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DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT AND ENVIRONMENTAL MANAGEMENT PROGRAMME

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

NAME OF APPLICANT:	**MAXWILL 146 CC**
TEL NO:	082 924 5965
POSTAL ADDESS:	18857 Thesele Street, John Daka, 8345
FILE REFFERENCE NUMBER SAMRAD:	NC30/5/1/2/2/10148 MR

PREPARED BY: NDI GEOLOGICAL CONSULTING SERVICES (PTY) LTD

DATE: October, 2019

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IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resource 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 environment"

Unless an Environmental Authorisation can be granted following the evaluation of Environmental Impact Assessment and Environmental Management Programme report in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA), it can 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 to the submission of applications.

It is therefore an instruction that the prescribed reports required in respect of application for an environmental authorisation for listed activities triggered by an application for 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*

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ensure that the information required is placed correctly in 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.

OBJECTIVES 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 geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;

(d) determine the-

i. nature, significance,consequences,extent,duration and probability of the impacts occurring to inform identified preferred alternatives; and

ii. degree to which these impacts-

(a) can be reversed;

(b) 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;

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

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

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

EXECUTIVE SUMMARY

Introduction

Ndi Geological Consulting Services (Pty) Ltd (Ndi Geological Consulting) has been appointed by Maxwill 146 cc (Maxwill) as the Environmental Assessment Practitioner (EAP) to undertake the Environmental Impact Assessment (EIA) for the proposed mining activities of alluvial diamonds on the remainder and portion 2 of the farm Spaar Hoek 90 as well as the remainder and portion 2 of the farm Blaauwbosch Fontein 91 and the remaining portion of farm Zulani 167 located within the Herbert Magisterial District in the Northern Cape Province. The lodged application was submitted to the Department of Mineral Resources (DMR) and the following reference number NC30/5/1/2/2/10148 MR was issued by the DMR.

The application includes various activities that are listed in terms of GNR listing number 983 and GNR listing 984 as promulgated in terms of the National Environmental Management Act 107 of 1998 (NEMA), as amended, requiring environmental authorisation. These listed activities cover the necessary infrastructure that would make the proposed mining activities to be feasible.

The process that was followed is a regulated process in terms of the NEMA for all EIAs. It is important to note that the entire process will include an integrated public participation process, environmental impact report and an

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environmental management plan before any decision can be taken or made on whether to permit the development or not.

The proposed mining triggers activities that are contained on the 2014 Environmental Impact Assessment Regulations (Government Notice 983, Government Notice 984 and Government Notice 985 of 4th of December 2014) and thus a Scoping and Environmental Impact Assessment Process is required. Furthermore, as the project occurs within a regulated area of a watercourse and involves abstraction of water, it triggers activities that are listed under Section 21 (a), (c) and (i) of the National Water Act (Act No. 36 of 1998). As such an Integrated Water Use Licence (WULA) application process will also be required.

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ACRONYMS AND ABBREVIATIONS
LIST OF ABBREVIATIONS

BID: Background Information Document

DEA: Department of Environmental Affairs

DMR: Department of Mineral Resources

DWS: Department of Water and Sanitation

EA: Environmental Authorisation

EIA: Environmental Impact Assessment

EIAR: Environmental Impact Assessment Report

EMPr: Environmental Management Programme

GN: Government Notice

HIA: Heritage Impact Assessment

I&AP: Interested & Affected Party

MPRDA: Minerals and Petroleum Resources Development Act, 2002

NEM: WA: National Environmental Management: Waste Amendment Act, 2008

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

NHRA: National Heritage Resources Act, 1999 (Act No. 25 of 1999)

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

PPP: Public Participation Process

WULA: Integrated Water Use Licence Application

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1. INTRODUCTION

Background and Introduction

Ndi Geological Consulting Services (Pty) Ltd (Ndi Geological Consulting) has been appointed by Maxwill 146 CC (Maxwill) as the Environmental Assessment Practitioner (EAP) to undertake the Environmental Impact Assessment (EIA) for the proposed mining activities of alluvial diamonds on the remainder and portion 2 of the farm Spaar Hoek 90 as well as the remainder and portion 2 of the farm Blaauwbosch Fontein 91 and the remaining portion of farm Zulani 167 located within the Herbert Magisterial District in the Northern Cape Province. The lodged application was submitted to the Department of Mineral Resources (DMR) on 5th of October 2018 and the following reference number NC30/5/1/2/2/10148 MR was issued by the DMR.

The application includes various activities that are listed in terms of GNR listing number 983 and GNR listing 984 as promulgated in terms of the National Environmental Management Act 107 of 1998 (NEMA), as amended, requiring environmental authorisation. These listed activities cover the necessary infrastructure that would make the proposed mining activities to be feasible.

The process that was followed is a regulated process in terms of the NEMA for all EIAs. It is important to note that the entire process will include an integrated public participation process, environmental impact report and an environmental management plan before any decision can be taken or made on whether to permit the development or not.

The proposed mining triggers activities that are contained on the 2014 Environmental Impact Assessment Regulations (Government Notice 983, Government Notice 984 and Government Notice 985 of 4th of December

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2014) and thus a Scoping and Environmental Impact Assessment Process is required. Furthermore, as the project occurs within a regulated area of a watercourse and involves abstraction of water, it triggers activities that are listed under Section 21 (a), (c) and (i) of the National Water Act (Act No. 36 of 1998). As such an Integrated Water Use Licence (WULA) application process will also be required.

2. PART A: EIA PHASE PROCESS

After the initial scoping phase, the EIA phase of the application includes:

- Specialist investigations are undertaken in accordance with the terms of reference established in the scoping assessment (plan of study for EIA appended to the scoping report). The scope for specialist work is determined
- accordingly to the nature and scale of the project impacts.
- An evaluation of development alternatives and identification of a proposed option.
- An assessment of existing impacts (no-go development option), environmental impacts that may be associated with the proposed project option, and cumulative impacts using the impact assessment methodology.
- Identification of mitigation measures to address the environmental impacts and development of actions required to achieve the mitigation required.
- Consultation with I&APs.
- Incorporation of public comment received during scoping and the draft EIA into the final EIA report.

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3. ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

3.1 Details of the EAP

Maxwill 146 CC (Maxwill) has appointed Ndi Geological Consulting Services (Pty) Ltd (Ndi Geological Consulting) as an independent Environmental Assessment Practitioner (EAP) to undertake a Scoping and Environmental Impact Assessment (S&EIA) process relevant the application for a mining right.

Ndi Geological Consulting has experience in providing comprehensive Environmental and Mining services. Details of the EAP are detailed in Table 1

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Table 1: Details of the EAP

ITEM	**CONSULTANT CONTACT DETAILS (If applicable)**
Name	Ndi Geological Consulting Services (Pty) Ltd
Tel no	053-8420687
Fax no:	086-5381069
Cellular no	0827608420
E-mail address	E: ndi@ndigeoservices.co.za E: atshidzaho@gmail.com
Postal address	P O Box 10489 Beaconsfield Kimberley 8315
Expertise of the EAP	
The qualifications of the EAP	BSc (Hons) Earth Sciences in Mining and Environmental Geology. University of Venda
Summary of the EAP's past experience.	
Ndivhudzannyi graduated with an Honours degree in Earth Science majoring in Mining and Environmental Geology. She is a self-motivated and hardworking geologist with 8 years' experience in the environmental, mining exploration, open cast work and consulting in the mining industry. She has proven leadership skills from supervising exploration rigs (Reverse Circulation and Percussion Drilling). Proven field experience in exploration i.e. mapping, borehole logging, borehole sampling, sample preparation for laboratory analysis and supervisory duties in the field. Ndivhudza also has experience in writing geological reports including Prospecting Work Programmes, Mining Work Programmes, Scoping Reports and Environmental Impact Assessment Reports, and handling of DMR documents in general. She has conducted environmental audits for mines. Ndivhudza's expertise also extends across annual reporting assessment, environmental authorizations and conducting public participation processes. Please refer to Appendix B for a copy of the EAP's Curriculum Vitae	

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3.2 Description of the property

The location of the property with reference to the nearest towns, the details of the farms and the extent of the application area are described in Table 2 below:

Table 2: Description of the property

Farm name:	The remainder and portion 2 of the farm Spaar Hoek 90 as well as the remainder and portion 2 of the farm Blaauwbosch Fontein 91 and the remaining portion of farm Zulani 167.		
Application area Ha	4499.8323 ha		
Magisterial district	Herbert Magisterial District		
Distance and direction from nearest town	±11km west of Plooysburg and 42 km east of Douglas town		
21 digit surveyor General Code	**Farm name**	**Portion**	**SG Code**
	Spaar Hoek 90	Remaining Extent (0)	C03200000000009000000
	Spaar Hoek 90	2	C03200000000009000002
	Blaauwbosch Fontein 91	Remaining Extent (0)	C03200000000009100000
	Blaauwbosch Fontein 91	2	C03200000000009100002
	Zulani 167	Remaining Extent (0)	C03700000000016700000

The proposed Mining Right application is located in an area west of Plooysburg in the Herbert District covering a combined area of 4499.8323 hectares to mine alluvial diamonds. The application runs on the remainder and portion 2 of the farm Spaar Hoek 90 as well as the remainder and portion 2 of the farm Blaauwbosch Fontein 91 and the remaining portion of farm Zulani 167. The property is accessed via R357 Main Road which also forms part of its north boundary (Figure1 and Figure 2).

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Figure 1: Locality Plan of Maxwill Proposed Mining Properties (Google Earth Map).

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Figure 2:Location map of the study area

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4. DESCRIPTION OF THE SCOPE OF OVERALL ACTIVITY

4.1 Mining operations

The proposed project involves the development of an opencast diamond mine and supporting infrastructure. The diamond material will be excavated from the pit using a bucket excavator and transported by an ADT to the overburden stockpile area. The proposed mine will require support infrastructure such as water access roads, storage, fuel storage, waste dump, topsoil storage etc. in Figure 3 in Appendix 1) shows the initial site plan for the mine infrastructure.

4.1.1 Mining methodology

The project involves the development of an opencast diamond mine and supporting infrastructure. Due to the proximity of the diamond resources to the surface, an open cut method was the best option to extract the resources hence the diamonds will be mined through opencast using conventional truck and excavator mining methods. The mining blocks will be 50m by 20m and the benches 10m high. The area to be mined is approximately 4499.8323 ha.

4.1.2 Supporting infrastructure

Ablution facility

A small area of less than 16m^2 will be used for the ablution facilities.

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Access roads

The property is accessed via the 357 Main Road from Douglas to Plooysburg. The road forms the southern boundary of the properties A haul road is proposed which will run from the pit to the plant area.

Chemical storage

A storage area of about 0.03ha will be necessary to store chemicals that will be used during the mining process. This facility will be adequately monitored in order to manage the potential risks of spillages, fire and /or explosion.

Diesel storage

A diesel storage area of about 0.02ha will be required. This facility will be adequately monitored in order to manage the potential risks of fire and /or explosion.

Domestic waste facility

General waste will have a demarcated area where the waste will be separated according to type. The rubbish bin containers will be labelled accordingly. When full, the waste will be disposed off in the right disposal area for such waste.

Electricity

The primary source of power will be generators supplying power to the mining operations and plant facilities. Should there be a need for electricity, permission will have to be obtained from Eskom as there are existing power lines in the area.

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Fences

A fence will be erected around the mining area for safety reasons. This will prevent animals from falling into the pits. This will also prevent unauthorised access within the mining area.

Office site

Office area of approximate 0.007 ha for storage of some stationary and for the field staff to work from will be erected on site.

Settling dam

A settling dam will be constructed adjacent to the processing plant.

Plant site

A plant will be required for processing the gravel mined from the pits.

Vehicle parking area

Vehicles and the other machinery used during mining will need a parking space of approximately 1 hectare.

Waste dump

All hazardous wastes will be stored and handled appropriately prior to being disposed of by a licensed hazardous waste disposal contractor.

Water pipelines

The main water source will be the Riet River. Pipes and pumps will be constructed to pump water from the river directly to the process plant. Process water will be managed and re-used throughout the operations of the project via clean and dirty water separation system, which shall include separate drains.

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Water reservoir

A water reservoir will be required for the processing of diamonds and for other uses in the mine. A space of about 0.4ha will be sufficient to accommodate it.

