </ul>	2	3	M	To minimise the extent of disturbance of the aquifer and to limit degeneration of groundwater	Groundwater monitoring (quarterly)	1 Year



NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT				SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			Impact Description	Reversibility	Irreplaceable loss	PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	Probability	Magnitude			Significance	Probability	Magnitude			
		Area and 5 West Void	rise naturally and no dewatering will be necessary in the opencast section at 2A. All opencast areas will be rehabilitated and water within these artificially created aquifers will also begin to rise naturally, but more rapid than the surrounding 'natural' aquifers. Decant at the lowest elevation is therefore possible from the rehabilitated opencast areas due to increased transmissivity compared to ambient. Decant is also possible from underground voids but is unlikely.							<p>National Water Act (Act No 36 of 1998), to avoid subsequent negative environmental impacts that may occur.</p> <ul style="list-style-type: none"> <li>Maintain containment barriers underground left intact between compartments to assist in final water containment.</li> <li>Update monitoring programme and the effectiveness of existing monitoring borehole positions should be re-evaluated.</li> <li>Continuation of the monitoring programme to establish post decommissioning trends.</li> <li>Pumping of affected water to EWRP should continue for as long as possible to keep water levels below decant levels.</li> </ul>				quality and quantity.			





NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT			PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			Impact Description	Reversibility	Irreplaceable loss			Probability	Magnitude	Significance			Probability	Magnitude	Significance			
9	Surface Water	<ul style="list-style-type: none"> <li>Grading, vegetation clearing and soil stripping</li> <li>Trench excavation and storage of soil stockpiles</li> <li>Use of hazardous materials</li> </ul>	<ul style="list-style-type: none"> <li>Decrease in surface water quality when any surface water comes into contact with dust, eroded soil, carbonaceous materials or other pollutants generated during the construction phase.</li> <li>The sediment load within surface water runoff may increase if not prevented or mitigated.</li> <li>Spillages of hazardous materials (i.e. oil, fuel and / or grease) used during the construction of the proposed Project may impact on the surrounding clean water environment.</li> <li>Deterioration of water quality, affecting the use of surface water as a natural resource.</li> </ul>	Reversible	Low Degree	Construction	46 196 m	3	2	M	Control	<ul style="list-style-type: none"> <li>Laydown area must be kept as small as reasonably possible.</li> <li>Soil stockpiles must be placed in designated areas and covered to protect the soils.</li> <li>The excavated trenches must be filled in and revegetated as soon as possible to prevent erosion.</li> <li>Store fuel and oil in designated bunded areas</li> </ul>	2	2	L	To conserve the surface water resource and prevent impact on downstream water users	Surface water quality monitoring (monthly).	1 Year



NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT			PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			Impact Description	Reversibility	Irreplaceable loss			Probability	Magnitude	Significance			Probability	Magnitude	Significance			
10	Surface Water	Operation of the pipeline system	<ul style="list-style-type: none"> <li>In areas where the pipelines are to be installed above ground, and support structures are needed, it could impact on the natural flow of surface water towards the Olifants River</li> <li>The pipelines will be constructed below ground. However, should a pipeline burst, or similar incident occur, affected water could migrate to the surface and affected water could spill into the clean water environment.</li> <li>Deterioration of water quality, affecting the use of surface water as a natural resource.</li> </ul>	Reversible	Low Degree	Operational	46 196 m	3	2	M	Control	<ul style="list-style-type: none"> <li>Construct the pipelines along the edges of the existing ramps, haul roads, light vehicle gravel roads and through the existing plant area.</li> <li>Utilise existing storm water culverts at any watercourse crossing</li> <li>Conduct regular inspections on the pipeline system to detect any leaks or malfunctions</li> </ul>	2	2	L	To conserve the surface water resource and prevent impact on downstream water users.	Surface water quality monitoring (monthly).	1 Year
11	Air Quality	<ul style="list-style-type: none"> <li>Clearance of vegetation.</li> <li>Construction of Pipelines and associated pump stations</li> </ul>	Continued utilisation of gravel roads to gain access to the Khwezela Bokgoni Colliery surface land use areas could impact intermittently on the dust content of the air and on the fallout dust levels, within the study area.	Reversible	Low Degree	Construction	46 196 m	3	2	M	Control	<ul style="list-style-type: none"> <li>Ensure dust suppression implemented throughout construction phase.</li> </ul>	2	2	L	To reduce air quality impacts from construction activities.	Dust fallout monitoring (monthly)	1 Year
12	Noise	It is anticipated that the proposed project will not have a severe impact on noise aspects. Mining activities are currently taking place at Khwezela Bokgoni Colliery. Therefore, it is likely that regular passers-by and the local residents are desensitised to the mining activities.																
13	Visual	It is anticipated that the proposed project will not have a severe impact on visual aspects. Mining activities are currently taking place at Khwezela Bokgoni Colliery. Therefore, it is likely that regular passers-by and the local residents are desensitised to the mining activities.																
14	Sites of Archaeological and Cultural Importance	It is anticipated that no site of archaeological and cultural importance will be impacted.																



NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT			PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			Impact Description	Reversibility	Irreplaceable loss			Probability	Magnitude	Significance			Probability	Magnitude	Significance			
15	Socio-Economic	<p>Pumping of affected water into 3A North Underground Area and 5 West Void.</p> <p>Construction of pipelines and associated pump stations</p>	Jobs will be retained, providing income and, therefore, having a further impact on the regional socio-economy aspects of the area, along with other benefits arising from the Social and Labour Plan.	Reversible	Low Degree	Operational	Local and Regional	Positive		Control	<ul style="list-style-type: none"> <li>Where possible and feasible, local procurement of labour should be applied to ensure the maximum benefit to the impacted community.</li> <li>Continuous skills and development training will equip low-skilled labourers with experience and advanced skills to work on other mining projects within the area, thus creating long-term employment if the foreseeable future.</li> </ul>	Positive			Prevent socio economic impacts by employment opportunities.	Implementation of approved Social and Labour Plan.	1 year	



Cumulative impacts refer to the situation where an activity may in itself not have a significant impact, but may become significant when added to the existing and potential impacts from similar or different activities in the area. Cumulative impacts can be defined as “changes to the environment that are caused by an action in combination with other past, present and future human actions” (DEAT, 2004). Different types of cumulative impacts can occur, depending on the characteristics thereof, refer Table 36. Table 37 below presents a summary of these cumulative impacts as per Guideline 5: Assessment of Alternatives and Impacts (DEAT, 2006).

Table 36: Types of Cumulative Impacts

Type		Description
Additive		Where it adds to the impact which is caused by other similar impacts.
Interactive impact		A cumulative impact is caused by different impacts that combine to form a new kind of impact.
	Countervailing	The net adverse cumulative impact is less than the sum of the individual impacts.
	Synergistic	The net adverse cumulative impact is greater than the sum of the individual impacts.

Table 37: Identified cumulative impacts

ENVIRONMENTAL COMPONENT (ASPECTS AFFECTED)	ACTIVITY	POTENTIAL IMPACT DESCRIPTION
Geology	Continuation of the Alternative Fuels and Resources Programme	No contribution to cumulative impacts associated with the Post 2A Dam Water Management Strategy project.
Topography, Soils Land Use and Land Capability	Continuation of the Alternative Fuels and Resources Programme	No contribution to cumulative impacts associated with the Post 2A Dam Water Management Strategy project.
Flora and Fauna	Continuation of the Alternative Fuels and Resources Programme	No contribution to cumulative impacts associated with the Post 2A Dam Water Management Strategy project.
Surface and Ground Water	Continuation of the Alternative Fuels and Resources Programme	Surface and ground water resources may become contaminated in the event that contaminated surface water runoff from the site enters the receiving environment.
Sensitive Landscapes (including wetlands)	Continuation of the Alternative Fuels and Resources Programme	Surface water runoff from the Post 2A Dam Water Management Strategy project site may cumulatively have an impact on the wetlands located on the project site.



ENVIRONMENTAL COMPONENT (ASPECTS AFFECTED)	ACTIVITY	POTENTIAL IMPACT DESCRIPTION
Socio-Economic	Continuation of the Alternative Fuels and Resources Programme	Jobs will be retained, providing income and, therefore, having a further impact on the regional socio-economy aspects of the area, along with other benefits arising from the Social and Labour Plan.
Air Quality	Continuation of the Alternative Fuels and Resources Programme	Nuisance impact of dust on residences in Ulco, considering the cumulative impact of the existing mining and processing operation.

## 8.6. Methodology used in determining and ranking potential environmental impacts and risks

### 8.6.1 Methodology applied

The environmental risk of any aspect is determined by a combination of parameters associated with the impact. Each parameter connects the physical characteristics of an impact to a quantifiable value to rate the environmental risk.

Impact assessments should be conducted based on a methodology that includes the following:

- Clear processes for impact identification, predication and evaluation;
- Specification of the impact identification techniques;
- Criteria to evaluate the significance of impacts;
- Design of mitigation measures to lessen impacts;
- Definition of the different types of impacts (indirect, direct or cumulative); and
- Specification of uncertainties.

After all impacts have been identified, the nature and scale of each impact can be predicted. The impact prediction will take into account physical, biological, socio-economic and cultural information and will then estimate the likely parameters and characteristics of the impacts. The impact prediction will aim to provide a basis where the significance of each impact can be determined and appropriate mitigation measures can be developed.

The risk assessment methodology is based on defining and understanding the three basic components of the risk, i.e. the source of the risk, the pathway and the target that experiences the risk (receptor). Refer to Figure 14 below for a model representing the above principle (as contained in the DWA's Best Practice Guideline: G4 – Impact Prediction).



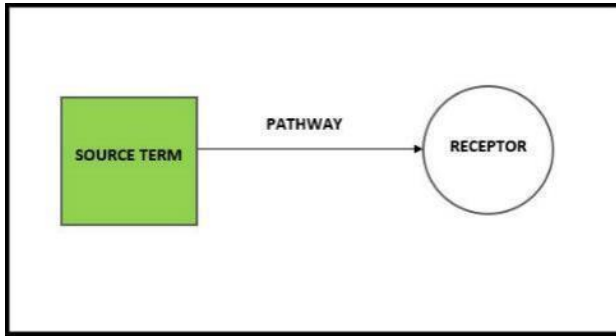


Figure 26: Impact prediction model

Table 38 and Table 39 below indicate the methodology to be used in order to assess the Probability and Magnitude of the impact, respectively, and Table 40 provides the Risk Matrix that will be used to plot the Probability against the Magnitude in order to determine the Severity of the impact.

Table 38: Determination of Probability of impact

Score	Frequency of Aspect / Unwanted Event	Availability of Pathway from the source to the receptor	Availability of Receptor
1	Never known to have happened, but may happen	A pathway to allow for the impact to occur is never available	The receptor is never available
2	Known to happen in industry	A pathway to allow for the impact to occur is almost never available	The receptor is almost never available
3	< once a year	A pathway to allow for the impact to occur is sometimes available	The receptor is sometimes available
4	Once per year to up to once per month	A pathway to allow for the impact to occur is almost always available	The receptor is almost always available
5	Once a month - Continuous	A pathway to allow for the impact to occur is always available	The receptor is always available

**Step 1:** Determine the **PROBABILITY** of the impact by calculating the average between the Frequency of the Aspect, the Availability of a pathway to the receptor and the availability of the receptor.



Table 39: Determination of Magnitude of impact

Score	SOURCE				RECEPTOR	
	Duration of impact	Extent	Volume / Quantity / Intensity	Toxicity / Destruction Effect	Reversibility	Sensitivity of environmental component
1	Lasting days to a month	Effect limited to the site. (metres);	Very small quantities / volumes / intensity (e.g. < 50L or < 1Ha)	Non-toxic (e.g. water) / Very low potential to create damage or destruction to the environment	Bio-physical and/or social functions and/or processes will remain unaltered.	Current environmental component(s) are largely disturbed from the natural state. Receptor of low significance / sensitivity
2	Lasting 1 month to 1 year	Effect limited to the activity and its immediate surroundings. (tens of metres)	Small quantities / volumes / intensity (e.g. 50L to 210L or 1Ha to 5Ha)	Slightly toxic / Harmful (e.g. diluted brine) / Low potential to create damage or destruction to the environment	Bio-physical and/or social functions and/or processes might be negligibly altered or enhanced / Still reversible	Current environmental component(s) are moderately disturbed from the natural state. No environmentally sensitive components.
3	Lasting 1 – 5 years	Impacts on extended area beyond site boundary (hundreds of metres)	Moderate quantities / volumes / intensity (e.g. > 210 L < 5000L or 5 – 8Ha)	Moderately toxic (e.g. slimes) Potential to create damage or destruction to the environment	Bio-physical and/or social functions and/or processes might be notably altered or enhanced / Partially reversible	Current environmental component(s) are a mix of disturbed and undisturbed areas. Area with some environmental sensitivity (scarce / valuable environment etc.).
4	Lasting 5 years to Life of Organisation	Impact on local scale / adjacent sites (km's)	Very large quantities / volumes / intensity (e.g. 5000 L – 10 000L or 8Ha– 12Ha)	Toxic (e.g. diesel & Sodium Hydroxide)	Bio-physical and/or social functions and/or processes might be considerably altered or enhanced / potentially irreversible	Current environmental component(s) are in a natural state. Environmentally sensitive environment / receptor (endangered species / habitats etc.).
5	Beyond life of Organisation / Permanent impacts	Extends widely (nationally or globally)	Very large quantities / volumes / intensity (e.g. > 10 000 L or > 12Ha)	Highly toxic (e.g. arsenic or TCE)	Bio-physical and/or social functions and/or processes might be severely/substantially altered or enhanced / Irreversible	Current environmental component(s) are in a pristine natural state. Highly Sensitive area (endangered species, protected habitats etc.)

**Step 2:** Determine the **MAGNITUDE** of the impact by calculating the average of the factors above



Table 40: Determination of Severity of impact

Environmental Impact Rating / Priority					
	MAGNITUDE				
Probability	1 Minor	2 Low	3 Medium	4 High	5 Major
5 Almost Certain	Low	Medium	High	High	High
4 Likely	Low	Medium	High	High	High
3 Possible	Low	Medium	Medium	High	High
2 Unlikely	Low	Low	Medium	Medium	High
1 Rare	Low	Low	Low	Medium	Medium

**Step 3:** Determine the **SEVERITY** of the impact by plotting the averages that were obtained above for Probability and Magnitude.

In terms of section 16(3)(b) of the Environmental Impact Assessment (EIA) Regulations, 2014, as amended, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority.

It is the purpose of the Risk Assessment Report (RAR) to provide the Competent Authority with the detail associated with the impact assessment table (as provided below) and included into the various sections of the EIAR / EMPr.

The following table and column headings (shown in table in Section 8.7 of Part A below), form part of the Shangoni risk assessment table template. For ease of reference, the various table columns have been incorporated into one integrated risk assessment table, as is presented in the table in Section 8.7 of Part A.