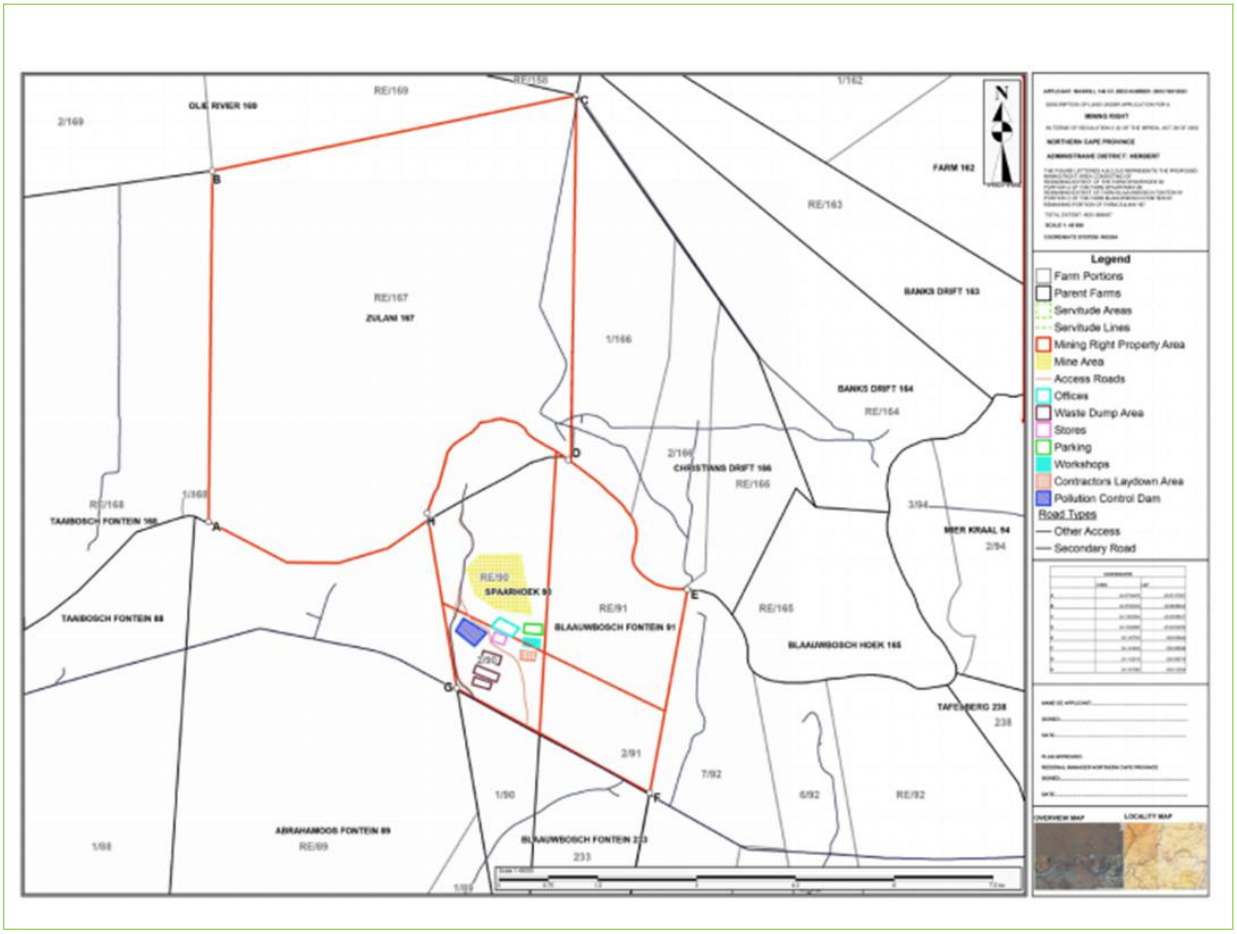

Figure 3: Initial layout of the proposed Maxwill Diamond Mine

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4.2 Listed and specified activities

Table 3: Listed and specified activities

NAME OF ACTIVITY **E.g. For prospecting - drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route etc…etc…etc** **E.g.for mining,- excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)**	**Aerial extent of the activity in Ha or m²**	**Listed activity mark with an x where applicable or affected**	**Applicable listing notice *(GNR 983,GNR 984 or GNR 985 or NOT LISTED***	**WASTE MANAGEMENT AUTHORISATION** **(Indicate whether an authorisation is required in terms of the Waste Management Act). (Mark with an X)**
Mining Area	4499.8323 ha	X	GNR 984 (15, 17)	
Ablution facility	>16m²	X	GNR 983 (25)	
Topsoil Stockpile	1ha	X	GNR 983 (27)	
Access roads	4ha	X	GNR 983 (24, 27)	
Chemical storage	0.03ha	X	GNR 983 (14) GNR 984 (4)	
Diesel storage	0.02ha	X	GNR 983 (14) GNR 984 (4)	
Domestic Waste Facility	1ha	X	GNR 983 (27)	X Category A (1, 3, 12)
Electricity	1ha	X	GNR 983 (2, 12) GNR 984 (2)	
Fencing	1ha	X	GNR 983 (27)	
Office site	0.07ha	X	GNR 983 (27)	
Settling dam	1ha	X	GNR 983 (13) GNR 984 (16)	X Category A (1, 3, 12)
Vehicle parking area	1ha	X	GNR 983 (27)	
Waste dump	1ha	X	GNR 983 (27)	X Category A (1, 3, 12)
Water pipelines	1ha	X	GNR 983 (9, 10,12, 19,)	
Water reservoir	0.4ha	X	GNR 983 (13)	
Contractor's camp	0.1ha	X	GNR 983 (27)	

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4.3 Staff requirements

The planned labour complement for Maxwill is expected to be 13 employees. Judging by the amount of resources calculated, Maxwill considered the labour complement adequate for the mining operation envisaged . Contractors will be required to honour commitments made in the SLP and also to comply with the Mining Charters requirement in terms of Black Economic Empowerment (BEE).

5. POLICY AND LEGISLATIVE CONTEXT

Applicable legislative and guidelines used to complete this report.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT *(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*	REFERENCE WHERE APPLIED	AUTHORITY
The South African Constitution This section provides an overview of the legislative requirements applicable to this project and it includes the Acts, guidelines and policies considered in the compilation of this report. The legislative motivation for this project is underpinned by the Constitution of South Africa, 1996 (Act No. 108 of 1996), which states that: The State must, in compliance with Section 7(2) of the Constitution, respect, protect, promote and fulfil the rights enshrined in the Bill of Rights, which is the cornerstone of democracy in South Africa. Section 24 of the Constitution:	Public participation process and consultation at every stage of the EIA phase. The project will endeavor avoid or minimise the impacts as well as apply mitigation measures where impacts can not be avoided or minimised.	N/A
Mineral and Petroleum Resources Development Act, 2002 (Act No. 28	In terms of the MPRDA, an application for a mining right must be supported by various	Department of Mineral Resources, Northern Cape

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APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT *(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*	REFERENCE WHERE APPLIED	AUTHORITY
of 2002) (MPRDA). The MPRDA makes provision, for persons to apply for a prospecting right. A prospecting right granted in terms of the MPRDA is a limited real right in respect of the type of resources and the land to which the right relates. The holder of a prospecting right is entitled to the rights referred to in the MPRDA or any other law. The applicant requires a prospecting right and environmental authorisation from the DMR.	documents, including a Scoping Report, EIA and EMP. A scoping report has been submitted and EIAR/EMPR report has also been compiled to meet the requirements of the MPRDA. This process will however run in parallel to this EIA process undertaken to meet the requirements of NEMA, NEM:WA and the NWA. In support of the application to obtain the mining right, Maxwill is required to conduct a Scoping Report, EIA /EMPr and I&AP consultation process that need to be submitted to the DMR for assessment.	Province
Mine Health and Safety Act 29 of 1996 The Act provides for the protection of health and safety of employees and other persons in the mines. It provides for the health and safety measures.	Maxwill will ensure that employees, contractors, sub-contractors and visiting personnel, adhere to this Act and subsequent amendment regulations on site.	Department of Mineral Resources (Northern Cape)
National Environmental Management: Air Quality Act (Act No 39 of 2004) The Act makes provision for the control of dust cause by general activities or machinery. Applicants to take responsibility in ensuring dust control, noise control and control of offensive odours.	Mining activities will result in dust emission. Dust suppression measures will be implemented. This will mostly include spraying of haul roads with water by water trucks. Noise levels will be high due to the movement and the sound of machineries. Operating hours where the	Department of Environmental Affairs and Siyancuma Local Municipality

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APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT *(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*	REFERENCE WHERE APPLIED	AUTHORITY
	machineries are used will be kept to daylight hours.	
National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) The Act aims at managing cultural heritage resources and encourages conservation and nurturing of cultural legacy for future generations. For development exceeding 0.5 Ha it is important that cultural heritage studies be undertaken. The Act provides guidelines for impact assessment studies to be undertaken where cultural resources may be disturbed by development activities. Archaeological impact assessments (AIAs) are often commissioned as part of the heritage component of an EIA and are required under Section 38(1) of the NHRA of 1999, Section 38(8) of the NEMA and the MPRDA. The South African Heritage Resources Agency (SAHRA) will need to approve the heritage assessment undertaken as part of the impact assessment process.	A Palaeontological Imapact Asessment study conducted on the remainder and portion 2 of the farm Spaar Hoek 90 as well as the remainder and portion 2 of the farm Blaauwbosch Fontein 91 and the remaining portion of farm Zulani 167, rated the area as moderate to low Palaeontological sensitivity area that requires only a desktop study.	Northern Cape Heritage Resource Authority
National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) NEMA underpins the environmental authorisation in South Africa. The regulations with listed activities are identified under the Regulations GNR 982,983,984 and 985 have been amended in 2017 through GNR 324, 325, 326 AND 327 respectively.	Environmental authorisation has been lodged with the DMR under NEMA For the purpose of this report GNR 983 and 984 will be applicable.	

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The competent authority for this activity is the DMR which deal with mining related applications in terms of NEMA.		
National Environmental Management: Waste Act (Act No. 59 of 2008) (NEM: WA)	The project will also trigger activities listed in GNR 921 of the NEM: WA. This will require a Waste Management Licence from the DMR. An integrated application for an Environmental Authorisation and WML was submitted to the DMR.	DMR and DWS, Northern Cape through the integrated application process
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA) The Act provides for the management and conservation of Biodiversity, the protection of species and ecosystems in South Africa. It also warrants the national protection and use of indigenous biological resources.	Mining activities in the proposed study areas will have direct negative ecological impacts, most notably vegetation clearing leading to habitat loss, degradation and fragmentation. Other noted impacts include inter alia, exotic species encroachment and dust generation. These impacts can similarly be mitigated through correct and active management. Proper rehabilitation and after-care of the mined area need to take place to prevent the colonisation of the areas by invader species.	
National Water Act, 1998 (Act No. 36 of 1998) The Act recognises that water is a scare and unevenly distributed resource nationally. Where applicable a water use licence will be	The study area is characterised by non perennial rivers and a perennial river (Riet River). The aquifer risk assessment was ranked medium and therefore it needed medium	Department of Water and Sanitation (DWS), Northern Cape

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lodged with the Department of Water and Sanitation (DWS) in terms of Section 21 of the Act with several water use activities listed which require authorisation of the DWS. An integrated water and waste management plan will be compiled in support of the water use licence application.	protection from the proposed activities The activity has minimal potential for groundwater contamination In terms of the NWA, any activities undertaken within 500 m of a wetland or within 100 m of a watercourse require a Section 21 (c) and (i) Water Use Licence (WUL). Should water required for the project be from groundwater and /or surface water, a Section 21 (a) WUL will also be required. Should the impacts of the activities be of low significance, the activities may also be Generally Authorised (GA).	
The National Forests Act 84 of 1998 The applicant needs to take cognisance of protected trees under this act and if there are any on site which will be required to be removed, the necessary authorisations will need to be obtained from the Department of Agriculture Forestry and Fisheries (DAFF).	The EMPr will regulate the applicant to apply for a permit prior to the removal of any sensitive and/or protected species	Department of Agriculture, Forestry and Fisheries (DAFF)
Convention on Wetlands (Ramsar, 1971 enforced 1975) The Convention on Wetlands, Ramsar Convention, is an environmental treaty established in	A wetland study was conducted in the study area. Pan/Depression, as well as flood plain wetland units have	Department of Environmental Affairs

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1971 by UNESCO. It provides for national action and international cooperation regarding the conservation of wetlands, and wise sustainable use of their resources. Ramsar lists wetlands of international importance across the world.	been identified on site. The wetland areas and associated buffer must be kept free from all development unless authorised by a water use licence	
Restitution of Land Rights Act, 1994 (Act No. 22 of 1994), as amended in 2014.	Land Claims. One of the key issues identified by the IDPs is to facilitate the land claims.	Department of Rural Development and Land Reform

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6. NEED AND DESIRABILITY OF THE PROPOSED PROJECT

Although the mining industry has not been performing well for the past few years, it still remains the cornerstone of the economy. It is still one of the biggest employers in the world. The Northern Cape economy is anchored by the primary sector specifically the mining industry with the primary sector contributing 32.6%, secondary 6.2% and the tertiary sector 49.8% (Statistics SA: GDP p0441: 2010). Although the tertiary sector contributes almost 50%, the mining industry alone contributes 24, 6% to the provincial value addition. Northern Cape recorded an average real annual economic growth rate of 2, 5% between 1996 and 2007. Average real annual economic growth rate of South Africa for the same period (1996 to 2007) was 3, 6%. Despite production challenges, diamond consumer demand has increased since a 2015 drop in global demand.