### 8.6.2 Shangoni risk assessment table template in relation to the requirements as per the DMR report template





NO	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT				SIGNIFICANCE if not mitigated			MITIGATION TYPE (modify, remedy, control, or stop) through e.g. noise control measures)	MITIGATION MEASURES	SIGNIFICANCE If mitigated			STANDARD TO BE ACHIEVED	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
			Impact Description	Reversibility	Irreplaceable loss	PHASE in which impact is anticipated	SIZE AND SCALE of disturbance	Probability	Magnitude			Significance	Probability	Magnitude			
For referencing purposes	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> <li>Section 3(i) of Part A</li> <li>Section 1 (e) of Part B</li> </ul>	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> <li>Section 3(g) (v) of Part A</li> <li>Section 3(i) of Part A</li> <li>Section 1(d) (ix) of Part B</li> <li>Section 1 (e) of Part B</li> <li>Section 1 (f) of Part B</li> </ul>	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> <li>Section 3(g) (v) of Part A</li> <li>Section 3(i) of Part A</li> <li>Section 1 (e) of Part B</li> <li>Section 1 (f) of Part B</li> </ul>	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> <li>Section 3(i) of Part A</li> <li>Section 1 (e) of Part B</li> </ul>	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> <li>Section 1(d) (ix) of Part B.</li> </ul>	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> <li>Section 3(g) (v) of Part A</li> <li>Section 3(i) of Part A</li> </ul>	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> <li>Section 3(g) (v) of Part A</li> <li>Section 3(i) of Part A</li> <li>Section 1 (e) of Part B</li> <li>Section 1 (f) of Part B</li> </ul>	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> <li>Section 3(g) (v) of Part A</li> <li>Section 3(i) of Part A</li> <li>Section 1 (e) of Part B</li> <li>Section 1 (f) of Part B</li> </ul>	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> <li>Section 1(d) (ix) of Part B</li> </ul>	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> <li>Section 3(g) (v) of Part A</li> <li>Section 3(i) of Part A</li> </ul>	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> <li>Section 3(g) (v) of Part A</li> <li>Section 3(i) of Part A</li> </ul>	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> <li>Section 3(g) (v) of Part A</li> <li>Section 3(i) of Part A</li> </ul>	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> <li>Section 1 (e) of Part B</li> </ul>	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> <li>Section 1(d) (ix) of Part B.</li> <li>Section 1 (f) of Part B</li> </ul>	As required in the following sections of the DMR EIAR / EMPr template: <ul style="list-style-type: none"> <li>Section 1(d) (ix) of Part B.</li> <li>Section 1 (f) of Part B</li> </ul>		



## **8.7. Positive and negatives that the proposed activity (in terms of the initial site layout) and alternatives will have on the environment and community affected**

The positive and negative implication of the proposed activity and the alternative identified have been provided below and assessed in terms of the following four categories:

- Environmental;
- Technical/Engineering;
- Economical; and
- Social.



Table 41: Advantage and disadvantages of the proposed activities and preliminary identified alternatives

Alternative	Advantages	Disadvantages
<p>Activity Alternatives (temporary storage of water and construction of pipelines and associated pump stations)</p>	<p><b>Alternative 1 (preferred):</b> Pumping of affected water for temporary storage into 3A North Underground Area and 5 West Void and the construction of pipelines and associated pump stations</p> <p><b>Environmental:</b> Pumping of affected water for temporary storage into 3A North Underground Area and 5 West Void and the construction of pipelines and associated pump stations will have minimal disturbance on fauna and flora. The post closure impact on land use will not be as significant as constructing a new water storage facility. No loss of landscape character, sense of place and visual absorption capacity. Small carbon footprint.</p> <p><b>Technical/Engineering:</b> Continuation of existing mining activities at Khwezela Bokgoni Colliery existing operations.</p> <p><b>Economical:</b> Economical advantages are closely linked to the technical/engineering aspects, with limited cost investment to undertake expansion activities.</p> <p><b>Social:</b> Lowered visual intrusion. Job opportunities will be retained. Benefits arising from the SLP such as LED projects, learnerships etc. will continue.</p>	<p><b>Environmental:</b> Leakages in pipeline and seepage of water from 3A North Underground Area and 5 West Void into the sensitive areas may cause pollution.</p> <p><b>Technical/Engineering:</b> Minimal understanding of the effects of pumping water underground for temporary storage.</p> <p><b>Economical:</b> No disadvantages identified.</p> <p><b>Social:</b> No disadvantages identified.</p>
	<p><b>Alternative 2:</b> Pumping of affected water for temporary storage into 3A North Underground Area and the construction of pipelines and associated pump stations</p> <p><b>Environmental:</b> Pumping of affected water for temporary storage into 3A North Underground Area and the construction of pipelines and associated pump stations will have minimal disturbance on fauna and flora. The post closure impact on land use will not be as significant as constructing a new water storage facility. No loss of landscape character, sense of place and visual absorption capacity. Small carbon footprint.</p>	<p><b>Environmental:</b> Leakages in pipeline and seepage of water from 3A North Underground Area into the sensitive areas may cause pollution. There may be overflows as the storage capacity is decreased.</p> <p><b>Technical/Engineering:</b> Specialized operators and maintenance crews will be required to ensure water balance is maintained</p>



Alternative	Advantages	Disadvantages
	<p><b>Technical/Engineering:</b> Continuation of existing mining activities at Khwezela Bokgoni Colliery existing operations.</p> <p><b>Economical:</b> The cost of purchasing materials for the proposed pipelines and pump stations will be decreased as there would be less pipelines and pump stations being constructed.</p> <p><b>Social:</b> Lowered visual intrusion. Job opportunities will be retained. Benefits arising from the SLP such as LED projects, learnerships etc. will continue.</p>	<p><b>Economical:</b> Due to capacity issues, the mine may have to temporarily cease operations should there be an excess amount of water that needs to be pumped to the 3A North Underground Area. This will in turn have a repercussion on the productivity of the mine.</p> <p><b>Social:</b> There may be job losses should the mine encounter economic challenges as described above.</p>
<p><b>Alternative 3:</b> Pumping of affected water for temporary storage into 5 West Void and the construction of pipelines and associated pump stations</p>	<p><b>Environmental:</b> Pumping of affected water for temporary storage into 5 West Void and the construction of pipelines and associated pump stations will have minimal disturbance on fauna and flora. The post closure impact on land use will not be as significant as constructing a new water storage facility. No loss of landscape character, sense of place and visual absorption capacity. Small carbon footprint.</p> <p><b>Technical/Engineering:</b> Continuation of existing mining activities at Khwezela Bokgoni Colliery existing operations.</p> <p><b>Economical:</b> The cost of purchasing materials for the proposed pipelines and pump stations will be decreased as there would be less pipelines and pump stations being constructed.</p> <p><b>Social:</b> Lowered visual intrusion. Job opportunities will be retained. Benefits arising</p>	<p><b>Environmental:</b> Leakages in pipeline and seepage of water from 5 West Void into the sensitive areas may cause pollution. There may be overflows as the storage capacity is decreased.</p> <p><b>Technical/Engineering:</b> Specialized operators and maintenance crews will be required to ensure water balance is maintained</p> <p><b>Economical:</b> Due to capacity issues, the mine may have to temporarily cease operations should there be an excess amount of water that needs to be pumped to the 5 West Void. This will in turn have a repercussion on the productivity on the mine.</p> <p><b>Social:</b> There may be job losses should the mine encounter economic challenges as described above.</p>



Alternative		Advantages	Disadvantages
		from the SLP such as LED projects, learnerships etc. will continue.	
Development versus no-go alternative	Alternative NG1: No go option	<p><b>Environmental:</b> Status quo of the site will remain as is (no additional environmental impacts will occur as a result of the mining and related activities)</p> <p><b>Technical/Engineering:</b> No additional machinery and resources required.</p> <p><b>Economical:</b> No additional materials required to be purchased.</p> <p><b>Social:</b> No additional environmental impacts will occur as a result of the mining and related activities</p>	<p><b>Environmental:</b> Additional water storage facilities would have to be constructed to manage the excess water from 2A Dam. This would have cumulative impacts on the environment. Should the mine not be able to handle to excess water, there is a possibility of spills into the sensitive environment.</p> <p><b>Technical/Engineering:</b> The mine would have to explore alternate ways to deal with the excess water from 2A Dam.</p> <p><b>Economical:</b> There may be repercussions on the operations of the mine should the development not go ahead as the mine would have to delay the mining of Pit 2A. This will affect the productivity of the mine and will have cumulative impacts on the local, provincial and national economy.</p> <p><b>Social:</b> No additional job opportunities will arise. LOM will also reduce.</p>



## 8.8. Possible mitigation measures that could be applied and the level of risk

The impact management measures and level of risk have been included under Section 8.5 of Part A.

Table 42 below provides for a summary of the issues and concerns as raised by affected parties and an assessment of the mitigations or site layout alternatives available to accommodate or address their concerns, together with an assessment of the impacts or risks associated with the mitigation or alternatives considered.

Table 42: Summary of issues and concerns raised by I&APs

Concerns as raised by affected parties	Mitigation measures or site alternative
<p>Department of Environmental Affairs and Department of Mineral Resources to attach the following conditions to the mining licenses:</p> <ul style="list-style-type: none"> <li>• That the mining company is required to formulate the Internal Coal Air Pollution Trust Fund that is aimed to pay for the medical expenses of employees of the company as well as members of community in the mining areas of operation of the company who suffer from illnesses associated with coal air pollution including but not limited to TB, lung cancer, bronchitis and other cardiopulmonary diseases. The Deed of Trust attached hereinafter can be used by the companies.</li> <li>• Compensation of house owners in the areas of operation of the mining companies in the event their houses are affected by blasting.</li> <li>• Lodging of Burial Site Protection Plan, in case of blasting destroying graves.</li> <li>• Compliance with Broad Based Black Economic Empowerment (BBBEE) and</li> <li>• Lodging of Broad Based Black Economic Empowerment Plan.</li> </ul>	<p>Information on the specific environmental features regarding air quality and noise and vibration has been provided for in Chapter J and Chapter K of Section 8.4.1.</p> <p>Please note that due to the proposed project being an extension of the operations at Khwezela Bokgoni Colliery, no new impacts regarding air quality and noise/vibrations are foreseen to be impacted upon as a result of this project.</p>

## 8.9. Motivation where no alternative sites were considered

Khwezela Bokgoni Colliery is an existing mining operation and the Post 2A Dam Water Management Strategy Project is associated with the Pit 2A Extension. The Post 2A Dam Water Management Strategy Project will be a continuation of already authorised mining rights open-pit area. The 3A North Underground Area and the 5 West Void are existing and within the locality of the Post 2A Dam Water Management Strategy Project. Therefore, no alternative site locations were considered.



## 8.10. The outcome of the Site Selection Matrix. Final site layout plan

No site alternatives were identified as the 3A North Underground Area and 5 West Void are existing facilities that will be utilised for the temporary storage of water. The pipeline routes were selected based on the topography as well as the sensitive areas located around the project area

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

All impacts and risks as identified are contained within Section 8.5 Impacts and risks identified. As further provided is an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures. The methodology applied in assessing and ranking the impacts and risks on the preferred site is described in Section 8.6.

## 10. Assessment of each identified potentially significant impact and risk

Refer to the full risk assessment and mitigation measures table provided in Section 8 (Part A) above.

## 11. Summary of specialist reports

Recommendations as provided by specialist have been included in the table below:

LIST OF STUDIES UNDERTAKEN	OF RECOMMENDATIONS OF SPECIALIST REPORT	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
Ground water study	<p>It is imperative that water be pumped to the EWRP and that pumped water only be stored temporarily.</p> <p>Seepage and decanting of mine water can be prevented by ensuring that water levels in a mine do not rise into the weathered zone.</p> <p>Water levels within these proposed storage voids should be kept low enough by</p>	X	Section 8.4 and 8.5



LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORT	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	<p>pumping to EWRP for treatment.</p> <p>The absolute critical water levels in 5 West Void is 1502 mamsl and 3A North Underground 1533 mamsl. Water levels must be kept well below these levels, i.e., critical water levels plus buffer.</p> <p>The mine must implement a rehabilitation and acid management strategy to control or limit the formation of acid mine drainage, especially during closure.</p> <p>Monitoring on Tweefonteinspruit and Olifants River be effective and efficient to quantify any risks that may result from decant or from seepage and groundwater contribution to baseflow to these systems.</p> <p>An additional monitoring point on the Olifants River, upstream from the current WP042 (<i>Olifants In</i>) can be implemented to allow for more effective impact quantification during the operational phase. Various other coal mines are operating within the catchment (Glencore's Tweefontein and Impunzi collieries; and Wolvekrans Colliery owned by South 32, that can also contribute to the substandard quality within this section of the Olifants River. This additional point will function as the most upstream locality on the Olifants River relative to Khwezela Bokgoni Colliery (and Wolvekrans, South 32).</p>		





LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORT	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	<p>Stage curves for all the mined-out areas need to be completed and refined and the water volumes in all areas need to be monitored to ensure that management actions (treatment) can be rolled out in time to cater for all contaminated water.</p> <p>Water abstraction should be planned such that the water level in the mine remains well below the decant surface elevation.</p>		
Wetland Study	<p>The Tweefonteinspruit must be crossed via the existing haul road crossing and no direct disturbance of wetland habitat must be allowed to take place.</p> <p>Water stored within the opencast pits must be maintained at levels as recommended in the groundwater report to minimise risk of seepage out of the opencast pits.</p> <p>It is important that technology that will allow the immediate detection of leaks and / or pipe bursts and the subsequent immediate shut down of pumping is utilised. In the absence of such technology it is possible that leaks could go undetected for lengthy periods due to the pipeline being buried. Such leaks could results in adjacent wetlands receiving contaminated water inputs.</p>	X	Section 8.4 and 8.5



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## 12. Environmental Impact Statement

### 12.1. Summary of the key findings of the environmental impact assessment

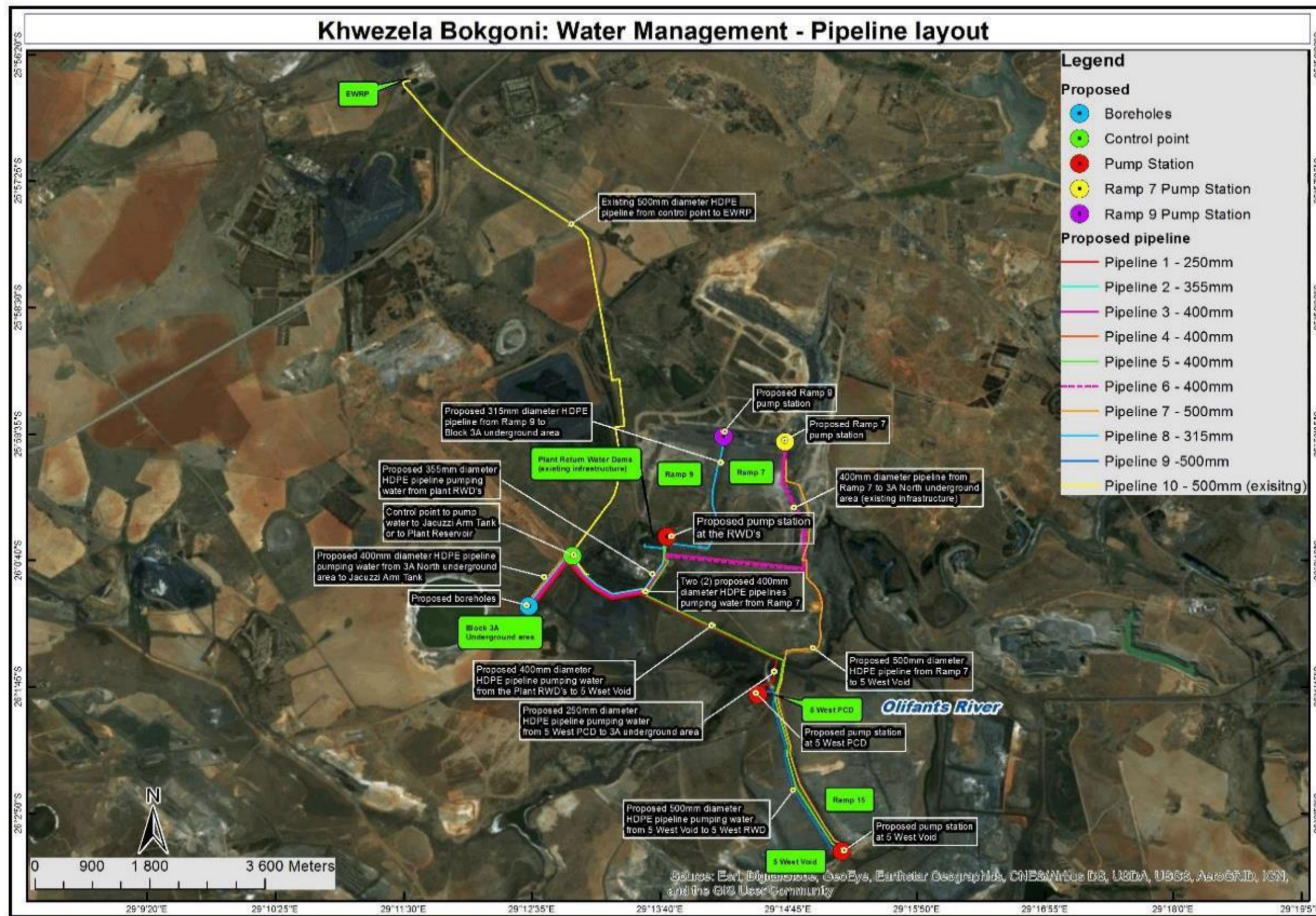
This EIAR has served to identify the potential impacts associated with the activities of the associated project. In accordance with the relevant environmental legislation, reasonable measures to mitigate the potential impacts arising from the proposed activities have been assessed and the significance of each of these impacts under both the pre- and post-mitigation scenarios identified and detailed.