An analysis of the geological information for the study area has determined that the area has potential for diamond reserves. In order to ascertain the above and determine the nature, location and extent of the diamond reserves within the proposed mining area, it will be necessary that mining be undertaken.

The information obtained through prospecting has proved that there are diamond resources on the properties. The quantity of the reserves available within the proposed mining area has been determined hence Maxwill has entered into the Mining Right application process.

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Should the application for a mining right be successful, Maxwill will be able to mine the available reserves. This will result in job creation and boost to Herbert District Municipality economy and subsequently boost the province and the country's economy as well.

Maxwill has made a commitment to develop the community through a Social and Labour Plan (SLP) which outlines the Local Economic Development (LED) programmes set for the Siyancuma and Herbert communities. The main priority of the LED programmes is to improve the education, provide mentorship to the surrounding communities with the main focus being on Historically Disadvantaged South African (HDSA) employees.

7. MOTIVATION FOR THE PREFERRED DEVELOPMENT FOOTPRINT WITHIN THE APPROVED SITE INCLUDING A FULL DESCRIPTION OF THE PROCESS FOLLOWED TO REACH THE PROPOSED DEVELOPMENT WITHIN THE APPROVED SITE

The proposed alternative was reached after an evaluation of the sensitivities of the site showed no fatal flaws. The overall mining site was also selected based on its potential to host diamond resources.

7.1 Details of development footprint alternatives considered

7.1.1 The property on which or location where it is proposed to undertake the activity

Maxwill has applied for a mining right on the remainder and portion 2 of the farm Spaar Hoek 90 as well as the remainder and portion 2 of the farm Blaauwbosch Fontein 91 and the remaining portion of farm Zulani 167. These properties have potential for diamond mineralisation due to the nature of the

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geology that covers it. The succession on the applied area, varies from about, oxidized surface of loose lag gravel dominated by banded ironstone clasts, underlain by a hard layer (0.5-3m thick) of calcrete, which is in turn underlain by a sandy, fine grained silcrete cemented, gravel horizon. The latter horizon is in turn generally underlain by an extensive, coarse and loosely cemented boulder bed hosting intercalated gravels and sandy lenses. The site is therefore regarded as the preferred site and no alternatives have been considered. Prospecting work conducted on the proposed study area has verified the availability of diamond mineralisation.

7.1.2 The type of activity to be undertaken

Opencast mining of diamonds will take place on the proposed site using conventional truck and excavator mining methods. The mining blocks will be 50m by 20m and the benches 10m high.

7.1.3 The design or layout of the activity

Supporting structures plan provided is not necessarily final, this may change after the public participation process has been conducted.

7.1.4 The technology to be used in the activity

Overburden stripping and resource mining will be done using excavators, creating and maintaining mine using bulldozer and grader, managing material around the stockpiles using front end loader a front-end loader, as well as transportation of material from the mine to the plant and vice versa using dump trucks. Water trucks will be used to transport water and to spray on the ramps and roads to reduce dust emission. Generators for will be required to supply power in the mine and plant areas.

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7.1.5 The operational aspects of the activity

The main source of water that will be used in the mining and processing plant areas will be the river. Pipelines will be installed in order to supply water from the river to the processing plant. A water reservoir will also be put in place for collection of water. Generators will be the main source of power both in the mining and processing plant facilities. Access roads will also be constructed in areas where there are no existing access routes and for the haul trucks to be able to transport mined out material to the stockpile and plant areas.

7.1.6 The No-Go alternative

By not implementing mining, it means that the current land use of the proposed study area will remain the same. This means that no disturbance to the environment will be caused by this particular project. It has been proven that there are diamond resources on the property. If mining does not take place, this will result in financial loss to Maxwill and a lost opportunity to contribute to the economy. More people in the Herbert area will stay jobless as a chance to create more jobs will have been lost.

7.2 Public Participation Process (PPP)

Public Participation is an integral part of the EIA process and is regarded as a way of empowerment and as a vital part of our democratic governance. Ndi Geological Consulting Services (Pty) Ltd has been appointed by Maxwill as a main independent consultant to undertake the EIA process as required in terms of the NEMA.

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Public participation is defined as a process that leads to a joint effort by stakeholders, technical specialist, the authorities and the proponent to work together to produce better decisions than if they had acted independently.

7.2.2 PPP Objectives

Some of the key EIA requirements with regards to public participation include the following:

- Mining Application and EIA must be publicly advertised (e.g. on site and or in newspaper);
- Public consultation during scoping phase to identify issues of concern which needs to be considered during the EIA phase of the project;
- Public to review the Scoping Report and EIA Report;
- Public may appeal within 21 days after the Environmental Authorization has been issued by the authority.

7.2.3 Public participation in EIA

NEMA supports the engagement of all stakeholders in environmental governance. Consultation in the EIA process achieves the following aspects:

- Inform and raise awareness of the proposal;
- Increase understanding amongst stakeholders;
- Identify and learn from local sources of information;
- Inform and improve decision-making.

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7.2.4 Consultation methods

Announcement Phase

I&APs were notified using relevant guidelines applicable to public participation process as contemplated in section 24J of the Act. Notifications which relate to this mining right application were done after the acceptance of the mining right application and Environmental Authorisation application. I&APs parties were consulted in one of the following forms:

During the scoping phase it was indicated to Ndi Geological Consulting that the Plooysburg community is not interested in or have no access to newspapers. For that reason Ndi Geological Consulting decided to use flyers as a method of consulting the community. Most of the flyers were given to school children to distribute to their family members . SMS'ses (Short Message Service) were also sent to the registered I&APs, the database for I&APs was compiled during the scoping phase. The community representatives were also notified about the proposed mining project via sms.

The copy of the Draft EIA/ EMP report was made available at the Plooysburg Police Station . The community and its representatives were notified about the availability via sms.

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Scoping Phase

Direct notification and circulation of the Final Scoping Report to identified stakeholders

Key stakeholders were sent letters by registered post. Background Information Document (BID) were also sent to the stakeholders. The BID had a comments sheet attached to it for registered I&APs to submit their comments on the project. The key stake holders were also informed about the availability of the Draft EIA/EMPr which could be sent via email.

Comments and concerns from the stakeholders will be documented and addressed. Stakeholders requested to be registered as I&APs as well as requested documents relating to the project.

EIA Phase

This phase begins once the Scoping Report has been submitted and accepted by DMR within 43 days. The stakeholders will be given 30 days to review and comment on the EIA/EMPr documentation. The EIA/EMPr must be submitted to the DMR within 106 days for review. The DMR will then review the documents within 107 days and make a decision on the application.

Notification to all the registered I&APs was done. A hard copy of the draft EIA/EMPr was made available at the Plooysburg Police Station and all the registered I&APs were notified of the availability via sms. Flyers were were distributed to the Plooysburg school children who gave them to their family members. The EAP maintained communication with the community representative, Theresa, via telephone, WhatsApp and sms to advise on the

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EIA process. The farmers were given a disc with the draft EIA/EMPr and the letter of notification on how to view the EIA report. The letters were hand delivered to a farm owner who distributed the letters to other farm owners and that way the farmers felt safe .

Appeal Phase

The stakeholders will be notified of the DMR decision. Information on how to appeal the decision made by the DMR will be made available to the stakeholders.

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7.3 Summary of issues raised by I&APs

All the issues raised by I&APs (Table 4) will be documented, addressed and attached as part of the Final Scoping Report.

Table 4: Issues raised by I&APs

Interested and affected parties. List the names of person consulted in this column, and mark with an X where those who must be consulted were in fact consulted		Date comments received	Issues raised	EAPs response to issues as mandated by the applicant.	Section and paragraphs reference in this report where the issues and or response were incorporated
INTERESTED AND AFFECTED PARTIES					
Land owners					

8. ENVIRONMENTAL ATTRIBUTES AND DESCRIPTION OF THE BASELINE RECEIVING ENVIRONMENT

8.1 Type of environment affected by the proposed activity

8.1.1 Geology

In general, the terraces on the application area comprise a sedimentary package of:

- Rooikoppie (0.5-3m)
- Calcrete capping (1-3m)
- Fine gravel and sandy gravel Coarse basal gravel (1-5m)
- Fine to coarse sandy gravel (2-8m)
- Coarse basal gravels (1-5m)

The succession on the applied area, varies from about, oxidized surface of loose lag gravel dominated by banded ironstone clasts, underlain by a hard layer (0.5-3m thick) of calcrete, which is in turn underlain by a sandy, fine grained silcrete cemented, gravel horizon. The latter horizon is in turn generally underlain by an extensive, coarse and loosely cemented boulder bed hosting intercalated gravels and sandy lenses. The coarseness of the boulder beds indicate that they were deposited during periods of high-energy river flow.Basal gravel sequences consist of rapidly aggraded or dumped material, ranging in size from large boulders

(over 1.5m in places) to sand. The gravels are compacted and frequently cemented with secondary lime to form calcretised cobble and boulder deposits.

Younger (lower) terrace gravels represent re- working of earlier deposits by late stage erosion and redeposition as sheet wash flood gravels in low level terraces often associated with river damming situation and splays.

Rooikoppie deposits represent a 'lag' or deflation deposit, and consist mainly of well-rounded and polished siliceous pebbles and reddish coloured sand. The clastic material originates primarily from the basal gravels and consists of most resistant

thereof, in particular chert, agate, jasper, quartzite and vein quartz. Due to the decomposition and winnowing of the less resistant clastic and matrix material,

there has been a substantial concentration of more durable components in the original gravel, including diamonds. Iron has stained the entire assemblage, giving it a reddish colour and hence the name 'Rooikoppie'. As noted above the Rooikoppie was mined throughout the region by small- scale prospectors using unsophisticated mining and diamond recovery techniques. The Rooikoppie deposits typically rests on sand, gravel or in places a hard, semi-continuous layer of calcrete and silcrete. Geology map is shown in Figure 4.

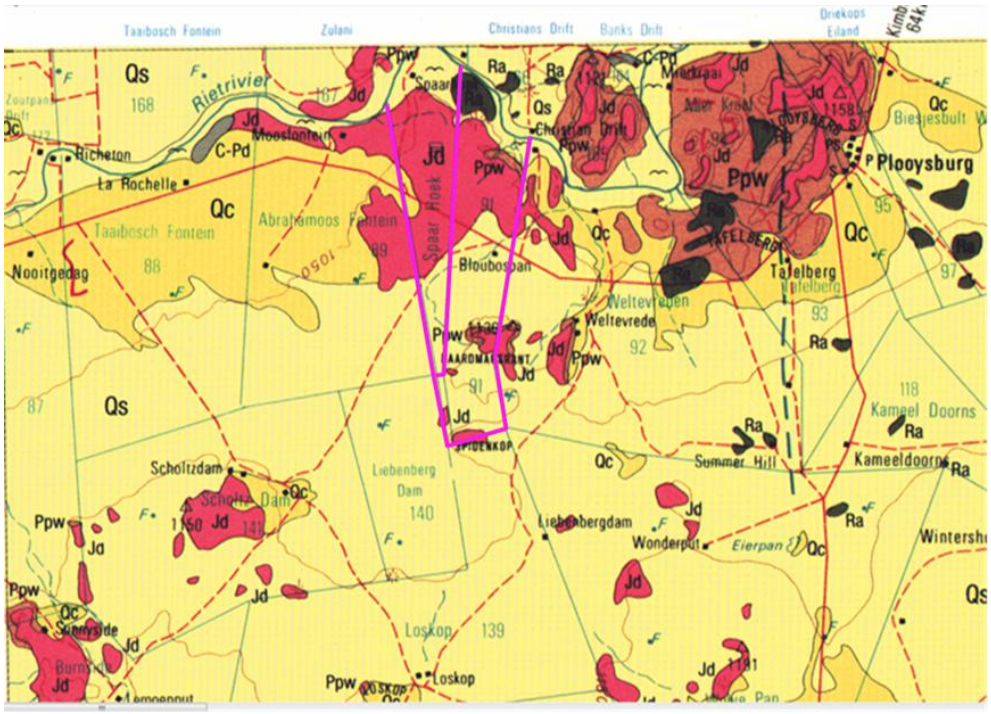

Figure 4: Geology map of the proposed Maxwill Diamond Mining Project

8.1.2 Climate

The climatic condition of the study area is considered to be a local steppe climate. The average maximum temperatures for the region range from 16.7°C in August to 32°C in January while the average minimum temperatures range from 0°C in June to 18°C in August.

The area lies within a summer/autumn rainfall area, with predominantly dry winters. The average rainfall of the quaternary catchment is 331 mm (Middleton and Bailey, 2012). The region receives the lowest rainfall in June and July, and the highest in February and March.

Evaporation data was sourced for WR2012 which provided monthly Class S-Pan for the period 1934 - 2001. This station is located north of the site as illustrated in Table 5 provides a summary of the monthly evaporation distribution (Class S-Pan) at this station.

Table 5: Monthly Evaporation distribution (Class S Pan)

Month	Evaporation (mm)
Jan	327.60
Feb	272.80
Mar	255.10
Apr	185.60
May	124.80
Jun	92.00
Jul	92.20
Aug	129.10
Sep	177.50
Oct	240.30
Nov	280.80
Dec	319.90
Total	2497.70

8.1.2.1 Rainfall

Rainfall data for the study area was obtained from the SAWS rainfall station Plooysburg SAPS 0257391A with a 62 year record from 1929 to 1990. This station was the closest station to the proposed study area. The station had a Mean Annual

Pre65cipitation (MAP) of 357 mm. Table 6 provides a summary of the monthly rainfall distribution at this station.

Table 6: Monthly Rainfall Distribution

Month	**Rainfall (mm)**
Jan	43.2
Feb	62.8
Mar	63.4
Apr	40.3
May	13.3
Jun	5.5
Jul	4.9
Aug	8.5
Sep	8.6
Oct	26.9
Nov	40.6
Dec	39.2
Total	**357.2**

8.1.3. Topography ad Drainage

The project area is situated on the Lower Vaal Water Management Area (WMA) on C51M quaternary catchment. The quaternary catchment has an area of 1521 km² of which the study area only covers 45 km². The hydrology of the region is mainly defined by the presence of the Vaal River of which all the rivers flow to. The study area is along the Riet River which flows westward to the Vaal River in Douglas Town. Its main tributary is the Modder River. Riet River used to be called the Gmaap River in colonial times. This name reflected the muddy state of the river with high turbidity water. Riet River has a storage weir with a gauging station C5H016 few meters upstream of the mining right area, stream-flow data from this gauging station was used for flood peak determination.

The presence of non-perennial rivers along the study area was identified. These rivers contribute to Riet River only during the wet season. The catchment is characterised generally by a flat topography with the lowest point along Riet and Vaal River. As of the study site, the topography is characterised by a gentle slope from the Riet River, with the Riet River as the lowest point of 1009.13 m above sea level. The study area is characterised by a flat topography which increases the slope as you move north of the mining area to a mountainous area of 1120 m above the sea level. Topography and elevation for the study area are shown in Figure 5.

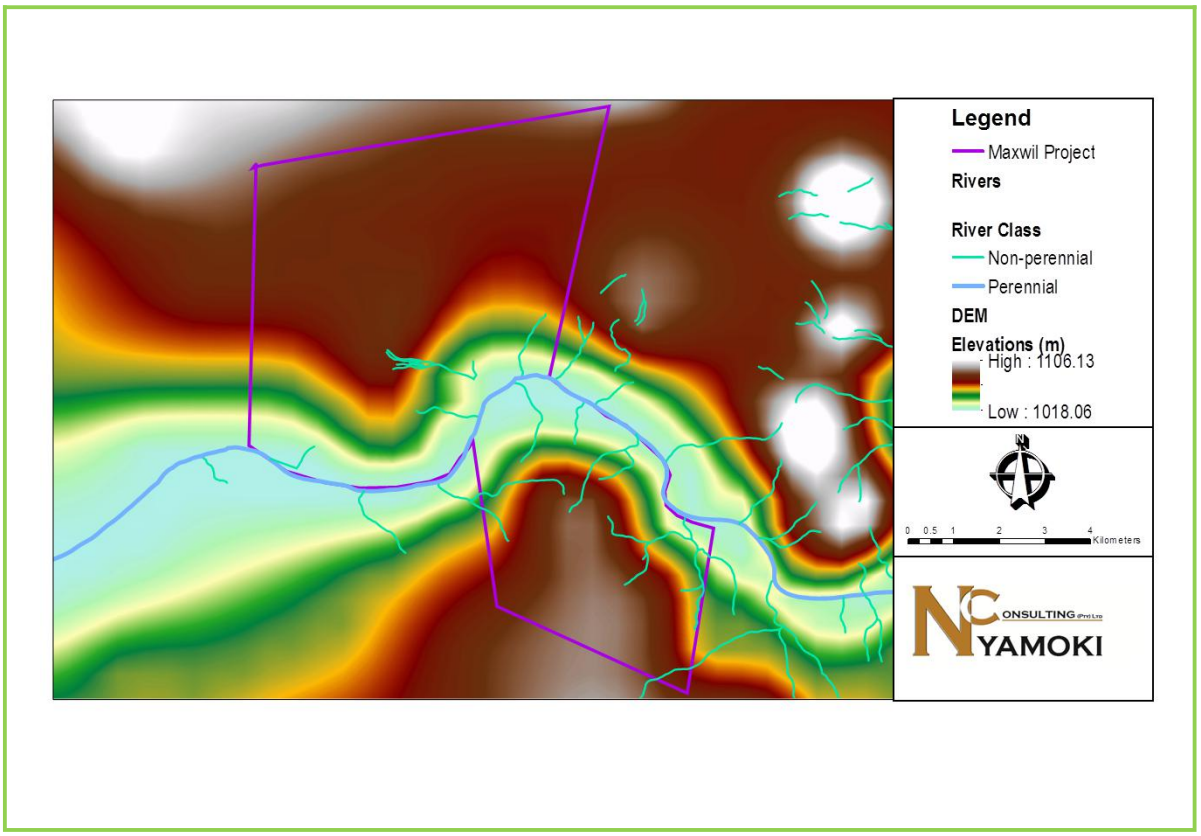

Figure 5: Elevation

8.1.4 Vegetation Cover

According to Mucina & Rutherford (2006), the entire bigger area of the mining right is located within *Kimberley Thornveld* (SVk 4). Kimberley Thornveld (SVk 4) vegetation unit which is covering the majority of the site. This vegetation unit is distributed in the North-West, Free State, and Northern Cape Provinces: Most of the Kimberley, Hartswater, Bloemhof and Hoopstad Districts as well as substantial parts of the Warrenton, Christiana, Taung, Boshof and to some extent the Barkly West Districts. Also includes pediment areas in the Herbert and Jacobsdal Districts. Altitude on this vegetation normally ranges from 1 050 to 1 400 m.

It occurs on the plains often slightly irregular with well-developed tree layerwith *Acacia erioloba*, *A. tortilis*, *A. karoo,* and *Boscia albitrunca* and well-developed shrub layer with occasional dense stands of *Tarchonanthus camphoratus* and *A. mellifera*. Grass layer open with much uncovered soil.

The Kimberley Thornveld is regarded as Least threatened with a conversation target of 16%. Only 2% statutorily conserved in Vaalbos National Park as well as in Sandveld, Bloemhof Dam and S.A. Lombard Nature Reserves. Some 18% already transformed, mostly by cultivation. Erosion is very low. The area is mostly used for cattle farming or game ranching. Overgrazing leads to encroachment of *Acacia mellifera* subsp. *detinens*.

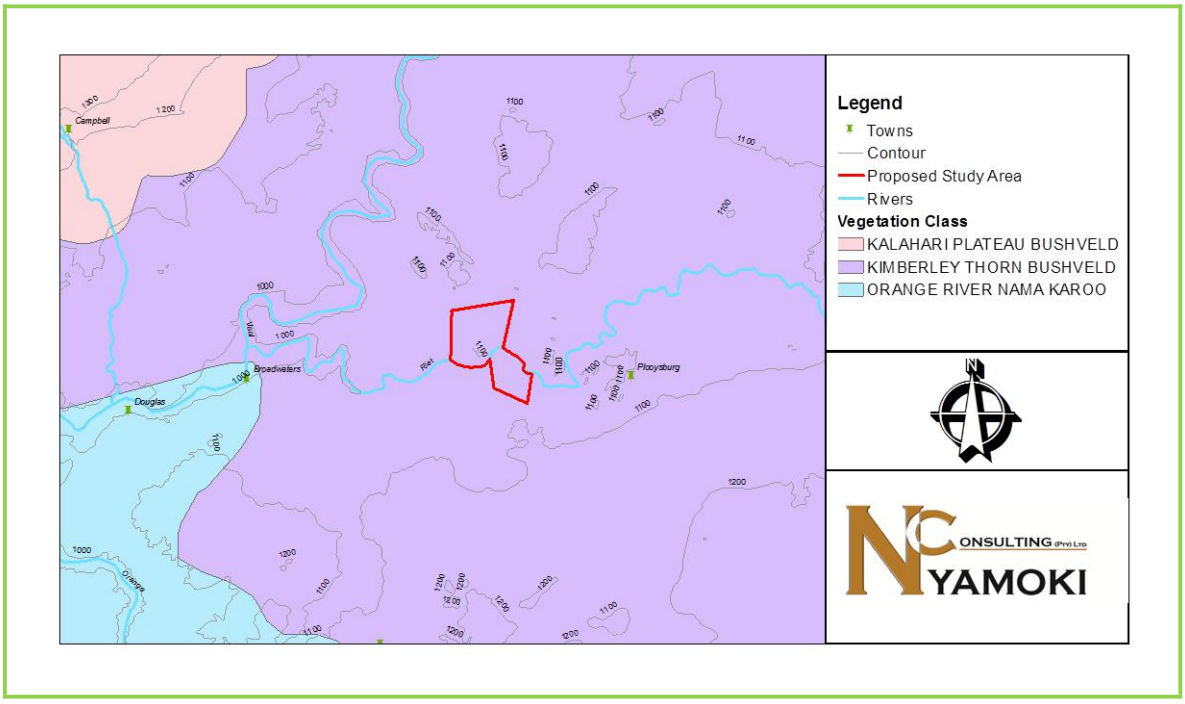

Figure 6: Site broad vegetation map

8.1.4.1 Riverine vegetation

The vegetation forms dense woodland dominated by Vachellia karoo, but other dominant species include *Ziziphus mucronata, Diospyros lycioides, Melianthus comosus, and Searsia provides, Phaeoptilum spinosum, Senegalia mellifera, Searsia burchellii, and S. lancea*. Other species found here include *Asparagus suaveolens, Lycium hirsutum, L. arenicola, Cyperaceae spp.Phragmites australis* as well as grass species including *Andropogon eucomus, Eragrostis plana, Urochloa mosambicens, Panicum coloratum, Sporobolus africanus,* Cyperus *rupestris, Andropogon appendiculatus* and *Setaria incrassata* were all recorded in seasonal and temporary saturation zones.

Figure 7: Vegetation along the river that cuts the site in two

Woodland area on the banks of the river

8.1.4.2 Senegalia mellifera shrubland

The shrub *Senegalia mellifera* is the most conspicuous woody species. Other more sparsely distributed tall shrubs include *Phaeoptilum spinosum, Rhigozum obovatum, Searsia burchellii,* and *Ziziphus mucronata, Vachellia karoo*. Common lower shrubs include *Rhigozum trichotomum, Asparagus burchellii, Kleinia longiflora, Pegolettia retrofracta, Pteronia glauca, Monechma spartioides, Pentzia incana, P. globosa, Aptosimum spinescens, A. albomarginatum, Aizoon asbestinum, Barleria rigida, and Eriocephalus sp.*

The grass layer is well developed with rather a high species richness and includes the dominant *Enneapogon scaber*, as well as other grasses such as *Cenchrus ciliaris, Eragrostis annulata, Enneapogon desvauxii, E. scoparius, Heteropogon contortus, Stipagrostis obtusa, S. ciliata var.capensis and Eragrostis lehmanniana*.

Figure 8: Indication of the shrubland dominated Acaci

Figure 9: Dry grassland section on site

8.1.4.3 Alien invasive plants

Declared weeds and invaders have the tendency to dominate or replace the herbaceous layer of natural ecosystems, thereby transforming the structure, composition, and function of natural ecosystems. Therefore, it is important that all these transformers be eradicated and controlled by means of eradication and monitoring program. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species (Henderson, 2001).