The methodology utilised to undertake the impact assessment has incorporated, amongst other skills, professional experience, relevant literature and local knowledge of the site and surrounding area.

It is the EAP's opinion that based on the process that has been followed and the findings of the impact assessment, in conjunction with the proposed mitigation measures, that no unmanageable adverse impacts are expected to occur and some positive impacts are expected.



## 12.2. Final Site Map



*Figure 27: Final Site Map*



### 12.3. Summary of the positive and negative implications and risks of the proposed activity

A summary of the positive and negative implications and risks of the authorised project have been summarised below.

Table 43: Summary of the negative environmental impacts, after mitigation

NO.	ACTIVITY	POTENTIAL IMPACT	PHASE in which impact is anticipated	SIGNIFICANCE If mitigated
<b>Geology</b>				
1	Pumping of affected water into 3A North Underground Area and 5 West Void.	The pumping of water underground may affect the stability of the geology due to the weathering and erosion.	Operational; Decommissioning	Medium
<b>Topography</b>				
2	Earthworks and excavation of trench for pipeline.	Altered runoff patterns, leading to increased erosion and sedimentation of freshwater habitat.	Construction	Low
<b>Soils</b>				
3	<ul style="list-style-type: none"> <li>Clearance of vegetation.</li> <li>Removal and stockpiling of topsoil.</li> <li>Construction of pipelines and associated pump stations.</li> <li>Earthworks and excavation of trench for pipeline.</li> </ul>	<ul style="list-style-type: none"> <li>A loss of microbes and viable seed may occur as a result of the temporary stockpiling of topsoil.</li> <li>The removal of topsoil may result in the mixing of the horizons of the soil that will have an impact on the fertility and production potential of the soil.</li> <li>The temporary stockpiling of topsoil may result in a decrease in the fertility of the soil and the leaching of minerals due to exposure of the soil to elements.</li> </ul>	Construction; Operational; Decommissioning	Low



NO.	ACTIVITY	POTENTIAL IMPACT	PHASE in which impact is anticipated	SIGNIFICANCE If mitigated
		<ul style="list-style-type: none"> <li>• Soil pollution due to hazardous chemical substances including fuel greases and oils used on site.</li> <li>• Erosion due to pipe bursts</li> </ul>		
<b>Land Capability</b>				
4	Pumping of affected water into 3A North Underground Area and 5 West Void.  Construction of pipelines and associated pump stations.	Since Khwezela Bokgoni Colliery is pumping water to the existing 3A North Underground Area and 5 West Void, that are areas that have been previously disturbed and where the land capability has already been altered, no additional changes in land capability will take place during the Construction or Operational Phases.		
<b>Fauna and Flora</b>				
5	<ul style="list-style-type: none"> <li>• Clearance of vegetation</li> <li>• Removal and stockpiling of topsoil.</li> <li>• Earthworks and excavation of trench for pipeline</li> </ul>	<ul style="list-style-type: none"> <li>• Spread of alien invasive plant species from the transformed areas to the natural vegetation.</li> <li>• Disturbance of sensitive vegetation.</li> <li>• Damage to natural habitat due to construction activities and consequential displacement of faunal species.</li> <li>• Revegetation of areas disturbed during construction</li> </ul>	Construction; Decommissioning	Low
<b>Sensitive Landscapes (Including Wetlands)</b>				
6	<ul style="list-style-type: none"> <li>• Construction of pipelines within wetland habitat.</li> <li>• Construction of pipelines within 500m regulated area but outside wetlands.</li> </ul>	<ul style="list-style-type: none"> <li>• Alteration/damage to banks.</li> <li>• Disturbance and loss of biodiversity &amp; habitat.</li> <li>• Dust generation.</li> </ul>	Construction	Medium



NO.	ACTIVITY	POTENTIAL IMPACT	PHASE in which impact is anticipated	SIGNIFICANCE If mitigated
		<ul style="list-style-type: none"> <li>• Compaction of wetland sediments.</li> <li>• Spillages and leaks from machinery and equipment.</li> <li>• Water quality impact.</li> </ul>		
7	<ul style="list-style-type: none"> <li>• Operation of pipeline within wetland habitat</li> <li>• Operation of pipelines within the 500 m regulated area but outside wetland habitat</li> </ul>	<ul style="list-style-type: none"> <li>• Water quality deterioration due to leaks or pipe bursts.</li> <li>• Erosion due to pipe bursts.</li> </ul>	Operational	Medium
<b>Ground Water</b>				
8	Storage of surplus water in underground and opencast voids	<ul style="list-style-type: none"> <li>• The shallow weathered and unconfined aquifer is highly susceptible to pollution from surface.</li> <li>• Artificial recharge could increase the water levels and pressures greater than ambient, which could result in the 'unlimited' migration of water and pollutants within the weathered aquifer.</li> </ul>	Operational	Low
9	Storage of surplus water in underground and opencast voids	At the LoM, when all mining has ceased at Khwezela Bokgoni Colliery, the water in the underground compartments begin to rise naturally and no dewatering will be necessary in the opencast section at 2A. All opencast areas will be rehabilitated and water within these artificially created aquifers will also begin to rise naturally, but more rapid than the surrounding 'natural' aquifers. Decant at the lowest elevation is therefore possible	Closure	Medium



NO.	ACTIVITY	POTENTIAL IMPACT	PHASE in which impact is anticipated	SIGNIFICANCE If mitigated
		from the rehabilitated opencast areas due to increased transmissivity compared to ambient. Decant is also possible from underground voids but is unlikely.		
<b>Surface Water</b>				
10	Grading, vegetation clearing and soil stripping. Trench excavation and storage of soil stockpiles	<ul style="list-style-type: none"> <li>Decrease in surface water quality when any surface water comes into contact with dust, eroded soil, carbonaceous materials or other pollutants generated during the construction phase.</li> <li>The sediment load within surface water runoff may increase if not prevented or mitigated.</li> <li>Spillages of hazardous materials (i.e. oil, fuel and / or grease) used during the construction of the proposed Project may impact on the surrounding clean water environment.</li> <li>Deterioration of water quality, affecting the use of surface water as a natural resource.</li> </ul>	Construction	Low
11	Operation of the pipeline system	<ul style="list-style-type: none"> <li>In areas where the pipelines are to be installed above ground, and support structures are needed, it could impact on the natural flow of surface water towards the Olifants River</li> <li>The pipelines will be constructed below ground. However, should a pipeline burst, or similar incident occur, affected</li> </ul>	Operation	Low





NO.	ACTIVITY	POTENTIAL IMPACT	PHASE in which impact is anticipated	SIGNIFICANCE If mitigated
		water could migrate to the surface and affected water could spill into the clean water environment. <ul style="list-style-type: none"> <li>• Deterioration of water quality, affecting the use of surface water as a natural resource.</li> </ul>		
<b>Air Quality</b>				
12	<ul style="list-style-type: none"> <li>• Clearance of vegetation.</li> <li>• Construction of Pipelines and associated pump stations</li> </ul>	Continued utilisation of gravel roads to gain access to the Khwezela Bokgoni Colliery surface land use areas could impact intermittently on the dust content of the air and on the fallout dust levels, within the study area.	Construction	Low
<b>Noise</b>				
13	It is anticipated that the proposed project will not have a severe impact on noise aspects. Mining activities are currently taking place at Khwezela Bokgoni Colliery. Therefore, it is likely that regular passers-by and the local residents are desensitised to the mining activities.			
<b>Visual</b>				
14	It is anticipated that the proposed project will not have a severe impact on visual aspects. Mining activities are currently taking place at Khwezela Bokgoni Colliery. Therefore, it is likely that regular passers-by and the local residents are desensitised to the mining activities.			
<b>Sites of Archaeological Importance</b>				
15	It is anticipated that no site of archaeological and cultural importance will be impacted.			



Table 44: Summary of the positive environmental impacts, after mitigation

NO.	ACTIVITY	POTENTIAL IMPACT	PHASE in which impact is anticipated	SIGNIFICANCE If mitigated
<b>Socio-Economic</b>				
1	Pumping of affected water into 3A North Underground Area and 5 West Void.  Construction of pipelines and associated pump stations	Jobs will be retained, providing income and, therefore, having a further impact on the regional socio-economy aspects of the area, along with other benefits arising from the Social and Labour Plan.	Operational	Positive Impact

### 13. Proposed impact management objectives and the impact management outcomes for inclusion into the EMPr

Based on the assessment and where applicable the recommendations from specialist reports, the table below summarises the impact management objectives and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.

Table 45: Impact management objectives and the impact management outcomes

ENVIRONMENTAL ASPECT	OBJECTIVE	SUMMARY OF IMPACT MANAGEMENT OUTCOME
Geology	Geology to remain stable and prevent sinkholes	Geological surveys (Quarterly).
Topography	To prevent alterations of natural topography of the area.	General implementation of activities taking Mining and Biodiversity Guidelines into account.
Soil	<ul style="list-style-type: none"> <li>To prevent soil contamination and to conserve surface and ground water resources as well as to prevent impact on downstream water users.</li> <li>To prevent the loss of valuable topsoil.</li> </ul>	Bio-monitoring (Bi-annual). Groundwater monitoring (Quarterly). Surface water monitoring (monthly). Rehabilitation monitoring to be undertaken by suitably qualified rehabilitation specialist (in consultation with ecologist). General implementation of activities taking Mining and Biodiversity Guidelines into account.



ENVIRONMENTAL ASPECT	OBJECTIVE	SUMMARY OF IMPACT MANAGEMENT OUTCOME
Flora and Fauna	To preserve and protect indigenous fauna and flora.	Rehabilitation monitoring to be undertaken by suitably qualified rehabilitation specialist (in consultation with ecologist). General implementation of activities taking Mining and Biodiversity Guidelines into account.
Sensitive Landscapes (including wetlands)	To protect wetland and sensitive areas.	Bio-monitoring (Bi-annual). Groundwater monitoring (Quarterly). Surface water monitoring (monthly).
Ground Water	<ul style="list-style-type: none"> <li>To minimise the extent of disturbance of the aquifer and to limit degeneration of groundwater quality and quantity.</li> <li>To minimise the extent of disturbance of the aquifer and to limit degeneration of groundwater quality and quantity.</li> </ul>	Groundwater monitoring (quarterly)
Surface Water	<ul style="list-style-type: none"> <li>To conserve the surface water resource and prevent impact on downstream water users.</li> <li>To conserve the surface water resource and prevent impact on downstream water users.</li> </ul>	Surface water quality monitoring (monthly).
Air Quality	To reduce air quality impacts from construction activities.	Dust fallout monitoring (monthly)
Socio-Economic	Prevent socio economic impacts by employment opportunities	Implementation of approved Social and Labour Plan.

## 14. Final proposed alternatives

The proposed 2A Dam Water Management Strategy Project is an extension to the Khwezela Bokgoni Colliery Pit 2A extension project. The mine revised its mine plan to extend mining operations in Pit 2A to include the mining of the coal situated in the area beneath 2A Dam. The mining out of the 2A Dam at Khwezela Bokgoni Colliery will result in a surplus of water, as confirmed by a recent update of the groundwater water balance. The project will focus on the management of water at the operation after mining out of 2A Dam.

It is proposed that 2A Dam water is temporarily stored within the 3A North Underground Area and 5 West Void before being pumped to EWRP. Both the 3A North Underground Area and the 5 West Void will be required for this project as this increases the storage capacity required for this project. The storage of water in both the 3A North Underground Area and the 5 West Void will ensure that no new



infrastructure to store affected water is constructed as these are existing infrastructure. No construction of new affected water storage infrastructure means that the proposed project footprint will be kept to a minimum and the cost of the proposed project will also remain minimal and this would make the proposed project more sustainable.

As mentioned above, the proposed project is an extension of the Pit 2A extension project, therefore, this project will also ensure that the coal reserves within Pit 2A can be mined without any delay due to the mine not having sufficient storage capacity for affected water. The continuation of mining ensures that there is a continuation of the operation of activities and will have a positive effect on the local, regional and national economy.

The proposed pipelines associated with the project will be continuously welded 400/500 mm diameter HDPE CLASS 10 pipes, buried in a 1 m deep x 1 m wide trench backfilled with selected gravel material with a minimum pipe cover of 0.5 m. The option of laying the pipelines above ground is not recommended due to fire, theft and the restriction of natural surface storm water run-off. There will, therefore, be no requirements for pipe anchors and supports. In order to minimise any disturbance to rehabilitated areas, the pipelines will be constructed along the edges of the existing ramps, haul roads, light vehicle gravel roads and through the existing plant area. All pipes crossing the existing gravel mine roads will be accommodated in a heavy-duty concrete interlocking pipe sleeves. Existing storm water culverts will be utilized at any water course crossings and no additional storm water culverts will be required. The pipelines will be constructed on top of the existing culverts and may be partially exposed depending on the depth of the fill material on top of the culverts.

## 15. Aspects for inclusion as conditions of the authorisation

Should the Department of Mineral Resources grant authorisation for this project, it should be subject to the following conditions:

- The project should remain in full compliance with the requirements of the EMPr and with all regulatory requirements;
- The EMPr should be implemented by qualified environmental personnel who have the competence and credibility to interpret the requirements of the EIA and the EMPr. Such persons must be issued with a written mandate by mine management to provide guidance and instructions to employees and contractors; and
- Stakeholder engagement must be maintained during the operational and closure/rehabilitation phases of the project.



## 16. Description of any assumptions, uncertainties and gaps in knowledge

In terms of the EIA Regulations GN R982 Appendix 1(3)(o), the Environmental Impact Assessment Practitioner (EAP) must provide a description of any assumptions, uncertainties and gaps in knowledge upon which the impact assessment has been based. The table below provides the assumptions and limitations applicable to the various specialist assessments.