According to the published Alien and Invasive Species regulations in terms of section 97(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) four categories of problem plants are identified as:

- **Category 1a** plants are high-priority emerging species requiring compulsory control. All breeding, growing, moving and selling are banned.

- **Category 1b** plants are widespread invasive species controlled by a management program.
- **Category 2** plants are invasive species controlled by area. Can be grown under permit conditions in demarcated areas. All breeding, growing, moving, and selling is banned without a permit.
- **Category 3** plants are ornamental and other species that are permitted on a property but may no longer be planted or sold.

Table 7 lists the alien species as well as the various NEMBA categories for the alien species that are likely to habit the study. Their presence will have to be confirmed by a site walk through (site survey).

Table 7: Alien species recorded in the study area.

Scientific name	Common name	Category
Salix babylonica	Weeping willow	2
Xanthium strumarium	Large cocklebur	1
Prosopis glandulosa	Honey mesquite	3
Datura stramonium	Downy thorn apple	1

8.1.5 Biodiversity

8.1.5.1 Description of the CBAs

Critical Biodiversity Areas (CBA's) are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services (SANBI, 2007). These form the key output of a systematic conservation assessment and are the biodiversity sectors inputs into multi-sectoral planning and decision making tools.

The primary purpose of CBA's is to inform land-use planning and the land-use guidelines attached to CBA's aim to promote sustainable development by avoiding loss or degradation

of important natural habitat and landscapes in these areas and the landscape as a whole. CBA's can also be used to inform protected area expansion and development plans. The use of CBA's here follows the definition laid out in the guideline for publishing bioregional plans (Anon, 2008):

- "**Critical biodiversity areas** (CBAs) are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses".
- "**Ecological support areas** (ESA's) are areas that are not essential for meeting biodiversity representation targets/thresholds but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree of restriction on land use and resource use in these areas may be lower than that recommended for critical biodiversity areas."

The guideline for bioregional plans defines three basic CBA categories based on three high-level land management objectives is presented in Table 8 and shown in Figure 8.

Table 8: A framework for linking spatial planning categories (CBAs) to land-use planning and decision-making guidelines based on a set of high-level land biodiversity management objectives.

CBA category	Land Management Objective
PA & CBA 1	**Natural landscapes**: ● Ecosystems and species fully intact and undisturbed ● These are areas with high irreplaceability or low flexibility in terms of meeting biodiversity pattern targets. If the biodiversity features targeted in these areas are lost, then targets will not be met. ● These are landscapes that are at or past their limits of acceptable change.

CBA 2	**Near-natural landscapes**: ● Ecosystems and species are largely intact and undisturbed. ● Areas with intermediate irreplaceability or some flexibility in terms of the area required to meet biodiversity targets. There are options for loss of some components of biodiversity in these landscapes without compromising our ability to achieve targets. ● These are landscapes that are approaching but have not passed their limits of acceptable change.
Ecological Support Areas (ESA)	**Functional landscapes**: ● Ecosystems moderately to significantly disturbed but still able to maintain basic functionality. ● Individual species or other biodiversity indicators may be severely disturbed or reduced. ● These are areas with low irreplaceability with respect to biodiversity pattern targets only.
Other Natural Areas (ONA) and Transformed	**Production landscapes**: manage land to optimize sustainable utilization of natural resources.

According to the Northern Cape Conservation plan, about 80% of the site is located within under Critical biodiversity 2 with the area long the Vaal River regarded as Critical Biodiversity Area 1. Mining should be avoided on the area regarded as CBA 1.

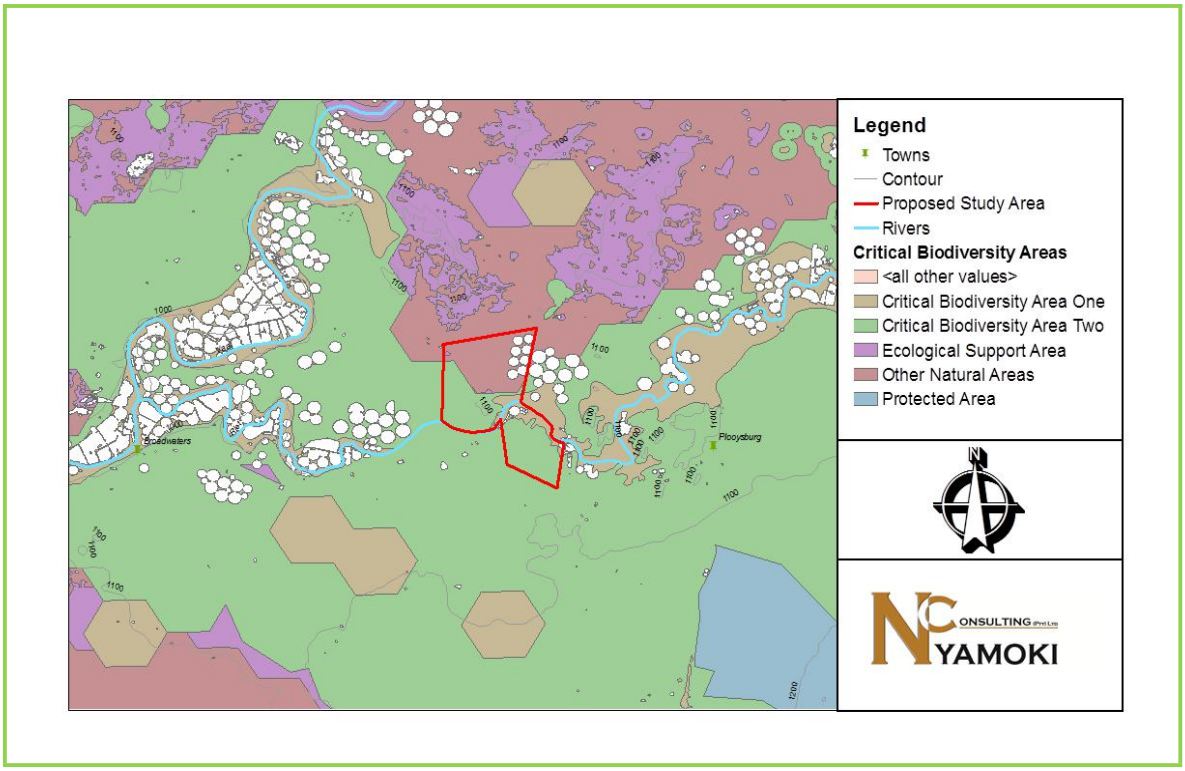

Figure 8: CBA map of the site

8.1.5.2 Mammals

This faunal survey focused mainly on mammals, and birds of the study area (Table 9). The survey focused on the current status of threatened animal species occurring, or likely to occur within the study area, describing the available and sensitive habitats. Faunal data was supplemented by previous surveys conducted in similar habitats, literature investigations, and historic data. Different habitats were explored to identify any sensitive or endangered species. Mammal names are as used by Stuart & Stuart (1998) & Skinner & Chimimba (2005), and

Table 9: Faunal species recorded during the site visit.

Scientific name	Common name
Galerella pulverulenta	Small gray mongoose
Sylvicapra grimmia	Common Duiker
Tragelaphus strepsiceros	Kudu

8.1.5.3 Avi-fauna

Birds can be viewed as good ecological indicators since their presence or absence tends to represent conditions pertaining to the proper functioning of the ecosystem. Bird communities and ecological condition are linked to land cover, as the land cover changes so do the types of birds in the area. The project area has the propensity to harbour Red Data Bird Species however none were observed during the field surveys.

The desktop assessment showed that about 166 bird species have been confirmed within the QDGCs. The area considered during the desktop study is thus much larger than the area likely to be affected by the project. This approach is adopted to ensure that all species potentially occurring at the site, whether resident, nomadic, or migratory, are identified. Many avifaunal species are adaptable as they are habitat generalists and can, therefore, accommodate a certain degree of habitat degradation and transformation (Harrison *etal.*, 1997). Other species are extremely habitat specific and have to rely on certain habitat units for breeding, hunting or foraging and roosting. It is the survival of these species that become threatened as they cannot adapt to changes to the habitat. Habitat-specific species are sensitive to environmental change, with the destruction of habitat being the leading cause of species decline worldwide (Barnes, 2000).

It is widely accepted that vegetation structure, rather than the actual plant species, influences bird species' distribution and abundance (Harrison *etal.*, 1997). Therefore, the vegetation description used in the Bird Atlas does not focus on lists of plant species, but rather on factors which are relevant to bird distribution.

8.1.6 Water resources

The local hydrogeology within the study area is underlain by lithological units that are classified as intergranular and fractured. Ground water occurrence is that of fractured 0.1 to 0.5ls. Most of the communities in the area rely on groundwater. The main purpose is to describe the impact on catchment hydrology which may likely be caused by the proposed Maxwill Alluvial Diamond Open Cast Mining

8.1.6.1 Flood Modelling

The aim of the flood modelling undertaken as part of this study was to fulfil the requirements of the National Water Act (Act 36 of 1998) and more particularly, Government Notice 704 (Government Gazette 20118 of June 1999) (hereafter referred to as GN 704). The final mining plan will need to consider the specific provisions of GN704. The principle condition of GN 704 applicable to this project with regards to flooding is summarised as follows:

Condition 4 which define the area in which mine workings or associated structures may be located with reference to a watercourse and associated flooding. The 50 year flood-line and 100 year flood line are used for defining suitable locations for mine workings (mining, underground mining or excavations) and associated structures respectively. Where the flood line is less than 100 metres away from the watercourse, then a minimum watercourse buffer distance of 100 metres is required for both mine workings and associated structures.

In order to satisfy the Gazette notice referred to above, it was necessary to determine the peak flows for the design floods with a return period of 1:50 and 1:100. The flood line was then delineated in order to arrive at a determination if the mining location meets the Gazette conditions of being located more than the 1:100 m flood line and 100 metres away from the watercourse. The flood modelling to determine the flood peaks involved the pre-processing and conditioning of the Digital Elevation Model (DEM) which was produced from 5 m contour lines which were modelled from Google Earth Elevation Points. The DEM was also useful for the extraction of River cross sections.

8.1.6.2 Design Flood Peak

The study location is located in quaternary Catchment C51M downstream of a weir gauging structure/station C5H016 (Figure 10). The station has observed stream-flow data from 1953 to 1999. Based on the availability of data and location of the gauging weir C5H016 relative to the study location, it was therefore decided that determination of flood designs will be done using flood frequency analysis or probabilistic method. This was achieved by plotting a probability flow of observed flood data of station C1H016 for the period of record. The result of the probability flow is indicated in Figure 11 and also tabulated in Table 10. Probabilistic method is based on the theory that the maximum flood is normally associated with a very low probability – most often P = 0.0001(recurrence interval of 10 000 year).