Table 46: Specialist assumptions and limitations

SPECIALIST	ASSUMPTIONS AND LIMITATIONS
Wetland study	<p><i>Assumptions</i></p> <ul style="list-style-type: none"> <li>• Wetland systems reflect the ecological boundary where there is a close relation and interaction between water content and soil particles in the first 50 centimetres of the soil profile. The soil-water interaction in response influences the plant communities and soil properties, i.e. causing mottling and gleying in the soil. The wetland boundary, based on vegetation species compositions and soil properties, can vary depending on historical rainfall conditions and introduce a degree of variability in the wetland boundary between years as well as sampling period.</li> <li>• The scale of the remote imagery used (1:10 000 aerial photographs and Google Earth Imagery), as well as the accuracy of the handheld GPS unit used to delineated wetlands in the field, result in the delineated wetland boundaries being accurate to about 10-20m on the ground. Should greater mapping accuracy be required, the wetlands would need to be pegged in the field and surveyed using conventional survey techniques.</li> <li>• The water use risk assessment was based on the project description and proposed development and activity descriptions as detailed and illustrated in this report.</li> </ul> <p><i>Uncertainties</i></p> <ul style="list-style-type: none"> <li>• Reference conditions of the wetlands are unknown. This limits the confidence with which the present ecological category (PES) is assigned.</li> </ul>
Storm water study	<ul style="list-style-type: none"> <li>• Storm water control recommendations are based on industry experience and best practice. Final designs for construction should be authorised by an approved engineer.</li> <li>• Contour and elevation data as provided during the analysis are assumed to be accurate and representative of the site and catchment areas.</li> <li>• Upstream catchment activities are interpreted according to common practices and no detailed insight is available on possible storm water measures beyond the site. The assessment does not guarantee the integrity of downstream infrastructure in the event of release or discharge from site.</li> <li>• The measures proposed as part of the storm water management section of the report do not impose preference as this is an operational document to assist in the complete management of clean and dirty surface water in the vicinity of the operation.</li> </ul>



SPECIALIST	ASSUMPTIONS AND LIMITATIONS
	<ul style="list-style-type: none"> <li>The measures proposed in the storm water management plan section of the report do not specifically cover considerations relevant to storm water management for the purpose of safety, like mine flooding and loss of life; the primary focus being environmental management and the identification of potential environmental concerns.</li> </ul>
<p>Geohydrological study</p>	<ul style="list-style-type: none"> <li>Flood peak calculations assume rainfall intensity is uniform throughout the duration of the storm. Analysis does not account for runoff retention or artificial acceleration within the catchment.</li> <li>Calculations are done for complete catchment areas and should be distributed where there is more than one drainage point within the same built up catchment.</li> <li>Storm water control recommendations are based on industry experience and best practice. Final designs for construction should be authorised by an approved engineer.</li> <li>Contour and elevation data as provided during the analysis are assumed to be accurate and representative of the site and catchment areas.</li> <li>Upstream catchment activities are interpreted according to common practices and no detailed insight is available on possible storm water measures beyond the site. The assessment does not guarantee the integrity of downstream infrastructure in the event of release or discharge from site.</li> <li>The measures proposed as part of the storm water management section of the report do not impose preference as this is an operational document to assist in the complete management of clean and dirty surface water in the vicinity of the operation.</li> <li>The measures proposed in the storm water management plan section of the report do not specifically cover considerations relevant to storm water management for the purpose of safety, like mine flooding and loss of life, the primary focus being environmental management and the identification of potential environmental concerns.</li> <li>Recommendations represented in this report apply to the site conditions and features as they existed at the time of Shangoni’s investigations, and those reasonably foreseeable. The recommendations do not necessarily apply to conditions and features that may arise after the date of this hydrological study, for which Shangoni had no prior knowledge nor had the opportunity to evaluate.</li> </ul>

## 17. Reasoned opinion as to whether the proposed activity should or should not be authorised.

### 17.1. Reasons why the activity should be authorised or not

In accordance with the EIA Regulations GN R982, the Environmental Impact Assessment Practitioner (“EAP”) must provide an opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation must be stated.



The impact assessment undertaken for the proposed activities considered both the biophysical and socio-economic environments. The assessment of the biophysical environment revealed that there are no environmental fatal flaws nor significant negative impacts associated with the existing and proposed activities should mitigation and management measures be implemented. The socio-economic impacts associated with the proposed activities have raised no significant negative impacts should mitigation and management measures be implemented. Khwezela Bokgoni Colliery operations need to be managed utilising the draft EMPr (amongst other things) to ensure minimal impact on the affected environment. The proposed activities will have positive impacts on the socio-economic environment in the form of additional job opportunities and skills development.

In terms of collectively considering ecological, social and economic impacts it is important to remember that while there might be some trade-offs between the considerations, in South Africa all development must in terms of Section 24 of the Constitution be ecologically sustainable, while economic and social development must be justifiable. There are therefore specific "trade-off" rules that apply. Environmental integrity may never be compromised and the social and economic development must take a certain form and meet certain specific objectives in order for it to be considered justifiable<sup>39</sup>.

It is the EAP's opinion that, given the already disturbed state of the environment in which the project will be located and that the application relates to pumping of affected water into the existing 3A North Underground Area and existing 5 West Void as well as the construction of pipelines and associated pump stations, these impacts can be mitigated to prevent the environmental integrity from being compromised. In terms of collectively considering ecological, social and economic impacts the economic development of approving the proposed project can be justified from a mine operational perspective also considering the economic and social benefit, with no significant environmental risks identified, and the EAP is of opinion that this project should be authorised.

## **17.2. Conditions that must be included in the authorisation**

### **17.2.1 Specific conditions to be included into the compilation and approval of the EMPr**

Should the Department of Mineral Resources grant authorisation for this project, it should be subject to the following conditions:

- The project should remain in full compliance with the requirements of the EMPr and with all regulatory requirements;
- The EMPr should be implemented by qualified environmental personnel who have the competence and credibility to interpret the requirements of the EIA and the EMPr. Such persons must be issued with a written mandate by mine management to provide guidance and instructions to employees and contractors; and

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<sup>39</sup> Guideline on need and desirability in terms of the Environmental Impact Assessment (EIA) Regulations, 2010 (GN 891 of 20 October 2014)



- Stakeholder engagement must be maintained during the operational and closure/rehabilitation phases of the project.

### 17.2.2 Rehabilitation requirements

The objective of the Rehabilitation Plan at Khwezela Bokgoni Colliery is to limit the adverse effects on the land capability of the disturbed area. These objectives are discussed in the Rehabilitation Plan attached as Annexure H.

## 18. Period for which Environmental Authorisation is required

The estimated production is 45 Mt (5.1 Mt/a on average). As mentioned above the Life of Mine for the Pit 2A operations is up until 2025. Therefore, the period that the environmental authorisation is required is at least 7 years (from the date of approval provided by the DMR).

## 19. Undertaking

The undertaking by the EAP is provided in Section 2 of Part B (Environmental Management Programme) below. This undertaking confirms: the correctness of the information provided in the reports, the inclusion of comments and inputs from stakeholders and I&APs, the inclusion of inputs and recommendations from the specialist reports where relevant and the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.

## 20. Financial Provisions

The 2018 quantum was calculated at R 1 899 606 074.72 (including preliminary and general costs, contingency and 15% VAT) for the decommissioning and rehabilitation of the Khwezela Bokgoni Colliery. A breakdown of the costing is contained in Table 47. Refer to Appendix B of Annexure H for the complete cost model.

Table 47: Summary of the closure cost calculation

No.	Description	Cost
1	Dismantling of processing plant	R 8 725 882.98
2	Demolition of steel buildings & structures	R 34 722 342.81
3	Demolition of reinforced concrete structures	R 47 022 117.48
4	Rehabilitation of access roads	R 98 179 724.72
5	Demolition and rehabilitation of electrified railway lines	R 13 596 659.78
6	Demolition of housing and facilities	R 26 657 048.24
7	Opencast rehabilitation including final voids and ramps	R 570 380 186.67
8	Sealing of shafts, adits and inclines	R 58 180 890.77





No.	Description	Cost
9	Processing waste deposits and evaporation ponds (acid, metal)	R 332 931 567.09
10	Rehabilitation of subsided areas	R 11 598 355.85
11	General surface rehab and grassing	R 129 292 736.26
12	Fencing	R 57 415 877.72
13	Water management	R 981 700.18
14	2 to 3 years of maintenance and aftercare	R 30 634 229.58
	Sum of items (1 - 15)	<b>R 1 420 319 320.14</b>
	Preliminary and general costs: Add 6% of sub-total 1 if sub-total 1 > 100 000 000	R 85 219 159.21
	<b>Sub-total 1:</b> Multiply sub-total 1 by Weighing factor 2 (1.05)	R 89 480 117.17
	Contingency: 10% of sub-total 1	R 142 031 932.01
	<b>Sub-total 2</b>	<b>R 231 512 049.18</b>
	<b>Sub-total 3:</b> Sum of sub-totals 1 & 2	<b>R 1 651 831 369.32</b>
	Vat: 15% of sub-total 3	R 247 774 705.40
	<b>GRAND TOTAL</b>	<b>R 1 899 606 074.72</b>

## 20.1. Explain how the aforesaid amount was derived

### 20.1.1 Process followed

The following steps were taken to update the environmental closure cost:

- A site visit was conducted on the 29th of August 2018 to discuss the closure liability update;
- The infrastructure list was reviewed to incorporate any changes to volumes and measurements or included any new structures or disturbed areas;
- Concurrent rehabilitation was taken into account;
- The relevancy of the existing assumptions was reviewed and adjusted where necessary; and
- The DMR master tariffs were adjusted by 5.10% according to the CPI of July 2018 (Statistics South Africa, 2018).

#### Summary of information input into the calculation process

Table 48 includes the information that serves as input into explaining the process followed to calculate the financial provision required.

*Table 48: DMR input information based on Guideline*



Aspects	DMR Reference	Guideline Input
Primary risk class	Table B12	Class A – Coal mine
Environmental Sensitivity	Table B4	High
Specialist studies required	Table B9	Water pollution potential studies Overall quantified risk assessment
Preliminary and General	N/A	6% (Add 6% of sub-total 1 if sub-total 1 > 100 000 000)
Contingency	N/A	10%
Weighing factor 1 – Nature of terrain	Table B7	Undulating – 1.1
Weighing factor 2 – Proximity to urban area	Table B8	Peri-urban – 1.05 (less than 150 km from a developed urban area)

### 20.1.3 Tariffs

The tariffs used in the guideline document have been adjusted to support inflation increases since 2005 (as per CPIX obtained from Statistics South Africa). Table 49 contains the rates used for the 2018 closure liability calculation. The detailed tariff adjustment table, obtained from the DMR in 2016, is included in Appendix B1 of Annexure H.

Table 49: DMR Tariffs used for quantum determination (2005 escalated rates to 2018)

Description	Unit	Rate
1 Dismantling of processing plant and related structures (Including overland conveyors and power lines)	m <sup>3</sup>	R 14.72
2a Demolition of steel buildings and structures	m <sup>2</sup>	R 203.32
2b Demolition of reinforced concrete buildings and structures	m <sup>2</sup>	R 299.66
3 Rehabilitation of access roads	m <sup>2</sup>	R 36.37
4a Demolition and rehabilitation of electrified railway lines	m	R 353.16
4b Demolition and rehabilitation of non-electrified railway lines	m	R 192.63
5 Demolition of housing and/or administration facilities	m <sup>2</sup>	R 407.94
6 Opencast rehabilitation including final voids and ramps	ha	R 213 184.00
7 Sealing of shafts, adits and inclines	m <sup>3</sup>	R 109.15
8a Rehabilitation of overburden and spoils	ha	R 142 122.66
8b Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste)	ha	R 177 011.20
8c Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste)	ha	R 514 124.45



Description		Unit	Rate
9	Rehabilitation of subsided areas	ha	R 119 006.32
10	General surface rehabilitation	ha	R 112 585.11
11	River diversions	ha	R 112 585.11
12	Fencing	m	R 128.41
13	Water management	ha	R 42 808.02
14	2 to 3 years of maintenance and aftercare	ha	R 14 982.81

## 20.2. Confirm that this amount can be provided for from operating expenditure

Anglo Operations (Pty) Ltd. Khwezela Bokgoni Colliery will provide for the closure liability associated with the project through a Bank Guarantee.

## 21. Deviations from the approved scoping report and plan of study

No deviations from the approved scoping report and plan of study have been undertaken.

## 22. Other information required by the competent authority

### 22.1. Compliance with the provisions of section 24(4)(a) and (b) read with section 24(3)(a) and (7) of the National Environmental Management Act 107 of 1998. The EIA report must include the

#### 22.1.1 Impact on the socio-economic conditions of any directly affected person

Results of investigation, assessment and evaluation of impact on any directly affected person	Reference to where mitigation is reflected
Should the proposed Post 2A Dam Water Management Strategy Project be authorised and the no-go option not be implemented, mining of the available reserves can continue. This will ensure continued job security for the mine's current employees and contractors, along with the continued and long-term benefits for the local community arising from the Social and Labour Plan	Refer to Part A Section 8.5



### 22.1.2 Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act 25 of 1999

Results of investigation, assessment and evaluation of impact on any directly affected person	Reference to where mitigation is reflected
No impact on national estate (heritage resources) in terms of the Heritage Resources Act (Act 25 of 1999), are identified as part of the project.	Refer to Part A Section 8.5

## 23. Other matters required in terms of section 24(4) (a) and (b) of the Act

An impact assessment for the proposed project has been undertaken and will incorporate extensive consultation with and participation of interested and affected parties. Applying the hierarchical approach to impact management were firstly considered to avoid negative impacts, but where avoidance was not possible, to better mitigate and manage negative impacts. Where impacts were found to be potentially significant, various mitigation measures to manage and monitor the impacts of the project have been proposed. Furthermore, the environmental impact statement (Part A Section 8.5) summarises the key findings of the environmental impact assessment and negative implications of the project.



# PART B

## ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

### 1. Draft environmental management programme

#### 1.1. Details of the EAP

The requirements for the provision of the detail and expertise of the EAP are included in Part A, Section 1.2.

#### 1.2. Description of the aspects of the activity

The requirement to describe the aspects of the activity that are covered by the draft environmental management programme is included in Part A, Section 8.5

#### 1.3. Composite map

Refer to Figure 27 above as well as Annexure A for a map that superimposes the proposed activity, its associated structures and infrastructures on the environmental sensitivities of the preferred sites.

#### 1.4. Description of impact management objectives including management statements

##### 1.4.1 Determination of closure objectives

This section presents the closure objectives of Khwezela Bokgoni Colliery operation (that are also considered applicable to the Post 2A Dam Water Management Strategy Project). Refer to the Section 1.7 of Part B below for a description of the closure objectives as compared to the baseline environment.

In order to guide identification of key biophysical and socio-economic drivers, and aligned to the mine's current EMPr commitments, the following general closure objectives have been formulated:

- To rehabilitate mining-related disturbed areas to a land capability that will support and sustain a predetermined mix of post closure land uses;
- To reinstate a self-sustaining system over the rehabilitated mined and infrastructure areas, requiring minimum maintenance to facilitate a walk away situation;
- To ensure that the plans and actions put in place will meet specific closure-related performance objectives;
- To maximise surface runoff from the rehabilitated mine site to the nearby Tweefonteinspruit and Olifants River;



- To remove all surface infrastructure that cannot be beneficially re-used and return the associated disturbed land to the planned final land use; and
- To limit adverse effect on local catchment yield.

#### 1.4.2 The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity.

The potential impacts that may result from the Post 2A Dam Water Management Strategy activities have been presented in the Risk Assessment Report (attached hereto as Annexure G). The impacts were identified through the input from various specialists and their resultant specialist reports (attached hereto in Annexure C). The impacts were identified, described, assessed and their significance ranked. Mitigation measures were then put forward to prevent these impacts from occurring, and where they could not be prevented, mitigation measures were put forward to minimise, remedy and / or avoid the impacts.

#### 1.4.3 Has a water use licence been applied for

A Water Use Licence Application for water use activities associated with the Post 2A Dam Water Management Strategy project has been applied for. A notice of intent to submit a Water Use Licence Application was submitted to the DWS (refer to Annexure D). Furthermore, a pre-application meeting was held with DWS in September 2018. The minutes of the mentioned meeting are attached in Annexure D. The Water Use Licence Application was submitted to the DWS via the e-WULAAS system on 25 January 2019.



1.4.4 Impacts to be mitigated in their respective phases.

Table 50: Measures to rehabilitate the environment affected by the undertaking of any listed activity

Environmental Component	Activity	PHASE Planning and design, Pre-Construction, Construction, Operational, Rehabilitation, Closure, Post closure.	SIZE AND SCALE OF DISTURBANCE (volumes, tonnages and hectares or m <sup>2</sup> )	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
Geology	Pumping of affected water into 3A North Underground Area and 5 West Void.	Operational	17 Ha	The velocity of affected water pumped into 3A North Underground Area and 5 West Void should be minimised to decrease the possibility of erosion and weathering.	Geology to remain stable and prevent sinkholes.	During the Operational Phase.
Topography	Earthworks and excavation of trench for pipeline.	Construction	46 196 m	<ul style="list-style-type: none"> <li>Earthworks to be limited to areas required for construction of pipelines and associated pump stations.</li> <li>Drainage lines to be reinstated and rehabilitated upon completion of construction.</li> </ul>	General implementation of activities taking Mining and Biodiversity Guidelines into account.	During the Operational Phase.
Soils	<ul style="list-style-type: none"> <li>Clearance of vegetation.</li> <li>Removal and stockpiling of topsoil.</li> <li>Construction of pipelines and associated pump stations.</li> <li>Earthworks and excavation of trench for pipeline.</li> </ul>	Construction and Decommissioning	46 196 m	<ul style="list-style-type: none"> <li>Schedule vegetation clearance and soils stripping to coincide with the dry (low rainfall) season.</li> <li>Topsoil and subsoil are to be excavated and stockpiled separately.</li> <li>Install erosion control measures to divert storm water away from stockpiles e.g. berms, soil traps, hessian curtains.</li> <li>Temporary stockpiles are to be exposed to the elements for as minimal time as possible i.e. excavation to only take place just before pipeline is installed and backfilling to commence immediately upon installation of pipeline.</li> <li>Immediately clean all spillages of fuels, lubricants and other petroleum-based products</li> <li>Regular inspection of pipelines.</li> <li>The spill prevention and handling procedure should be implemented in the event of the relevant spillages at the project areas.</li> </ul>	<ul style="list-style-type: none"> <li>Rehabilitation monitoring to be undertaken by suitably qualified rehabilitation specialist (in consultation with ecologist).</li> <li>General implementation of activities taking Mining and Biodiversity Guidelines into account.</li> <li>Implementation in compliance with the mine's internal procedures (spill handling, incident reporting, emergency response, training, waste management, topsoil management).</li> </ul>	During the construction and decommissioning phases.
Land Capability	<ul style="list-style-type: none"> <li>Pumping of affected water into 3A North Underground Area and 5 West Void.</li> <li>Construction of pipelines and associated pump stations.</li> </ul>	Since Khwezela Bokgoni Colliery will be pumping water to the existing 3A North Underground Area and 5 West Void, that are areas that have been previously disturbed and where the land capability has already been altered, no additional changes in land capability will take place during the Construction or Operational Phases.				



Environmental Component	Activity	PHASE Planning and design, Pre-Construction, Construction, Operational, Rehabilitation, Closure, Post closure.	SIZE AND SCALE OF DISTURBANCE (volumes, tonnages and hectares or m <sup>2</sup> )	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
Flora and Fauna	<ul style="list-style-type: none"> <li>• Clearance of vegetation</li> <li>• Removal and stockpiling of topsoil.</li> <li>• Earthworks and excavation of trench for pipeline</li> </ul>	Construction, Decommissioning	17 Ha 46 196 m	<ul style="list-style-type: none"> <li>• Alien invasive species should be removed (prioritising NEMBA category 1A &amp; B species).</li> <li>• Any sensitive vegetation present on site must be demarcated to avoid disturbance.</li> <li>• A temporary fence or demarcation must be erected around the construction area to prevent access to sensitive environments</li> <li>• Construction activities should be restricted to the development footprint.</li> <li>• Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction</li> <li>• Ensure immediate re-vegetation of disturbed areas following completion of construction activities.</li> <li>• Considering that the proposed Post 2A Dam Water Management Strategy project and related activities forms part of the existing Khwezela Bokgoni Colliery, it is recommended that this Final Rehabilitation, Decommissioning and Closure Plan be consolidated with the Mine's closure planning documents.</li> <li>• After construction, the land must be cleared of rubbish, surplus materials and equipment, and all parts of the land must be left in a condition as close as possible to that prior to construction.</li> <li>• All alien seedlings and saplings must be removed as they become evident.</li> <li>• Manual/mechanical removal should be used rather than chemical control. Hazardous chemicals may impact upon natural vegetation in the area as well as the freshwater resources.</li> <li>• All equipment and vehicles should be thoroughly cleaned prior to access the study area to prevent the spread of alien invasive vegetation.</li> <li>• Educate site workers and contractors about the value of wildlife and environmental sensitivity.</li> <li>• Site workers and contractors should ensure that no animals are disturbed, trapped, hunted or killed during the construction phase. Conservation-orientated clauses should be included into contracts for construction personnel.</li> </ul>	<p>Rehabilitation monitoring to be undertaken by suitably qualified rehabilitation specialist (in consultation with ecologist).</p> <p>General implementation of activities taking Mining and Biodiversity Guidelines into account.</p>	<p>During the Construction- and Operational Phase and During the Closure / Decommissioning Phase</p>





Environmental Component	Activity	PHASE Planning and design, Pre-Construction, Construction, Operational, Rehabilitation, Closure, Post closure.	SIZE AND SCALE OF DISTURBANCE (volumes, tonnages and hectares or m <sup>2</sup> )	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
Sensitive Landscapes (including wetlands)	<ul style="list-style-type: none"> <li>Construction of pipelines within wetland habitat.</li> <li>Construction of pipelines within 500 m regulated area but outside wetlands.</li> </ul>	Construction	46 196 m	<ul style="list-style-type: none"> <li>Laydown areas and construction camps must be located outside delineated wetland habitat.</li> <li>Use of existing access roads/tracks to access pipeline routes as far as possible. Where no routes exist, single access routes must be demarcated.</li> <li>Demarcate vehicle access routes into laydown area and limit vehicular movement to these routes.</li> <li>Ensure laydown area is located outside delineated wetland and outside of the 1:100 year floodline.</li> <li>No servicing or cleaning of machinery and equipment on site.</li> <li>Ensure earth moving equipment such as TLBs, Graders, Loaders, etc. are in good working order and stored outside of the project area, within designated areas.</li> <li>Ensure where possible earth moving equipment only used during daylight hours to ensure immediate notice of spillages.</li> <li>Ensure spills/leaks are cleaned up immediately.</li> <li>Drip trays and spill kits to be used.</li> <li>Provide portable toilet facilities.</li> <li>Pipelines must cross the Tweefonteinspruit via the existing haul road crossings. No new excavations or disturbances within the wetland.</li> <li>Limit vegetation removal to the immediate footprint of the proposed pipeline trench.</li> <li>Ensure immediate re-vegetation of disturbed areas following completion of construction activities.</li> <li>Only indigenous and locally occurring species to be used during re-vegetation.</li> <li>Implement vegetation monitoring following completion of construction to ensure successful establishment of indigenous vegetation.</li> <li>Control of alien vegetation, specifically alien trees.</li> <li>Construction activity should ideally be undertaken during low flow periods, ideally towards the end of the dry season, i.e. June to September.</li> <li>Diversion of water to be minimised to as short a period as possible.</li> </ul>	Bio-monitoring (Bi-annual). Groundwater monitoring (Quarterly). Surface water monitoring (monthly).	During the Construction phase



Environmental Component	Activity	PHASE Planning and design, Pre-Construction, Construction, Operational, Rehabilitation, Closure, Post closure.	SIZE AND SCALE OF DISTURBANCE (volumes, tonnages and hectares or m <sup>2</sup> )	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
				<ul style="list-style-type: none"> <li>Minimise sediment inputs to channel from surrounding construction activity.</li> <li>Install sediment control barriers between construction site and flow in channel</li> <li>Pipeline trenches should not remain open for extended periods and should ideally be backfilled within 7 days of excavation.</li> <li>Ensure removal of all excavated and introduced material from the wetland area following completion of construction activity.</li> <li>Landscape all areas affected by earthworks and stockpiling of soils to reflect the natural landscape profile of the area and ensure no impacts to flow.</li> </ul>		
	<ul style="list-style-type: none"> <li>Operation of pipeline within wetland habitat</li> <li>Operation of pipelines within the 500 m regulated area but outside wetland habitat</li> </ul>	Operational	46 196 m	<ul style="list-style-type: none"> <li>The pipeline must include flow monitoring technology that will allow for leaks and pipe bursts to be identified immediately.</li> <li>Pumping must be stopped immediately following identification of a leak or burst.</li> <li>Relevant authorities must be notified within 24 hours of any pipe burst or significant leak.</li> <li>Immediate clean-up and repair of any erosion damage caused by pipe bursts.</li> <li>Regular inspections of the pipeline to ensure optimal operation and to check for any erosion damage along the route.</li> <li>Inspections to be undertaken as walkdown surveys within wetland areas.</li> </ul>	Bio-monitoring (Bi-annual). Groundwater monitoring (Quarterly). Surface water monitoring (monthly).	During the Operational phase
Ground Water	Storage of surplus water in underground and opencast voids	Operational	17 Ha	<ul style="list-style-type: none"> <li>Control water levels at elevations lower than the surrounding strata to prevent mine water from entering adjacent aquifer/s.</li> <li>Control water levels by pumping excess water to EWRP for treatment.</li> <li>The absolute critical water levels in 5 West Void is 1502 mamsl and 3A North underground 1533 mamsl. Water levels must be kept well below these levels, i.e., critical water levels plus buffer.</li> <li>Water levels in underground compartments must be measured frequently to ensure that levels are controlled efficiently and kept well below absolute critical levels and/ or surrounding water levels.</li> </ul>	Groundwater monitoring (quarterly)	During the Operational phase



Environmental Component	Activity	PHASE Planning and design, Pre-Construction, Construction, Operational, Rehabilitation, Closure, Post closure.	SIZE AND SCALE OF DISTURBANCE (volumes, tonnages and hectares or m <sup>2</sup> )	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
				<ul style="list-style-type: none"> <li>Monitor groundwater quality frequently to act timeously if pollution is detected outside of the active mining area.</li> <li>Monitor surface water in Tweefonteinspruit and Olifants River in up- and downstream localities on a regular basis.</li> <li>Do not allow spillage or seepage of affected mine water into the receiving surface water environment.</li> <li>Inspect areas frequently for any subsidence.</li> </ul>		
	Storage of surplus water in underground and opencast voids	Closure		<ul style="list-style-type: none"> <li>A rehabilitation plan must be implemented, and the plan should be done in the line with the contents of National Water Act (Act No 36 of 1998), to avoid subsequent negative environmental impacts that may occur.</li> <li>Maintain containment barriers underground left intact between compartments to assist in final water containment.</li> <li>Update monitoring programme and the effectiveness of existing monitoring borehole positions should be re-evaluated.</li> <li>Continuation of the monitoring programme to establish post decommissioning trends.</li> <li>Hydraulic containment should be implemented if pollution is expected by either active measures, such as containment pumping or reactive barriers, or through passive containment, such as phytoremediation.</li> <li>Pumping of affected water to EWRP should continue for as long as possible to keep water levels below decant levels.</li> </ul>	Groundwater monitoring (quarterly)	Operational Phase and During the Closure / Decommissioning Phase
Surface Water	<ul style="list-style-type: none"> <li>Grading, vegetation clearing and soil stripping</li> <li>Trench excavation and storage of soil stockpiles</li> <li>Use of hazardous materials</li> </ul>	Construction	46 196 m	<ul style="list-style-type: none"> <li>Laydown area must be kept as small as reasonably possible.</li> <li>Soil stockpiles must be placed in designated areas and covered to protect the soils.</li> <li>The excavated trenches must be filled in and revegetated as soon as possible to prevent erosion.</li> <li>Store fuel and oil in designated bunded areas.</li> </ul>	Surface water quality monitoring (monthly).	During the construction phase
	Operation of the pipeline system	Operational	46 196 m	<ul style="list-style-type: none"> <li>Construct the pipelines along the edges of the existing ramps, haul roads, light vehicle gravel roads and through the existing plant area.</li> </ul>	Surface water quality monitoring (monthly).	During the operational phase



Environmental Component	Activity	PHASE Planning and design, Pre-Construction, Construction, Operational, Rehabilitation, Closure, Post closure.	SIZE AND SCALE OF DISTURBANCE (volumes, tonnages and hectares or m <sup>2</sup> )	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
				<ul style="list-style-type: none"> <li>Utilise existing storm water culverts at any watercourse crossing.</li> <li>Conduct regular inspections on the pipeline system to detect any leaks or malfunctions</li> </ul>		
Air Quality	<ul style="list-style-type: none"> <li>Clearance of vegetation.</li> <li>Construction of Pipelines and associated pump stations</li> </ul>	Construction	46 196 m	Ensure dust suppression is implemented throughout construction phase.	Dust Fall Out Monitoring (Monthly)	During the Construction phase
Noise	<ul style="list-style-type: none"> <li>Pumping of affected water into 3A North Underground Area and 5 West Void.</li> <li>Construction of pipelines and associated pump stations</li> </ul>	It is anticipated that the proposed project will not have a severe impact on noise aspects. Mining activities are currently taking place at Khwezela Bokgoni Colliery. Therefore, it is likely that regular passers-by and the local residents are desensitised to the mining activities.				
Visual	<ul style="list-style-type: none"> <li>Pumping of affected water into 3A North Underground Area and 5 West Void.</li> <li>Construction of pipelines and associated pump stations</li> </ul>	It is anticipated that the proposed project will not have a severe impact on visual aspects. Mining activities are currently taking place at Khwezela Bokgoni Colliery. Therefore, it is likely that regular passers-by and the local residents are desensitised to the mining activities.				
Sites of Archaeological Importance	<ul style="list-style-type: none"> <li>Pumping of affected water into 3A North Underground Area and 5 West Void.</li> <li>Construction of pipelines and associated pump stations</li> </ul>	It is anticipated that no site of archaeological and cultural importance will be impacted.				
Socio-Economic	<ul style="list-style-type: none"> <li>Pumping of affected water into 3A North Underground Area and 5 West Void.</li> <li>Construction of pipelines and associated pump stations</li> </ul>	Operational, Decommissioning, Closure	17 Ha 46 196 m	<ul style="list-style-type: none"> <li>Where possible and feasible, local procurement of labour should be applied to ensure the maximum benefit to the impacted community.</li> <li>The various plans and programmes as contained in the SLP should continue to be implemented.</li> <li>Proactive engagement with local and environmental authorities to should continue to be undertaken.</li> <li>A complaints register will be made available at the mine security offices for I&amp;APs and stakeholders to voice their concerns and raise any complaints.</li> <li>Continuous skills and development training will equip low-skilled labourers with experience and advanced skills to work on other mining projects within the area, thus creating long-term employment if the foreseeable future.</li> </ul>	Implementation of approved Social and Labour Plan.	During the Construction- and Operational Phase and During the Closure / Decommissioning Phase



## 1.5. Impact management outcomes

Table 51: Impact management outcomes, identifying the stand of impact management required for the identified aspects

Aspects Affected	Activity	Impact Description	Phase Planning and design, Pre-Construction, Construction, Operational, Rehabilitation, Closure, Post closure.	Mitigation Type	Standards to be achieved
Geology	Pumping of affected water into 3A North Underground Area and 5 West Void.	The pumping of water underground may affect the stability of the geology due to the weathering and erosion.	Operational	Control	Geology to remain stable and prevent sinkholes
Topography	Earthworks and excavation of trench for pipeline.	Altered runoff patterns, leading to increased erosion and sedimentation of freshwater habitat.	Construction	Control, Remedy	To prevent alterations of natural topography of the area.
Soils	<ul style="list-style-type: none"> <li>Clearance of vegetation.</li> <li>Removal and stockpiling of topsoil.</li> <li>Construction of pipelines and associated pump stations.</li> <li>Earthworks and excavation of trench for pipeline.</li> </ul>	<ul style="list-style-type: none"> <li>A loss of microbes and viable seed may occur as a result of the temporary stockpiling of topsoil.</li> <li>The removal of topsoil may result in the mixing of the horizons of the soil that will have an impact on the fertility and production potential of the soil.</li> <li>The temporary stockpiling of topsoil may result in a decrease in the fertility of the soil and the leaching of minerals due to exposure of the soil to elements.</li> <li>Soil pollution due to hazardous chemical substances including fuel greases and oils used on site.</li> <li>Erosion due to pipe bursts.</li> <li>The ineffective handling of hydrocarbon spillages may lead to the contamination of soil, surface water and ground water resources.</li> </ul>	Construction and Decommissioning	Control, Remedy	<ul style="list-style-type: none"> <li>To prevent the loss of valuable topsoil.</li> <li>To prevent soil contamination and to conserve surface and ground water resources as well as to prevent impact on downstream water users</li> </ul>
Land Capability	<ul style="list-style-type: none"> <li>Pumping of affected water into 3A North Underground Area and 5 West Void.</li> <li>Construction of pipelines and associated pump stations.</li> </ul>	Since Khwezela Bokgoni Colliery will be pumping water to the existing 3A North Underground Area and 5 West Void, that are areas that have been previously disturbed and where the land capability has already been altered, no additional changes in land capability will take place during the Construction or Operational Phases.			
Flora and Fauna	<ul style="list-style-type: none"> <li>Clearance of vegetation</li> <li>Removal and stockpiling of topsoil.</li> <li>Earthworks and excavation of trench for pipeline</li> </ul>	<ul style="list-style-type: none"> <li>Spread of alien invasive plant species from the transformed areas to the natural vegetation.</li> <li>Disturbance of sensitive vegetation.</li> <li>Damage to natural habitat due to construction activities and consequential displacement of faunal species.</li> <li>Revegetation of areas disturbed during construction</li> </ul>	Construction, Decommissioning	Control	To preserve and protect indigenous fauna and flora.
Sensitive Landscapes (including wetlands)	<ul style="list-style-type: none"> <li>Construction of pipelines within wetland habitat.</li> <li>Construction of pipelines within 500 m regulated area but outside wetlands.</li> </ul>	<ul style="list-style-type: none"> <li>Alteration/damage to banks.</li> <li>Disturbance and loss of biodiversity &amp; habitat.</li> <li>Dust generation.</li> <li>Compaction of wetland sediments.</li> <li>Spillages and leaks from machinery and equipment.</li> </ul>	Construction	Control	To protect wetland and sensitive areas.