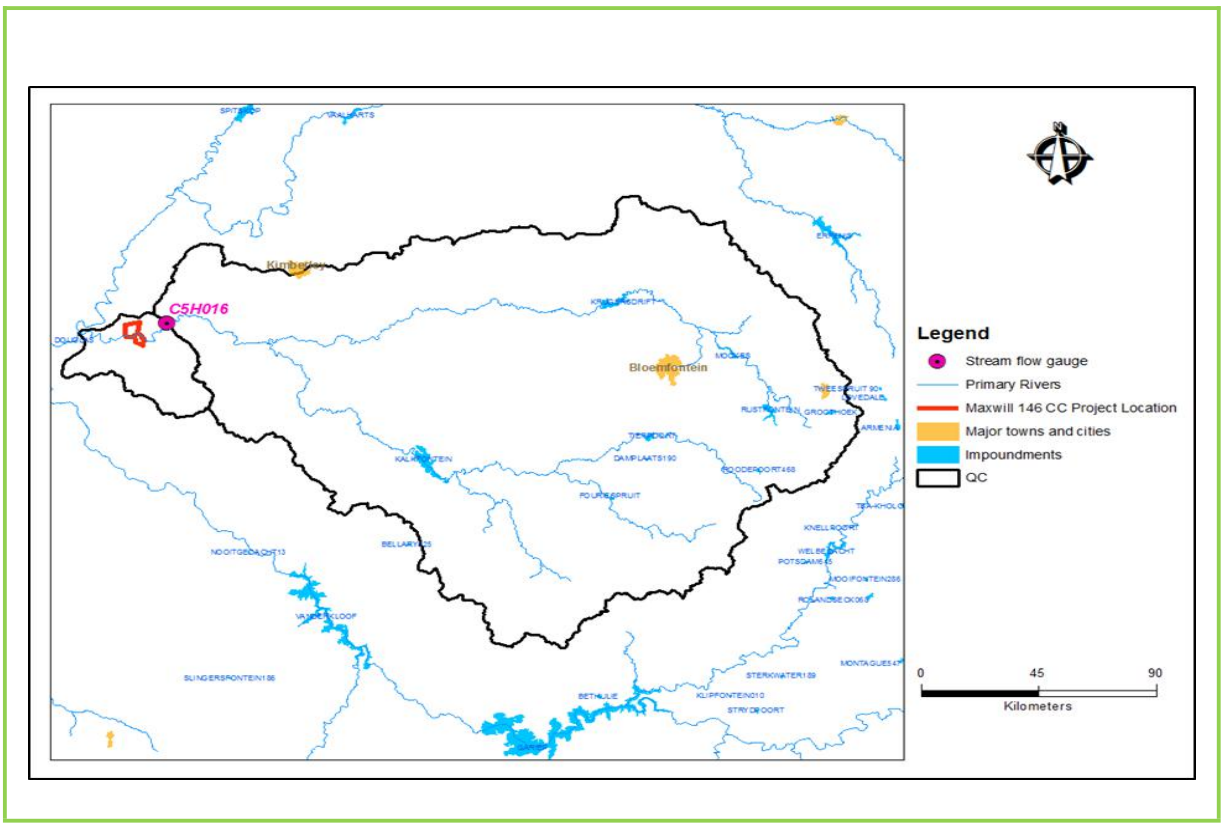

Figure 10: Catchment Area (C5H016)

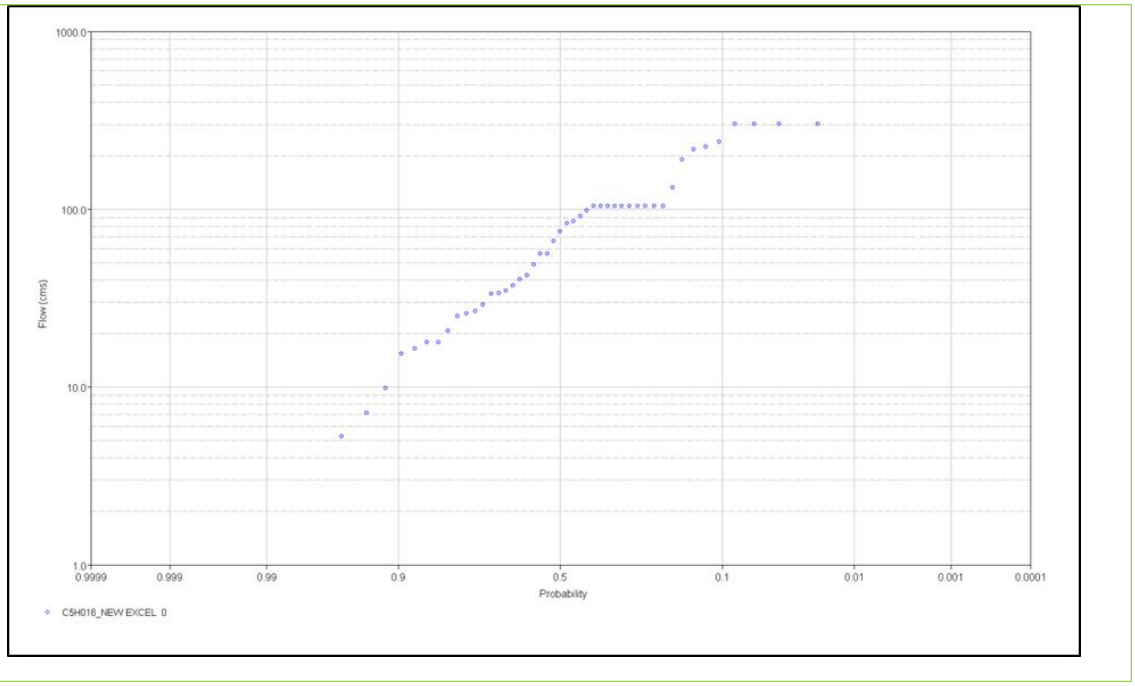

Figure 11**:** Flood data Probability Plot

Table 10: Flood Peak

Recurrence Interval (RI)	**Flood Peak (m^3/s)**
1:50	300
1:100	400

The commonly used “return period,” or Recurrence Interval (RI), requires further explanation. In hydrological terms, the more accurate term is Probability of Exceedance (PE). The PE denotes the statistical probability of a certain flood magnitude being exceeded. By contrast, the RI suggests a flood that recurs with certain regularity. Table 11 shows the correlation between these terms. As can be seen, the 1 year RI flood has a PE of 100%, which means that there is a 100% probability in any given year that a flood with that magnitude will occur. Similarly, there is only a 1% probability that the 100 year RI flood will be exceeded in any given year.

This distinction is important when assessing the impact of storm flows. By way of an extreme example, a 100% PE storm event would be less threatening than a 1% PE

storm event. These storm events are vastly different and have vastly disparate outcomes. In the case of the 100% PE storm, the flood peak and volume is beneficial to the ecosystem, while typically the 1% PE storm is potentially threatening to downstream infrastructure and communities. Clearly, in terms of impact, a reduction in small PE storms (i.e. large RI) would be seen as a positive impact as there will be less impact on downstream infrastructure, whilst a reduction in large PE storms would have negative consequences. It should, however, be stated that downstream of the proposed development there are no communities or significant infrastructure.

Table 11: Comparison between Recurrence Interval and Exceedance Probability

Recurrence Interval (RI)	**Probability of Exceedance (PE)**
2	50%
5	20%
10	10%
20	5%
50	2%
100	1%
200	0.5%

8.1.6.3 Mean annual rainfall (MAR)

The MAR of catchment C51M has been fluctuating over time. This was captured in the Water Resource (WR) studies from 1990 to 2012 using data from 1920 to 2012. The fluctuation was recorded as follows: 1 Mm^3 in WR90, 2.43 Mm^3 in WR2005 and 2.32 Mm^3 in WR2012. This project may have minimal impact on the MAR of the total catchment as the mining activity will use a small portion of the catchment.For this project, WR2012 quaternary runoff data (Middleton and Bailey, 2012) was downscaled in order to obtain representative site runoff. The Mean Annual Runoff (MAR) was calculated using the method. This was calculated using the simple

equation; Site runoff = (site area *quaternary catchment runoff) / quaternary catchment area.

As the figures are small, the area will not have a large potential stream flow reduction impact on the runoff of the immediate and general areas. This means that the runoff of the Quaternary Catchment into which the proposed development sites falls will not be significantly decreased by the proposed development as the decrease is estimated at 3%.

8.1.6.4 Flood Line Delineation

Flood lines for the delineated catchments were analysed to evaluate risks associated with the potential flooding of infrastructure and to facilitate the protection of natural resources. For this study, flood lines were determined using the HEC-RAS model to indicate areas within the site where infrastructure associated with the proposed mining activities should not be built.HEC-RAS is a hydraulic program designed to perform one-dimensional hydraulic calculations for a range of applications, from a single watercourse to a full network of natural or constructed channels. The software is used worldwide and has consequently been thoroughly tested through numerous case studies. The flood lines were determined 1:50 and 1:100 flood peaks. Results of the flood delineation using HEC-RAS are given in Figure 12.

A condition of the site not being less than 100 m of the watercourse was tested by putting a 100 m buffer around the delineated rivers in Esri's ArcMap, and results are shown in Figure 13.

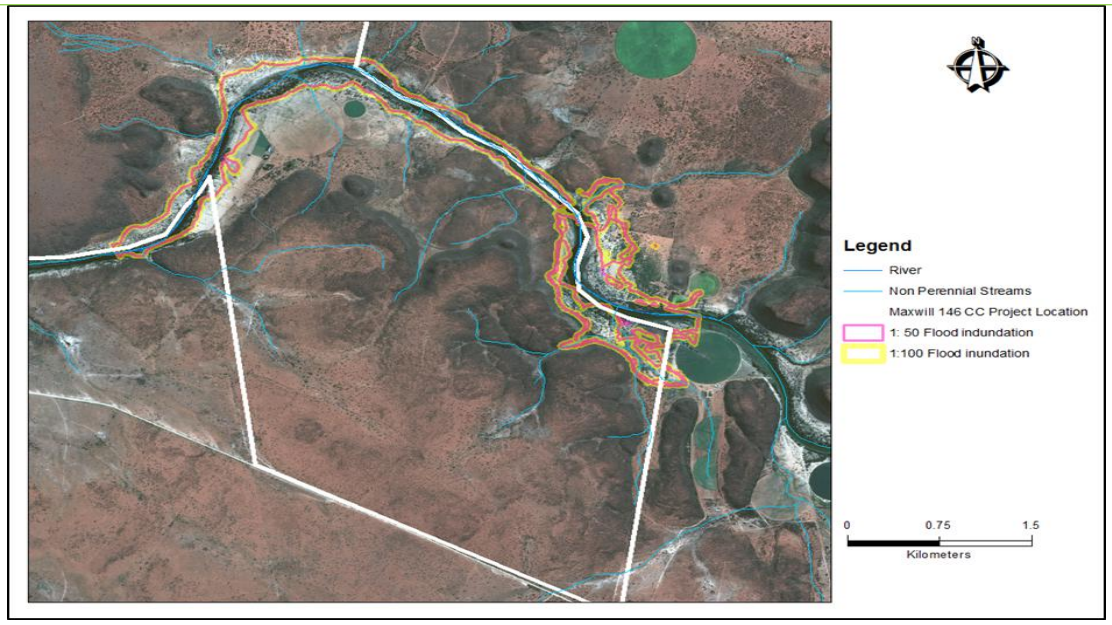

Figure 12: 1:50 and 1:100 Flood line

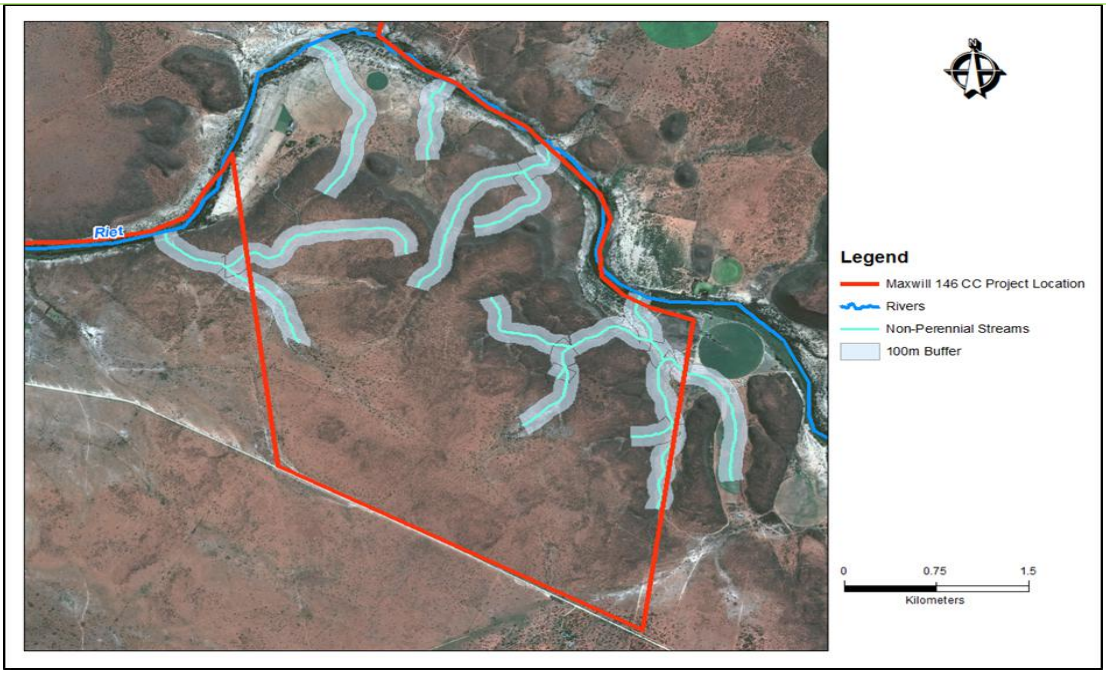

Figure 13: 100m buffer

8.1.6.5 Interpretation of result

The 1:50 and 1:100 year flood lines analysed for the Riet River and the 100m buffer for non-perennial rivers in the catchment's study area were deemed reasonably accurate. Alluvial mining even requires mining along the banks of the river, so the flood lines should mainly be considered when constructing slime dam and settling ponds, and also dumping of stockpiles in order to comply with DWS regulations.