Aspects Affected	Activity	Impact Description	Phase Planning and design, Pre-Construction, Construction, Operational, Rehabilitation, Closure, Post closure.	Mitigation Type	Standards to be achieved
		<ul style="list-style-type: none"> <li>Water quality impact.</li> </ul>			
	<ul style="list-style-type: none"> <li>Operation of pipeline within wetland habitat</li> <li>Operation of pipelines within the 500 m regulated area but outside wetland habitat</li> </ul>	<ul style="list-style-type: none"> <li>Water quality deterioration due to leaks or pipe bursts.</li> <li>Erosion due to pipe bursts.</li> </ul>	Operational	Control	To protect wetland and sensitive areas.
Ground Water	Storage of surplus water in underground and opencast voids	<ul style="list-style-type: none"> <li>The shallow weathered and unconfined aquifer is highly susceptible to pollution from surface.</li> <li>Artificial recharge could increase the water levels and pressures greater than ambient, which could result in the 'unlimited' migration of water and pollutants within the weathered aquifer.</li> </ul>	Operational	Control	To minimise the extent of disturbance of the aquifer and to limit degeneration of groundwater quality and quantity.
	Storage of surplus water in underground and opencast voids	At the LoM, when all mining has ceased at Khwezela Bokgoni Colliery, the water in the underground compartments begin to rise naturally and no dewatering will be necessary in the opencast section at 2A. All opencast areas will be rehabilitated and water within these artificially created aquifers will also begin to rise naturally, but more rapid than the surrounding 'natural' aquifers. Decant at the lowest elevation is therefore possible from the rehabilitated opencast areas due to increased transmissivity compared to ambient. Decant is also possible from underground voids but is unlikely.	Closure	Control	To minimise the extent of disturbance of the aquifer and to limit degeneration of groundwater quality and quantity.
Surface Water	<ul style="list-style-type: none"> <li>Grading, vegetation clearing and soil stripping</li> <li>Trench excavation and storage of soil stockpiles</li> <li>Use of hazardous materials</li> </ul>	<ul style="list-style-type: none"> <li>Decrease in surface water quality when any surface water comes into contact with dust, eroded soil, carbonaceous materials or other pollutants generated during the construction phase.</li> <li>The sediment load within surface water runoff may increase if not prevented or mitigated.</li> <li>Spillages of hazardous materials (i.e. oil, fuel and / or grease) used during the construction of the proposed Project may impact on the surrounding clean water environment.</li> <li>Deterioration of water quality, affecting the use of surface water as a natural resource.</li> </ul>	Construction	Control	To conserve the surface water resource and prevent impact on downstream water users.
	Operation of the pipeline system	<ul style="list-style-type: none"> <li>In areas where the pipelines are to be installed above ground, and support structures are needed, it could impact on the natural flow of surface water towards the Olifants River</li> <li>The pipelines will be constructed below ground. However, should a pipeline burst, or similar incident occur, affected water could migrate to the surface and affected water could spill into the clean water environment.</li> </ul>	Operational	Control	To conserve the surface water resource and prevent impact on downstream water users.



Aspects Affected	Activity	Impact Description	Phase Planning and design, Pre-Construction, Construction, Operational, Rehabilitation, Closure, Post closure.	Mitigation Type	Standards to be achieved
		<ul style="list-style-type: none"> <li>Deterioration of water quality, affecting the use of surface water as a natural resource.</li> </ul>			
Air Quality	<ul style="list-style-type: none"> <li>Pumping of affected water into 3A North Underground Area and 5 West Void.</li> <li>Construction of pipelines and associated pump stations</li> </ul>	Continued utilisation of gravel roads to gain access to the Khwezela Bokgoni Colliery surface land use areas could impact intermittently on the dust content of the air and on the fallout dust levels, within the study area	Construction	Control	To reduce air quality impacts from construction activities.
Noise	<ul style="list-style-type: none"> <li>Pumping of affected water into 3A North Underground Area and 5 West Void.</li> <li>Construction of pipelines and associated pump stations</li> </ul>	It is anticipated that the proposed project will not have a severe impact on noise aspects. Mining activities are currently taking place at Khwezela Bokgoni Colliery. Therefore, it is likely that regular passers-by and the local residents are desensitised to the mining activities.			
Visual	<ul style="list-style-type: none"> <li>Pumping of affected water into 3A North Underground Area and 5 West Void.</li> <li>Construction of pipelines and associated pump stations</li> </ul>	It is anticipated that the proposed project will not have a severe impact on visual aspects. Mining activities are currently taking place at Khwezela Bokgoni Colliery. Therefore, it is likely that regular passers-by and the local residents are desensitised to the mining activities.			
Sites of Archaeological Importance	<ul style="list-style-type: none"> <li>Pumping of affected water into 3A North Underground Area and 5 West Void.</li> <li>Construction of pipelines and associated pump stations</li> </ul>	It is anticipated that no site of archaeological and cultural importance will be impacted.			
Socio-Economic	<ul style="list-style-type: none"> <li>Pumping of affected water into 3A North Underground Area and 5 West Void.</li> <li>Construction of pipelines and associated pump stations</li> </ul>	Jobs will be retained, providing income and, therefore, having a further impact on the regional socio-economy aspects of the area, along with other benefits arising from the Social and Labour Plan.	Construction, Operational, Decommissioning	Control	Prevent socio economic impacts by employment opportunities



## 1.6. Impact management actions.

Table 52: Impact management actions, identifying the manner in which the impact management objectives and outcomes will be achieved.

Activity	Impact Description	Mitigation Type	Time Period for Implementation	Compliance with Standards
<b>Geology</b>				
Pumping of affected water into 3A North Underground Area and 5 West Void.	The pumping of water underground may affect the stability of the geology due to the weathering and erosion.	Control	During the Operational Phase.	Geology to remain stable and prevent sinkholes
<b>Topography</b>				
Earthworks and excavation of trench for pipeline.	Altered runoff patterns, leading to increased erosion and sedimentation of freshwater habitat.	Control	During the Operational Phase.	General implementation of activities taking Mining and Biodiversity Guidelines into account.
<b>Soil</b>				
<ul style="list-style-type: none"> <li>Clearance of vegetation.</li> <li>Removal and stockpiling of topsoil.</li> <li>Construction of pipelines and associated pump stations.</li> <li>Earthworks and excavation of trench for pipeline.</li> </ul>	<ul style="list-style-type: none"> <li>A loss of microbes and viable seed may occur as a result of the temporary stockpiling of topsoil.</li> <li>The removal of topsoil may result in the mixing of the horizons of the soil that will have an impact on the fertility and production potential of the soil.</li> <li>The temporary stockpiling of topsoil may result in a decrease in the fertility of the soil and the leaching of minerals due to exposure of the soil to elements.</li> <li>Soil pollution due to hazardous chemical substances including fuel greases and oils used on site.</li> <li>Erosion due to pipe bursts.</li> <li>The ineffective handling of hydrocarbon spillages may lead to the contamination of soil, surface water and ground water resources.</li> </ul>	Control, Remedy	During the Construction and Decommissioning Phases.	<ul style="list-style-type: none"> <li>Rehabilitation monitoring to be undertaken by suitably qualified rehabilitation specialist (in consultation with ecologist).</li> <li>General implementation of activities taking Mining and Biodiversity Guidelines into account.</li> <li>Implementation in compliance with the mine's internal procedures (spill handling, incident reporting, emergency response, training, waste management, topsoil management).</li> </ul>
<b>Land Capability</b>				
<ul style="list-style-type: none"> <li>Pumping of affected water into 3A North Underground Area and 5 West Void.</li> <li>Construction of pipelines and associated pump stations.</li> </ul>	Since Khwezela Bokgoni Colliery will be pumping water to the existing 3A North Underground Area and 5 West Void, that are areas that have been previously disturbed and where the land capability has already been altered, no additional changes in land capability will take place during the Construction or Operational Phases.			
<b>Flora and Fauna</b>				
<ul style="list-style-type: none"> <li>Clearance of vegetation</li> <li>Removal and stockpiling of topsoil.</li> <li>Earthworks and excavation of trench for pipeline</li> </ul>	<ul style="list-style-type: none"> <li>Spread of alien invasive plant species from the transformed areas to the natural vegetation.</li> <li>Disturbance of sensitive vegetation.</li> </ul>	Control	During the Construction and Operational Phases.	To preserve and protect indigenous fauna and flora.





Activity	Impact Description	Mitigation Type	Time Period for Implementation	Compliance with Standards
	<ul style="list-style-type: none"> <li>Damage to natural habitat due to construction activities and consequential displacement of faunal species.</li> <li>Revegetation of areas disturbed during construction</li> </ul>			
<b>Sensitive Landscapes (including wetlands)</b>				
<ul style="list-style-type: none"> <li>Construction of pipelines within wetland habitat.</li> <li>Construction of pipelines within 500 m regulated area but outside wetlands.</li> </ul>	<ul style="list-style-type: none"> <li>Alteration/damage to banks.</li> <li>Disturbance and loss of biodiversity &amp; habitat.</li> <li>Dust generation.</li> <li>Compaction of wetland sediments.</li> <li>Spillages and leaks from machinery and equipment.</li> <li>Water quality impact.</li> </ul>	Control	During the Construction Phase	To protect wetland and sensitive areas.
<ul style="list-style-type: none"> <li>Operation of pipeline within wetland habitat</li> <li>Operation of pipelines within the 500 m regulated area but outside wetland habitat</li> </ul>	<ul style="list-style-type: none"> <li>Water quality deterioration due to leaks or pipe bursts.</li> <li>Erosion due to pipe bursts.</li> </ul>	Control	During the Operational Phase	To protect wetland and sensitive areas.
<b>Ground Water</b>				
Storage of surplus water in underground and opencast voids	<ul style="list-style-type: none"> <li>The shallow weathered and unconfined aquifer is highly susceptible to pollution from surface.</li> <li>Artificial recharge could increase the water levels and pressures greater than ambient, which could result in the 'unlimited' migration of water and pollutants within the weathered aquifer.</li> </ul>	Control	During the Operational Phase	To minimise the extent of disturbance of the aquifer and to limit degeneration of groundwater quality and quantity.
Storage of surplus water in underground and opencast voids	At the LoM, when all mining has ceased at Khwezela Bokgoni Colliery, the water in the underground compartments begin to rise naturally and no dewatering will be necessary in the opencast section at 2A. All opencast areas will be rehabilitated and water within these artificially created aquifers will also begin to rise naturally, but more rapid than the surrounding 'natural' aquifers. Decant at the lowest elevation is therefore possible from the rehabilitated opencast areas due to increased transmissivity compared to ambient. Decant is also possible from underground voids but is unlikely.	Control	During the Closure Phase	To minimise the extent of disturbance of the aquifer and to limit degeneration of groundwater quality and quantity.
<b>Surface Water</b>				



Activity	Impact Description	Mitigation Type	Time Period for Implementation	Compliance with Standards
<ul style="list-style-type: none"> <li>Grading, vegetation clearing and soil stripping</li> <li>Trench excavation and storage of soil stockpiles</li> <li>Use of hazardous materials</li> </ul>	<ul style="list-style-type: none"> <li>Decrease in surface water quality when any surface water comes into contact with dust, eroded soil, carbonaceous materials or other pollutants generated during the construction phase.</li> <li>The sediment load within surface water runoff may increase if not prevented or mitigated.</li> <li>Spillages of hazardous materials (i.e. oil, fuel and / or grease) used during the construction of the proposed Project may impact on the surrounding clean water environment.</li> <li>Deterioration of water quality, affecting the use of surface water as a natural resource.</li> </ul>	Control	During the Construction Phase	To conserve the surface water resource and prevent impact on downstream water users.
Operation of the pipeline system	<ul style="list-style-type: none"> <li>In areas where the pipelines are to be installed above ground, and support structures are needed, it could impact on the natural flow of surface water towards the Olifants River</li> <li>The pipelines will be constructed below ground. However, should a pipeline burst, or similar incident occur, affected water could migrate to the surface and affected water could spill into the clean water environment.</li> <li>Deterioration of water quality, affecting the use of surface water as a natural resource.</li> </ul>	Control	During the Operational Phase	To conserve the surface water resource and prevent impact on downstream water users.
<b>Air Quality</b>				
<ul style="list-style-type: none"> <li>Pumping of affected water into 3A North Underground Area and 5 West Void.</li> <li>Construction of pipelines and associated pump stations</li> </ul>	Continued utilisation of gravel roads to gain access to the Khwezela Bokgoni Colliery surface land use areas could impact intermittently on the dust content of the air and on the fallout dust levels, within the study area	Control	During the Construction Phase	To reduce air quality impacts from construction activities.
<b>Noise</b>				
<ul style="list-style-type: none"> <li>Pumping of affected water into 3A North Underground Area and 5 West Void.</li> <li>Construction of pipelines and associated pump stations</li> </ul>	It is anticipated that the proposed project will not have a severe impact on noise aspects. Mining activities are currently taking place at Khwezela Bokgoni Colliery. Therefore, it is likely that regular passers-by and the local residents are desensitised to the mining activities.			
<b>Visual</b>				
<ul style="list-style-type: none"> <li>Pumping of affected water into 3A North Underground Area and 5 West Void.</li> </ul>	It is anticipated that the proposed project will not have a severe impact on visual aspects. Mining activities are currently taking place at Khwezela Bokgoni Colliery. Therefore, it is likely that regular passers-by and the local residents are desensitised to the mining activities.			