8.1.6.6 Water Quality Monitoring

Water quality evaluations were performed for three sampling points as indicated in Figure 14. This sampling was done on the 17th of June 2019 and serves as a baseline description of the quality of surface water on site.The points were marked as sampling site 1, 2 and borehole 1 in relation to their proximity to the proposed mining site.

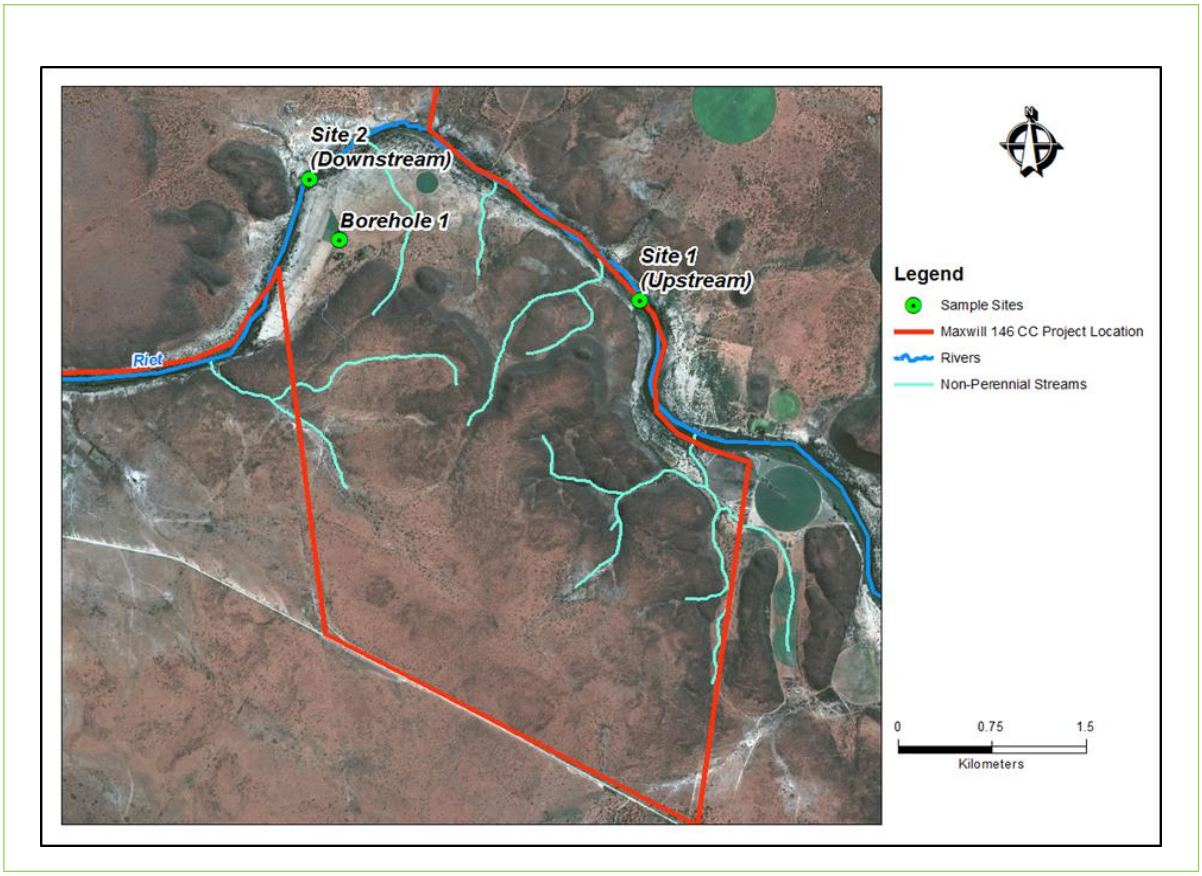

Figure 14: Sampling Points

The water samples were collected during the field survey on two locations along the Riet River, one was for the upstream and another one downstream of the site as indicated in Figure 14. Only one borehole water sample was collected for drinking water standards. All the samples were taken to the Siza Coal Laboratory within a period of 24 hours stored in the cooler box. Water quality sampling was conducted to establish the hydro-chemical baseline of the water prior to the commencement of the mining activity. This serves to quantify the relative impact of mining on water resources.This was done to comply with the water quality standards to preserve the bacteria in the water and preventing the precipitations of the cations.

The microbial quality of the Drinking Water was compared with the requirements of SANS 241-1:2015: “Drinking Water” and Regulation 22.9 (2) (c) of the Mine Health and Safety Act 29 of 1996 (MHSA) for potable water.

- The results for the Total Microbial Activity for the Borehole Water yielded bacterial growth and did not comply with the general limit set by SANS 241-1:2015: “Drinking Water”.
- The Total Microbial Activity is used to assess the general microbial quality of the water. A high Heterotrophic Plate Count indicates that water could possibly contain pathogenic micro-organisms that pose a health risk.
- The Electrical Conductivity of sample PT01, PT02, and BH01 collected at the Drinking Water exceeded the recommended level of Domestic standard of 70 mS/m but is still within the maximum limit of 300 mS/m as set by Regulation 22.9 (2)(c) of the Mine Health and Safety Act as well as the SANS 241-1:2015 “Drinking Water” standard.
- Concentrations of TDS, Magnesium (both BH01 and PT02), Chlorine (BH01), and Sulphate (BH01, PT01, and PT02) collected at the Drinking Water exceeded the recommended level but is still within the maximum limit as set by Regulation 22.9 (2)(c) of the Mine Health and Safety Act a “Drinking Water” standard.
- Concentrations of Arsenic and Cadmium for BH01, PT01, and PT02 have acceded the SANS 241-1:2015 “Drinking Water” standard.

- Electrical conductivity is relevant to the concentration of total dissolved solids in the water and indicates the ability of water to conduct electricity. Ingestion of water with electrical conductivity exceeding the maximum allowed limit may cause disturbance of the salt and water balance in infants, heart patients, renal disease patients and individuals with high blood pressure.

8.1.6.7 Conceptual Stormwater Management Plan

The aim of this Stormwater Management Plan (SWMP) is to fulfil the requirements presented in Government Notice 704 (Government Gazette 20118 of June 1999) which deals with the separation of clean and dirty water. The conceptual stormwater management plan will form a necessary part of the Integrated Water Use License Application (IWULA), to be submitted to the Department of Water and Sanitation (DWS). This stormwater management plan also complies with the principles presented in the DWS Best Practice Guideline G1 for Stormwater Management.

8.1.7 Hydrogeology

8.1.7.2 Local geohydrology

The project area hydrogeology can be classified as intergranular and fractured with aquifer yield estimated about 0.5 to 2.0l/s as indicated on Figure 15. The hydrogeological potential of the intergranular is confined to the compact Dwyka Group. The diamictite and sub-ordinate shale of the Dwyka Group (C-Pd) is dense and massive; unfortunately, its groundwater potential is low. Yields of up to 0.5 l/s can however be obtained from occasional joints and fractures. However, the groundwater quality tends to be rather poor.

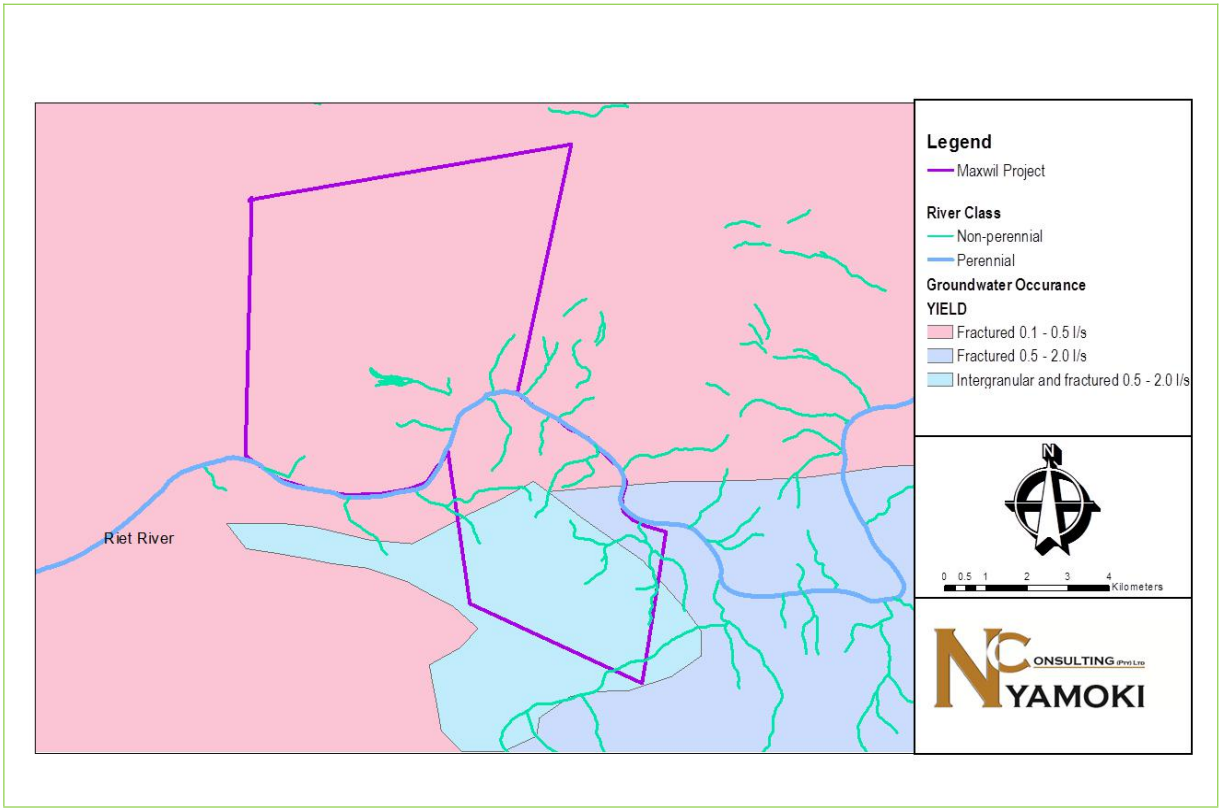

Figure 15: Aquifer Potential

8.1.7.3 Hydro-census and Land Use

Hydro-census was conducted within a limited distance of 1 km radius of the study area to establish groundwater use information such as the registered and unregistered boreholes, borehole depth to water level, groundwater abstraction, springs etc.

The study area comprises of a mountain and also a low topography towards the Riet River. The non-perennial rivers flow from the high topographical elevated mountainous area towards the Riet River. A total of four water courses were identified within the study area. These rivers may potentially serve as groundwater pollution conduits from point source pollutants and therefore needs to be protected.

There were two boreholes located in the area, however, these boreholes were not recorded on DWS WARMS database; however 2 boreholes were identified at the

study area. The first borehole was located at 29º01´20.0˝Latitude and 24º06´45.0˝longitudes, while the second borehole was at 29º0´29˝ latitude and 24º6´9.74˝longitudes.

The first borehole was not in use, with the infrastructure around indicating that the borehole may have been abandoned while the second borehole was within the yard of the household and was equipped for use. Depth of these two boreholes could not be determined as they were cased and equipped. The yield of borehole 2 was not determined as pump testing was not conducted.

Land use activities around the proposed project area vary from mining, irrigated agriculture and also livestock farming. However, livestock farming and irrigated agriculture were practiced at a small scale within the 4499.8323ha of the proposed mining right area. Irrigated agriculture used water from the Riet River through a pipe as shown in Figure 16. Groundwater usage was very limited within the study area and the surrounding properties.

Figure 16: Surface water abstraction point

8.1.7.4 Water Quality

The water samples were collected during the field survey on two locations along the Riet River, one was for the upstream and another one downstream of the site. Only one borehole water sample was collected for drinking water standards. All the samples were taken to the Siza Coal Laboratory within a period of 24 hours stored in the cooler box.Water quality sampling was conducted to establish the hydro-chemical baseline of the water prior to the commencement of the mining activity. This serves quantify the relative impact of mining on the water resources.This was done to comply with the water quality standards to preserve the bacteria in the water and preventing the precipitations of the cations.

The sample analysis results are presented in Table 12 and they were analysed to ascertain if they meet the Department of Water and Sanitation (Domestic Standards), Mine Health& Safety Act 29 of 1996 and SANS 241:2015 standard. The microbial quality of the **Drinking Water** was compared with the requirements of SANS 241-1:2015: “Drinking Water” and Regulation 22.9 (2) (c) of the Mine Health and Safety Act 29 of 1996 (MHSA) for potable water.