Activity	Impact Description	Mitigation Type	Time Period for Implementation	Compliance with Standards
<ul style="list-style-type: none"> <li>Construction of pipelines and associated pump stations</li> </ul>	<b>Sites of Archaeological Importance</b>			
<ul style="list-style-type: none"> <li>Pumping of affected water into 3A North Underground Area and 5 West Void.</li> <li>Construction of pipelines and associated pump stations</li> </ul>	It is anticipated that no site of archaeological and cultural importance will be impacted.			
<b>Socio-Economic</b>				
<ul style="list-style-type: none"> <li>Pumping of affected water into 3A North Underground Area and 5 West Void.</li> <li>Construction of pipelines and associated pump stations</li> </ul>	Jobs will be retained, providing income and, therefore, having a further impact on the regional socio-economy aspects of the area, along with other benefits arising from the Social and Labour Plan.	Control	During the Construction, Operational and Decommissioning Phases	Prevent socio economic impacts by employment opportunities



## 1.7. Closure Objectives

### 1.7.1 Describe the closure objectives and the extent to which they have been aligned with the baseline environment described under Regulation 22(2)(d) as described in Section 7.4.1

Table 53: The alignment of Closure objectives to the baseline environment

Closure Objective	Alignment with baseline environment
To rehabilitate mining-related disturbed areas to a land capability that will support and sustain a predetermined mix of post closure land uses.	<p>It should be noted that Khwezela Bokgoni Colliery is an existing mine and the proposed activities will be undertaken on modified / already disturbed land. The Closure objectives may thus not be aligned with the current baseline environment (relevant to the project) but will aim at improving the baseline environment to as close to pre-mining conditions as possible with the principles of free drainage and establishing a self-sustaining landscape. One of the key measures that would provide such a link between the baseline (and specific pre-mining environment) relates to the development and implementation of the proposed wetland mitigation strategy.</p> <p>During the rehabilitation phase, the identified soils within the project area should be sequentially replaced to mimic the current (pre-mining) conditions which will enable re-establishment of the conditions, which is relatively consistent with the recommendations of the post-mining land capability as included in approved EMPr for the greater mining operation.</p> <p>The Khwezela Bokgoni Colliery Preliminary Mine Closure Plan identifies the end land use alternatives for Khwezela Bokgoni Colliery . It is assumed that the end use for the Post 2A Dam Water Management Strategy will be aligned with the final land use.</p> <p>Ultimately, the overarching aim for land use related closure is that the Khwezela Bokgoni Colliery site will contribute to a sustainable situation once mining has ceased in the region. To achieve this land uses that will viable in the long run must where possible be progressively realied throughout the remaining operational life of the mine. The Land Use Plan (“LUP”) and associated development strategies must therefore be reviewed over time to align to changes in the receiving biophysical environment, as well as policy changes at national level, planning requirements at local levels, shifts in mine planning and closure focus by Khwezela Bokgoni Colliery and changing socio-economic conditions in the area.</p>
To reinstate a self-sustaining system over the rehabilitated mined and infrastructure areas, requiring minimum maintenance to facilitate a walk away situation.	
To ensure that the plans and actions put in place will meet specific closure-related performance objectives.	
To maximise surface runoff from the rehabilitated mine site to the nearby Tweefonteinspruit and Olifants River.	
To prevent acid mine drainage.	
To limit decant from the open water bodies, as well as the amount of contaminated water seeping from the rehabilitated pits.	
To rehabilitate borrow pits (if any) to be free-draining.	
To remove all surface infrastructure that cannot be beneficially re-used and return the associate disturbed land to the planned final land use.	
To in-fill and slope ramps and voids to be free draining.	
To limit adverse effect on local catchment yield.	
To limit the recharge of rainfall to the rehabilitated pits; to reduce the amount of water to be abstracted; to maintain the in-pit water levels; to prevent surface and/or near surface contaminated excess mine water decant.	



Closure Objective	Alignment with baseline environment
	Furthermore, the establishment of a regional land use planning strategy supported by the local and district municipalities as well as all major mines should be pursued, to ensure that all role players strive towards an aligned long-term use vision for the region. Individual LUPs such as that of Khwezela Bokgoni Colliery would inform and form part of the land use master plan for the region.

**1.7.2 Confirm specifically that the environmental objectives in relation to closure have been consulted with landowners and interested and affected parties.**

This EIAR / EMPr will be made available to the public for review for a period thirty (30) days. The public are also encouraged to comment on sections of this report (with specific reference to the closure objectives as presented in Section 1.7.1 above), any aspect of the proposed project and raise any concerns and / or issues they may have. Any comments, concerns and / or issues will be addressed and responded to and will be taken into consideration in finalising this EIAR / EMPr.

**1.7.3 Provide a rehabilitation plan that describes and shows the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure.**

A rehabilitation plan has been compiled and is included in Annexure I

**1.7.4 Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives.**

The rehabilitation plan has been compiled taking the closure objectives into account (e.g. free-draining, sloping and rehabilitating to the agreed end land use etc.). The annual rehabilitation plan is included in Annexure I along with the Decommissioning- and Closure Plan.

**1.7.5 Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline.**

Refer to Section 20 (Part A) of this EIAR / EMPr and Annexure H.

**1.7.6 Confirm that the financial provision will be provided as determined.**

The financial provision as determined above will be provided for in the form of a bank guarantee.

**1.8. Mechanisms for monitoring compliance with and performance assessments against the environmental management programme**

The aim of environmental monitoring and auditing is to develop a cost-effective approach to monitoring the operations' environmental performance. Certain parameters (e.g. water quality) can be monitored through measurements, others can only be monitored through observation (e.g. maintenance



effectiveness). However, in all cases, anticipation of environmental problems through assessment of the environmental impact of the operations' working methods, followed by forward planning to prevent problems or at least limit their effects, are seen as key to successful environmental management.

### 1.8.1 Monitoring at Khwezela Bokgoni Colliery

The following management procedures have been developed and implemented to assist Khwezela Bokgoni Colliery:

*Table 54: Management Procedures at Khwezela Bokgoni Colliery*

Description
Environmental Management System Manual
Aspects, Obligations, Risks and Opportunities; and New Operations
Legal & Oher Requirements
Training, Awareness and Competence
Internal and External Communication
Document Control and Record Keeping
Emergency Preparedness
Incidents Reporting and Management
SHE Objectives
Management of Change

The following procedures have been developed and implemented in order to manage activities relating to the environmental impacts of the mine:

*Table 55: Procedures to manage environmental impacts at Khwezela Bokgoni Colliery*

Description
Waste Management
Hydrocarbon and Chemical Handling
Oil, Fuel and Chemical Spill Clean-up
Oil Traps and Silt Traps Clean Out
Drain Clean-up and Maintenance
Sewage Management Procedure
Water Monitoring
Dust Fall Out Monitoring
Coal Discard and Slurry Spillage



The following procedures are relevant for the monitoring of environmental aspects:

*Table 56: Procedures for the monitoring of environmental aspects at Khwezela Bokgoni Colliery*

Description
Surface and Groundwater Monitoring
Dust Suppression and Monitoring

## 1.8.2 Auditing at Khwezela Bokgoni Colliery

This section provides information pertaining to the auditing to be implemented at Khwezela Bokgoni Colliery including proposed commitments. At Khwezela Bokgoni Colliery auditing is conducted in accordance to the procedure SHE Audit Procedure, available from the mine upon request.

### 1.8.2.1 Audit Types

#### *Contractors / Suppliers Audits*

All contractor / supplier audits will be organised with the affected parties well in advance of the audit. The contractor / supplier to be audited will be determined based on the potential environmental risk that the contractor / supplier pose to the operation. This will be assessed when updating the mine's annual external audit schedule.

An informal opening meeting will be held before every contractors/suppliers audit. An attendance register will be signed before the audit commences. The meeting will confirm the scope, objective and members of the audit teams.

The audit team shall then conduct the audit using one or more of the following documents provided by the environmental department:

- Previous audit findings;
- Objectives and targets sheets;
- Checklists;
- Environmental procedures; and
- Any other documents that may be relevant for the audit.

The findings shall be recorded by the audit team on the observation sheets / check sheets provided. Feedback of the audit results will be done at a close out meeting with the contractor/supplier. The lead auditor for the audit will compile a report that will be submitted to the contractor/supplier and EMS representative responsible for the contractor.

All original audit reports will be forwarded to the environmental department for filing along with the attendance register for the audit. It is the responsibility of the EMS representative, responsible for the contractor activity on the operation, to ensure that the contractor is aware of the issues identified in the audit and that audit actions are addressed.



### *Other External Audits*

External audits will be conducted in the agreed format provided by relevant suppliers, consultants and/or auditing bodies. An audit report will be required in both electronic and hard copy format from the external auditors. The audit report must contain the scope of the audit, the findings and recommendations and a detailed list of specific comments as well as the list of the audit team members and the auditees. Where possible a photographic record is kept illustrating observations, but it is not mandatory.

The following external audits will be periodically conducted on the operation/mine:

- Environmental legal audit or legal review;
- Environmental performance audit;
- Certification / surveillance audit; and
- Any other audits to evaluate compliance with other requirements to which the mine subscribes.

### *Internal Audit Teams / Qualifications / Schedule*

The EMS management representative shall appoint a suitably qualified and/or experienced person or persons to conduct the audit to ensure objectivity and impartiality of the audit process. The audit team members shall not include members of the area being audited but will be facilitated / guided by a person from that department when on site.

When there is more than one person appointed to conduct an audit the EMS management representative shall appoint one person to act as lead auditor. Should there not be any qualified/experienced persons available at the mine to undertake a specific audit, someone may be sourced from another operation or from a consultancy.

For internal audits, a member of the team will have completed a registered auditing course and / or have a minimum of 2 years' experience in the mining SHE field.

Internal audits will be conducted according to the internal audit schedule. Criteria determining the scope and type of audit shall be based on the environmental importance of the activity concerned and the results of previous audits. Where applicable the frequencies of audits will be determined by potential high-risk activities identified during on-site audits, certification audits and/or audits required by head office.

### *Legal Compliance Audit*

Environmental legal compliance audits will be performed every two years to determine the status of compliance against all applicable legislation and policies.

Auditing of environmental authorisation, environmental management programme and closure plan must be done in accordance to the Regulation 34 and Appendix 7 of the EIA Regulations (2014) under the NEMA (1998).





### 1.8.2.2 Audit Process

According to Regulation 34 of the Environmental Impact Assessment (“EIA”) Regulations (GN R982 of 4 December 2014 as amended), “*Auditing of compliance with environmental authorisation, environmental management programme and closure plan:*”

34 (1) *The holder of an environmental authorisation must, for the period during which the environmental authorisation and EMPr, and where applicable the closure plan, remain valid-*

- (a) *ensure that the compliance with the conditions of the environmental authorisation and the EMPr, and where applicable the closure plan, is audited; and*
  - (b) *submit an environmental audit report to the relevant competent authority.*
- (2) *The environmental audit report contemplated in sub regulation (1) must-*
- (a) *be prepared by an independent person with the relevant environmental auditing expertise;*
  - (b) *provide verifiable findings, in a structured and systematic manner, on-*
    - (i) *the level of performance against and compliance of an organization or project with the provisions of the requisite environmental authorisation or EMPr and, where applicable, the closure plan; and*
    - (ii) *the ability of the measures contained in the EMPr, and where applicable the closure plan, to sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity;*
  - (c) *contain the information set out in Appendix 7; and*
  - (d) *be conducted and submitted to the competent authority at intervals as indicated in the environmental authorisation.*
- (3) *The environmental audit report contemplated in sub regulation (1) must determine-*
- (a) *the ability of the EMPr, and where applicable the closure plan, to sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity on an ongoing basis and to sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the closure of the facility; and*
  - (b) *the level of compliance with the provisions of environmental authorisation, EMPr and where applicable the closure plan.*
- (4) *Where the findings of the environmental audit report contemplated in sub regulation (1) indicate-*
- (a) *insufficient mitigation of environmental impacts associated with the undertaking of the activity; or*
  - (b) *insufficient levels of compliance with the environmental authorisation or EMPr and, where applicable the closure plan;*

*the holder must, when submitting the environmental audit report to the competent authority in terms of sub regulation (1), submit recommendations to amend the EMPr or closure plan in order to rectify the shortcomings identified in the environmental audit report.*



- (5) *When submitting recommendation in terms of sub regulation (4), such recommendations must have been subjected to a public participation process, which process has been agreed to by the competent authority and was appropriate to bring the proposed amendment of the EMPr and, where applicable the closure plan, to the attention of potential and registered interested and affected parties, including organs of state which have jurisdiction in respect of any aspect of the relevant activity and the competent authority, for approval by the competent authority.*
- (6) *Within 7 days of the date of submission of an environmental audit report to the competent authority, the holder of an environmental authorisation must notify all potential and registered interested and affected parties of the submission of that report, and make such report immediately available-*
  - (a) *to anyone on request; and*
  - (b) *on a publicly accessible website, where the holder has such a website.*
- (7) *An environmental audit report must contain all information set out in Appendix 7 to these Regulations.”*

### 1.8.2.3 Audit Report

According to Appendix 7 of the EIA Regulation (2014):

- (1) *The environmental audit report must provide for recommendations regarding the need to amend the EMPr, and where applicable, the closure plan.*
- (2) *The objective of the environmental audit report is to-*
  - (a) *report on-*
    - (i) *the level of compliance with the conditions of the environmental authorisation and the EMPr, and where applicable, the closure plan; and*
    - (ii) *the extent to which the avoidance, management and mitigation measures provided for in the EMPr, and where applicable, the closure plan achieve the objectives and outcomes of the EMPr, and closure plan. identify and assess any new impacts and risks as a result of undertaking the activity; evaluate the effectiveness of the EMPr, and where applicable, the closure plan; identify shortcomings in the EMPr, and where applicable, the closure plan; and identify the need for any changes to the avoidance, management and mitigation measures provided for in the EMPr, and where applicable, the closure plan.*
- (3) *An environmental audit report prepared in terms of these Regulations must contain-*
  - (a) *details of-*
    - (i) *the independent person who prepared the environmental audit report; and*
    - (ii) *the expertise of independent person that compiled the environmental audit report;*
  - (b) *a declaration that the independent auditor is independent in a form as may be specified by the competent authority;*
  - (c) *an indication of the scope of, and the purpose for which, the environmental audit report was prepared;*
  - (d) *a description of the methodology adopted in preparing the environmental audit report;*



- (e) *an indication of the ability of the EMPr, and where applicable, the closure plan to-*
  - (i) *sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity on an on-going basis;*
  - (ii) *sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the closure of the facility; and*
  - (iii) *ensure compliance with the provisions of environmental authorisation, EMPr, and where applicable, the closure plan;*
- (f) *a description of any assumptions made, and any uncertainties or gaps in knowledge;*
- (g) *a description of any consultation process that was undertaken during the course of carrying out the environmental audit report;*
- (j) *a summary and copies of any comments that were received during any consultation process; and*
- (k) *any other information requested by the competent authority."*

## **2. Indicate the frequency of the submission of the performance assessment report**

Unless otherwise instructed by the Competent Authority (in this case, the DMR) or as a condition to the authorisation / EMPr approval, environmental compliance audits on the EMPr will be undertaken on a biennial basis (every second year), and the resultant audit reports will be submitted to the DMR. The auditing process, as well as report format will comply with the requirements as contained in the EIA Regulations, GN R982, dated December 2014, as amended.

## **3. Environmental Awareness Plan**

In accordance with Regulation 51(b)(vi) MPRDR (2004), an Environmental Awareness Plan is needed, which states that an EMPr contemplated in Section 39(1) of the MPRDA (2002) must include an Environmental Awareness Plan as contemplated in Section 39(3)(c) of the Act. According to Section 39(3)(c) of the MPRDA (2002) "*an applicant who prepares an environmental management programme or an environmental management plan must develop an environmental awareness plan describing the manner in which the applicant intends to inform his or her employees of any environmental risks which may result from their work and the manner in which the risks must be dealt with in order to avoid pollution or the degradation of the environment*".

### **3.1. Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work.**

Formal training will be provided to all employees regarding the hazards of the duties to be performed to both their health as well as the surrounding environment. It is the responsibility of the Mine Manager and the Health and Safety officer to ensure that adequate training is provided to all employees. It is also



the responsibility of the relevant Head of Departments to identify the need for further training. As part of the mandatory training provided to all employees and contractors, environmental awareness training will be provided, as described in Section 2.2 below.

### **3.2. Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment.**

The following Environmental Awareness Training will be implemented by Khwezela Bokgoni Colliery in order to inform employees and contractors of the environmental risk that may result from their work, or the risk of their interaction with the sensitive environment. The training will be conducted as part of the induction process for all new employees (including contractors) that will perform work in terms of the proposed activities. Proof of all training provided must be kept on-site.

The Environmental Awareness Training will, as a minimum cover the following topics:

- Air Quality:
  - Activities that may result or mitigate impact on air quality; speeding on roads, covering of haul trucks etc.; and
  - Negative impacts on the receiving environment if mitigation measures are not implemented.
- Surface and groundwater:
  - Risks to surface and groundwater, e.g. fuel and chemical handling and further risks of erosion or damage to riparian vegetation;
  - How incidents should be reported, and emergency requirements;
  - The importance of storm water control, maintenance of pollution control infrastructure; and
  - The importance to reuse water and to prevent spillages.
- Cultural Heritage:
  - To respect all cultures and believes;
  - To remain within working areas and not to enter or interfere with any cultural heritage; and
  - How to report any sightings as identified during operation activities (e.g. fossils).
- Fauna:
  - Overview of the fauna found on site and the uniqueness thereof;
  - Mitigation measures that all contractors and employees need to abide by; and
  - No contractor or personnel allowed to catch or kill any species, and how any sightings should be reported if further actions are required (e.g. to catch and release).
- Flora:
  - Overview of the flora diversity on site, and the rare and endangered nature thereof;
  - Measures taken by the mine to protect species; and



- No contractor or personnel allowed to remove, harvest or destroy any flora species unless clearly instructed based on the construction and operational plans.
- Waste management:
  - The correct segregation of general and hazardous waste;
  - Do's and don'ts with respect to waste disposal; and
  - Measures to avoid waste generation and to participate in waste minimisation/reduction strategies.
- Traffic:
  - Abide by traffic rules, no speeding allowed;
  - To stay on designated roads (and not to drive on areas that are not fit and designed for this purpose); and
  - To be aware of the fauna species and to be on the lookout and avoid collisions.
- Natural Resource Consumption:
  - Minimise unnecessary use of energy by making use of energy saving devices, switching off non-essential appliances etc; and
  - Optimise utilisation of mining and plant equipment, travelling routes etc.
- Emergency Preparedness and Response:
  - Designated smoking areas;
  - How to report any emergency or incident; and
  - How to respond when emergency alarm goes off.
- General rules and conduct:
  - Respect for the sensitive environment;
  - Do not litter;
  - HIV/AIDS awareness;
  - Respect for each other and for different cultures; and
  - Safety and health requirements.

### **3.3. Internal and external communication**

The Internal and External Communications Management Procedure sets out how internal and external communication should take place at Khwezela Bokgoni Colliery.

The mentioned procedure has the following objectives:

- To provide a clear means of information transfer through the organisation and describe the mechanisms used for this purpose, and
- To provide a guideline for the process involved in communication with outside organisations.



The above-mentioned internal and external communications management procedure is available from the mine upon request.

#### *Identification of Stakeholders*

Khwezela Bokgoni Colliery is committed to communicating effectively with identified I&AP's and stakeholders. The I&AP's identified in terms of the mining and related activities at Khwezela Bokgoni Colliery include the following:

- Department of Agriculture, Rural Development, Land and Environmental Affairs;
- Department of Mineral Resources;
- Department of Water and Sanitation;
- Mpumalanga Tourism and Parks Agency;
- National Department of Agriculture;
- Adjacent Surface Owners;
- Witbank Magisterial District; and
- Surface water and groundwater users.

The database of stakeholders is, and will continue to be, updated on an annual basis. The most recent record of identified stakeholders is kept readily available on file by the responsible person for inspections and audits.

#### *Public liaison and forum participation*

Public liaison and forum participation form part of external communication undertaken by the mine. This also includes forum development and involvement, stakeholder liaison, annual public meetings and authorities meetings. Khwezela Bokgoni Colliery continues to aim at establishing and maintaining good relations with neighbouring surface owners and I&AP's.

#### *Distribution of information*

Communication and reporting form an integral part of the implementation of the EMP. Khwezela Bokgoni Colliery is committed to communicating and distributing the relevant information effectively to its employees, as well as to all the identified I&AP's.

#### *Public meeting(s)*

Public participation is a requirement in terms of the MPRDA, the NWA and the NEMA. Public meetings form an important part of the public participation, since they provide the opportunity for the mine and the identified I&AP's to communicate on issues regarding the environment and social well-being.

#### *Documents for public review*

As part of the public participation that is undertaken by Khwezela Bokgoni Colliery regarding current and future projects, all documentation pertaining to environmental management are made available upon request to all registered I&AP's.



### 3.4. Awareness raising

#### *Personnel*

All employees, current and new and contractors undergo induction, a part of which is environmental awareness training. At the end of this training, personnel are required to complete the awareness test and the level of awareness assessed by the training department. Re-testing or induction may be required.

All personnel performing tasks which can cause significant or major environmental impacts shall be competent on the basis of training, education and/or experience. This applies to, but is not limited to, supervisor level and above – i.e. operators, artisans.

#### *Type*

Awareness training includes the potential consequences of departure from specified operating procedures as well as significant environmental impacts, actual or potential, of their work activities. Training is appropriate to the activity of individual employees. Monthly environmental topics are generated to raise awareness of employees on environmental issues.

#### *Evaluation*

Evaluation of awareness and competency training is carried out through questionnaires or post-training tests conducted during training sessions and is done through questioning of employees during audits.

Over and above the environmental awareness procedure, the awareness plan is detailed as follows:

- Induction on environmental issues to all employees starting to work on the mine;
- Induction to all employees coming back from leave and those who have been away from the mine for more than three weeks;
- At least one green flash (short environmental bulletins) is distributed on the mine each month;
- Environmental topics (together with the safety and health) are published on the noticed boards each month; and
- As part of the plan to reach out to the neighbouring communities the Environmental team runs awareness campaigns within the schools on significant environmental calendar days such as World Environment Day, Labour day, etc.



### 3.5. Specific information required by the Competent Authority

Ref No.	Department Comment	Shangoni Management Services Response
1	The Department has received and reviewed the application for Environmental Authorisation dated 14th March 2019. The following shortcoming were identified as guided by Regulation 16 NEMA:EIA and must be urgently corrected:	
1.1	Submit proof of payment of the prescribed application fee.	Proof of payment of the prescribed application fee will be submitted with the EIAR / EMPR.
1.2	An undertaking under oath or affirmation that all the information submitted or to be submitted for the purposes of the application is true and correct.	Shangoni takes note of this comment. This was included in Chapter 12 and 13 (pages 162 and 163) of the Scoping Report. This will also be included in Chapters, 4, 5 and 7 of Part B of the EIAR / EMPR.
1.3	Activities proposed in the section "Description of overall activity" in subsection "Surplus water dewatering activities" in page 3 are withdrawn in the section "Draft EMP" in page 9. Whereas, page 3 discuss storage of water in both 3A North Underground Area and 5 West void, page 9 discuss storage of water only in 5 West void.	Page 9 of the Scoping Report refers to the listed activities triggered by the project. However, cognisance will be taken of this comment and Shangoni will ensure that the EAIR / EMPR clearly states that the strategy of this project is to temporarily store mine affected water in both 5 West Void and 3A north Underground Area.
2	The Department received and reviewed the Scoping Report (SR) and the Plan of Study for the Environmental Impact Assessment (PSEIA) dated January 2019 and is satisfied that the documents comply with the minimum requirements of Appendix 2(2) of National Environmental Management Act, 1998 (as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations, 2014. The SR is hereby accepted by the Department, with conditions, in terms of Regulation 22(a) of the NEMA EIA Regulations, 2014.	Shangoni takes note of this comment.
3	You may proceed with the tasks contemplated in the PSEIA with the following conditions:	
3.1	Your alternatives must include and critically discuss establishment of a dam above ground (alternative 4) Section 8 (page 30) describes alternative 4 but not comprehensively. Your argument of alternative 1 versus alternative 4 centres around costs and reducing environmental footprint above ground. But you do not go further into comparing and discussing advantages and disadvantages of the two alternatives in	Shangoni takes note of this comment. A detailed alternative assessment was not undertaken in the scoping report as the scoping report assessment are not as detailed as the EIAR alternative assessments. All alternative assessment are quantitatively undertaken utilising the mitigation hierarchy as the guideline. A detailed alternative assessment in this regard is included in the EIAR / EMPR.





Ref No.	Department Comment	Shangoni Management Services Response
	<p>respect of environment in the broader context, [i.e. the environmental footprint (as interpreted from your submission refers to the hectares to be disturbed in terms of vegetation clearing) is not the only environmental concern]. Focusing on environmental footprint in a narrow perspective (i.e. clearing of vegetation above ground) as a criteria will obviously provide motivation for alternative 1 particularly in absence of other environmental criteria such as seepage of underground water to adjacent strata or topography stability. Finally, after critically discussing all these alternatives, give a closing argument on why the preferred alternative carries insignificant environmental risk relative to other alternatives.</p>	
3.2	<p>In Annexure E on page 8 you have correctly identified Government Departments or State Organs responsible for various environmental aspect, including Mpumalanga Tourism and Parks Agency (M TPA), but under section 5 page 38 (<i>Description of the process of engagement referred to in 3.2.1 and 3.2.2 above with identified communities, landowners and interested and affected parties</i>) MT PA is marked as N/A (assuming you mean Not Applicable). Given the location of the mining areas and proposed project relative to location of Critical Biodiversity Area (CBA) as indicated in Figure 25 page 91 and Biodiversity Annexure, MT PA must be consulted given their mandate on biodiversity conservation.</p>	<p>Shangoni takes note of this comment. “. Notification of the project has been sent to the MPTA (refer to the emails sent to identified I&amp;APs on 15 November 2018 and attached as Annexure E of the Scoping Report). Shangoni will continue to engage with the MTPA during the process.</p>
3.3	<p>The SR/PSEIA and application for EA do not specify the length of the temporal storage. This information is important for satisfying Appendix 2(2) (v) which requires "the impacts and risk which have informed the identification of each alternative, including the nature, significance, consequence, extent, duration and probability of such identified impacts. Duration implies length of time as you have correctly indicated page 99 Table 40. Furthermore, Appendix 2(2) (v) brings in the argument presented in section 2.1 above, in essence it requires preferred alternative to undergo a comprehensive determination process.</p>	<p>Shangoni takes note of this comment. Water that will be pumped to 5 West Void and 3A North Underground will not be pumped as a means of final disposal and therefore, the term “temporary storage” is used. Water will be pumped to the 5 West Void and 3A North Underground area before being pumped to eMalahleni Water Reclamation Plant (“EWRP”). It is, however, difficult to assign a specific timeframe to the term “temporary storage” as various factors would affect such (i.e. capacity at EWRP, volumes pumped to 5 West Void and 3A North Underground Area, etc.). Critical water levels within the 5 West Void and 3A North Underground area were specific in the geohydrological report to which</p>



Ref No.	Department Comment	Shangoni Management Services Response
		the applicant will have to adhere to and that will affect the timeframe for which water is being stored.
3.4	Specify the quantity and quality of water to be stored underground. Taking into account that eMalahleni coalfields typically contains pyrite and weathering of the coal pillars usually result in acid mine water high with sulphates (SO <sub>4</sub> ) content and high concentration of mobile iron (Fe), manganese (Mn) and other trace metals. Therefore, it is reasonable to believe that the underground workings have undergone or will eventually undergo through an acid phase until all pyrite is exhausted.	Shangoni takes note of this comment. The quantity and quality of water will be specified in the EIAR / EMPR. A detailed risk assessment, including risks associated with the quality of water, was undertaken by a geohydrologist and will be included in the risk assessment for the project.
3.5	Specify the depth of the voids relative to the water table. In this regard, attach a specialist study on potential impacts of mine void pollution plumes. The study should model the movement of underground mine water at different storage duration until the required storage duration. The purpose of this study is to determine if the mine water will seep into adjacent strata. Moreover, specify how you will control the water levels in rainy seasons to avoid overflow.	Shangoni takes note of this comment. Information in this regard was included in the geohydrological study that was conducted for the project and will be included in the EIAR / EMPR to be submitted to the department.
3.6	A specialist study that evaluates the long-term stability of the surface or topography	Shangoni takes note of this comment. Extensive studies within the eMalahleni area have been undertaken by Anglo and other mining houses regarding the stability of the surface or topography. The studies that Anglo have undertaken will be incorporated into the Annexures of the EAIR / EMPR.
4	You are requested to submit two (2) hard copies of the EIAR and EMPR and at least one electronic copy (CD/DVD) of the complete EIAR and EMPR to this Regional Office.	Shangoni takes note of this condition. Two hard copies and one electronic copy of the complete EIAR / EMPR will be submitted to the Regional Office.
5	Your attention is brought to Section 24F of the NEMA which stipulates "that no activity may commence prior to an environmental authorisation being granted by the competent authority"	Shangoni and Anglo takes note of this condition.



## 4. Undertaking Regarding Correctness of Information

I MARVIN GRIMETT herewith undertake that the information provided in the foregoing report is correct, and that the comments and inputs from stakeholders and Interested and Affected parties has been correctly recorded in the report.

Name: Marvin Grimett  
Date: 18 June 2019  
Project Code: ABG-BOK-18-07-26

Signature of EAP

Date: 18 June 2019

## 5. Undertaking Regarding Level of Agreement

I MARVIN GRIMETT herewith undertake that the information provided in the foregoing report is correct, and the level of agreement with Interested and Affected parties and stakeholders has been correctly recorded and reported herein.

Name: Marvin Grimett  
Date: 18 June 2019  
Project Code: ABG-BOK-18-07-26

Signature of EAP

Date: 18 June 2019



## 6. Disclaimer

This report has been produced by Shangoni Management Services (Pty) Ltd., ("Shangoni") with the skill and care ordinarily exercised by a reasonable Environmental Consultant at the time the services were performed. Further, and in particular, the Services were performed by Shangoni taking into account the limits of the scope of works required by the Client, the time scale involved and the resources, including financial and manpower resources. None of the work performed during this project shall constitute or be represented as a legal opinion of any kind or nature, but shall be a representation of the findings.

No warranties or guarantees, expressed or implied, are included in or intended by the report, except that it has been prepared in accordance with the current generally accepted practices and standards consistent with the level of care and skill exercised under similar circumstances by professional consultants or firms that perform the same or similar services. Any reference to legislation in this report should not be perceived as a substitute for the provisions of such legislation. In the event of any inconsistency between this document and such legislation, the latter would prevail.

Whilst every endeavour has been made by the Shangoni to ensure that information provided is correct and relevant, this report is, of necessity, based on information that could reasonably have been sourced within the time period allocated to the assessment, and is, furthermore, of necessity, dependent on information provided by management and/or its representatives. It should, accordingly, not be assumed that all possible and applicable findings, observations and/or measures are included in this report as this report represents a sample of assessable parameters. As a subsequent event, should additional information become available, Shangoni reserves the right to amend its findings, observations, measures and executive summary.

## 7. Declaration of independence

Shangoni hereby declares that it is an independent auditor in that it has no business, financial, personal or other interest in this project in respect of which Shangoni is appointed. Furthermore, no circumstances exist that may compromise the objectivity of Shangoni, excluding fair remuneration for work performed in connection with this environmental audit.

**Report compiled  
by:**

Name: Marvin Grimett  
Date: 18/06/19  
Project Code: ANG-BOK-18-07-26  
**Marvin Grimett**

**Report reviewed by:**

Name: Brian Hayes  
Date: 18/06/19  
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**Brian Hayes (Pr Eng)**