- The results for the **Total Microbial Activity** for the Borehole Water yielded bacterial growth and did not comply with the general limit set by SANS 241-1:2015: “Drinking Water”.
- The Total Microbial Activity is used to assess the general microbial quality of the water. A high Heterotrophic Plate Count indicates that water could possibly contain pathogenic micro-organisms that pose a health risk.
- The Electrical Conductivity of sample PT01, PT02, and BH01 collected at the Drinking Water exceeded the recommended level of Domestic standard of 70 mS/m but is still within the maximum limit of 300 mS/m as set by Regulation 22.9 (2)(c) of the Mine Health and Safety Act as well as the SANS 241-1:2015 “Drinking Water” standard.
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Sulphate (BH01, PT01, and PT02) collected at the Drinking Water exceeded the recommended level but is still within the maximum limit as set by Regulation 22.9 (2)(c) of the Mine Health and Safety Act a “Drinking Water” standard.

- Concentrations of Arsenic and Cadmium for BH01, PT01, and PT02 have acceded the SANS 241-1:2015 “Drinking Water” standard.

Electrical conductivity is relevant to the concentration of total dissolved solids in the water and indicates the ability of water to conduct electricity. Ingestion of water with electrical conductivity exceeding the maximum allowed limit may cause disturbance of the salt and water balance in infants, heart patients, renal disease patients and individuals with high blood pressure.

Table 12: Surface water and groundwater water quality results

LAB NO:		WC-19/184	WC-19/185	WC-19/186	Drinking Water Standard	Mine Health& Safety Act 29 of 1996	Domestic
Sample description	Unit	BH01	PT01	PT02	SANS 241:2015	MHSA	DWS
MICROBIOLOGICAL ANALYSIS							
Total Coliform	MPN/100ml	<1.00	1411	1120			
Faecal coliforms	MPN/100ml	<1.00	548	10			
PHYSICAL ANALYSIS							
PH	PH Unit	7.58	7.67	7.66	5.0-9.7	5.5-9.5	>4.0
Electrical Conductivity	m.S/m	85.20	56.15	56.05	170	Max: 300 m/s	0 -70
Total Dissolved Solids	mg/L	603	446	422	1 200	0 -100	0 -450
Turbidity	NTU	0.35	0.49	12.10	1 (operational) 5 (aesthetic)	Max 5 NTU	0 -1
***Total Alkalinity**	mg/L	2040	1643	1607			
***Chloride**	mg/L	25.74	12.77	12.87	300	0 -20	0 -100
CHEMICAL ANALYSIS							
Sulphate	mg/L	148	92	92	500 (health) 250 (aesthetic)	0 -30	0 -200
***Free chlorine**	mg/L	11	10	10			
***Nitrate**	mg/L	0.21	0.17	0.16	11	10	0 -6
***Fluoride**	mg/L	0.78	0.63	0.61	1.5	1.5	0 -1.0

***Calcium**	mg/L	31.75	27.65	43.30		150	0 -32
Potassium	mg/L	1.32	1.39	1.45		50	0 -50
***Sodium**	mg/L	6.62	6.68	5.68	200	400	0 -100
***Magnesium**	mg/L	76.92	29.00	108.20		100	0-30
***Manganese**	mg/L	0.013	0.014	0.012	0.4 (health) 0.1 (aesthetics)	1000	0 -0.05
***Iron**	mg/L	<0.10	<0.10	<0.10	2 (health) 0.3 (aesthetics)	1000	0 -0.1
#Zinc	mg/L	<0.019	<0.019	<0.019	5	5.0	0 -3
#Arsenic	mg/L	<6.3	<6.3	<6.3	0.01		0 - 10
#Copper	mg/L	<0.40	<0.40	<0.40	2	1000	0 -1
#Cadmium	mg/L	1.08	1.13	1.11	0.003	100	0 -5

8.1.7.5 Groundwater Resource Availability

The study area is in quaternary catchment C51M which is located in the Dry Harts Lower Vaal lowland Region as indicated in Figure 17. An Aquifer Firm Yield Model (AFYM) was set up to determine aquifer properties as no pump testing was conducted.

Aquifer Firm Yield Model is a model developed under the WRC (2012) project K5/1763/1/11 for the main Karoo basin to identify and quantify groundwater development options incorporating the concept of wellfield yields and aquifer firm yield. An aquifer firm yield is the maximum target draft, which can be imposed on the aquifer without drying the aquifer.

Aquifer Firm Yield model works better for the Karoo as it was developed and tested under for aquifer properties in the Karoo Basin. Catchments data has been updated from GRA1 and GRAII projects. The study area falls within the Karoo and therefore confidence level on the model result is high.

The model was set up and run for the quaternary catchment C51M to determine the firm yield of the aquifer. Water balance and groundwater level were analysed for the ambient, steady and transient state. The results were used to determine the study area's aquifer properties.

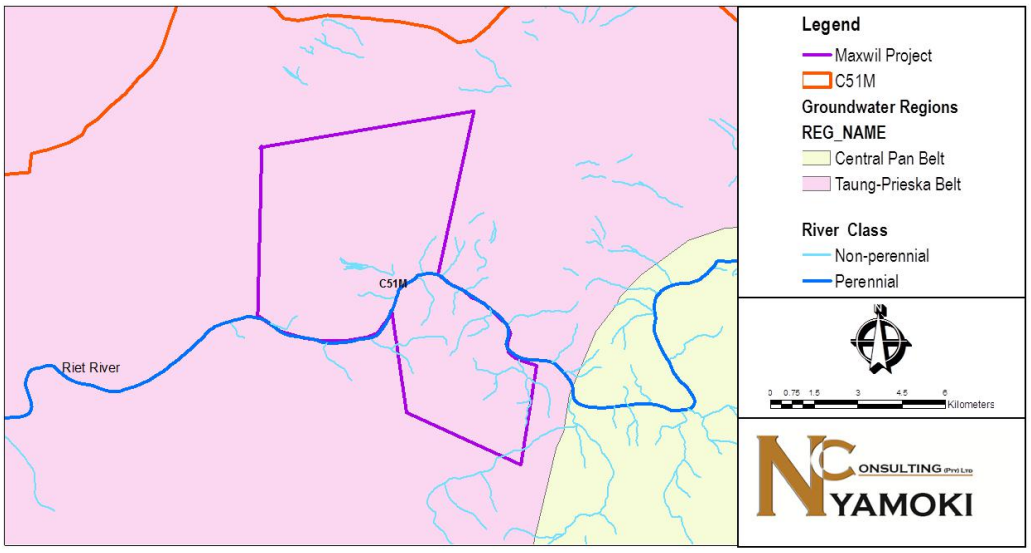


Figure 17: Groundwater regions

8.1.7.6 Aquifer Risk Assessment

Aquifer classification/strategic value

Aquifer Risk Assessment was conducted using the hydrocensus result and aquifer firm yield model result. These results were uploaded on to the Risk Assessment Spread sheet to determine the level of risk associated with the proposed activity. The results of such task are discussed below.

Aquifer classification was conducted in terms of the "***South African Aquifer System Management Classification, December 1995***" manual. The following definitions of aquifer management classification were used (Table 13):

Sole Aquifer:

An aquifer which is used to supplies 50% or more of domestic water for a given area, and for which there is no reasonably available alternative source should the aquifer be impacted upon or depleted. Aquifer yields and natural water quality are immaterial.

Major Aquifer System:

Highly permeable formations are usually with a known or probable presence of significant fracturing. They may be highly productive and able to support high abstractions for public supply and other purposes. Water quality is generally very good (less than 150 mSm Electrical Conductivity).

Minor Aquifer System:

These can be fractured or potentially fractured rocks which do not have high primary permeability or other formations of variable permeability. Aquifer extent may be limited and water quality variable. Although these aquifers seldom produce large quantities of water, they are important for local supplies and in supplying base flow for rivers.

Non-Aquifer System:

These are formations with negligible permeability that are regarded as not containing groundwater in exploitable quantities. Water quality may also be such it renders the aquifer unusable. However, groundwater flow through such rocks, although imperceptible, does take place, and needs to be considered when assessing the risks associated with persistent pollutants.

Special Aquifer System:

An aquifer designated as such by the Minister for Water Affairs (Water and Sanitation), after due process.

Table 13: Ratings for the Aquifer System Management and Second Variable Classifications

Aquifer System Management Classification		
Class	**Points**	**EIA Area**
Sole Source Aquifer System:	6	-
Major Aquifer System:	4	-
Minor Aquifer system:	2	2
Non-Aquifer System:	0	-
Special Aquifer System:	0 – 6	-
Second variable Classification **Weathering/ Fracturing**		
Class	**Points**	**EIA Area**
High:	3	-
Medium:	2	2
Low:	1	-
Note: The aquifer has one borehole used by 1 household for domestic purposes		

8.1.8 Hydropedology, Soil and Land capability

8.1.8.1 Land Cover

The study area is currently characterised silty sand to the loamy soil dark in colour indicating good capable for crop agricultural farming. The soil is darkish brown indicating fertility. The land cover within the study area indicates post mining activities within natural vegetation, cultivated land on the northern side close to the Vaal River and a small portion of the farm with degraded areas.

8.1.8.2 Agricultural potential

During the soil survey assessment, in the study area, the current agricultural activities include stock and game farming along with the local farmers.

8.1.8.3 Soil chemical conditions of the study area

During the field investigation, various soil samples were taken to determine baseline soil fertility. These samples were analysed for electrical conductivity (saturated extract), pH (KCl and H2O), phosphorus (Bray1), exchangeable cations (calcium, magnesium, potassium, sodium), cation exchange capacity (1M NH4-acetate at pH=7) and texture classes (relative fractions of sand, silt, and clay).

8.1.8.4. Interpretation of the results

The soil in the study area is characterised by the pH of 6.31, 6,42 and 7,05 for which was confirmed by the analytical results of soil samples taken during the survey. The overall analysis indicated that the soil within the study area has a pH of 6.31 (Neutral) to 7.05 (slightly alkaline). The condition of the pH is fairly good for types of crop farming for large and small-scale agricultural purposes (Table14).

The soil ranges from loamy sand to sand with medium to the high amount of Calcium (Ca) and Magnesium(Mg) mg/kg with the signature of low percentage averages. The soil type is fairly rich and fertile but however,Potassium (K) and Sodium (Na) was found slightly high due to the presence of agricultural

activities within the area. The electrical conductivity of all the soil samples was found minimal for all the sampling positions.

Soil texture is considered to be a permanent property of soils and as such, it is particularly important in determining soil behaviour. Many soil properties are dependent on the proportions of sand, silt and clay including inter alia nutrient and water holding ability, permeability, porosity, erodibility, and susceptibility to compaction (Table 14).

The exchangeable bases (Ca, Mg, K (potassium)) are major plant nutrients available in the soil which 'feed' the plants and stimulate growth. Soils should typically follow a trend of Ca>Mg>K>Na, samples for Maxwill 146 CC Opencast Alluvial Diamond Mine (topsoil and subsoil) do follow this trend. Most of the soils on the site exhibit high base saturation levels due to the dominant effect of the base rich soil parent materials. In conclusion, no serious soil chemical issues (such as salinity or sodicity) appear on site.

Table 14: pH conditions

Units	**Sample Identification**	**Sample ID**		
		1	B	3
mg/kg	pH (KCl)	7.05	6.31	6.42
	PBray1	3	18	11
	Na	17	18	22
	K	68	208	150
	Ca	1258	636	751
	Mg	144	274	299
Cmol H+/Kg Soil	Exchangeable acid	0	0	0
%	%Ca	81,5	52,6	56,2
	%Mg	15,3	37,2	36,6

	%K	2,3	8,8	5,7
	%Na	1	1,3	1,5
Calculation	Acid Saturation %	0	0	0
	Ca:Mg	5,3	1,4	1,5
	(Ca+Mg)/K	43	10,2	16,2
	Mg:K	6,8	4,2	6,4

Units	**Sample Identification**	**Sample ID**		
		1	B	3
Calculation (Ca+Mg+K+Na)	S-Value	7,7	6	6,7
Calculation	Na:K	0,4	0,1	0,3
Calculation (Ca+Mg+K+Na+H)	CEC	7,7	6	6,7
g/ml	Digtheid	1,449	1,298	1,308
mg/kg	S	29,27	16,13	18,25

Soil Texture			
Sample ID	**1**	**B**	**3**
Clay	6	8	10
Sand	85	76	73
Silt	9	16	17
Overall Class	Sandy	Loamy Sand	Loamy sand

8.1.8.5 Agricultural potential

Almost 34% hectares of the land is used for the grazing capacity for sheep, goat, and cattle farming purposes, and about 66% of the area is scattered with bush for game purposed. Cattle farming are a viable long-term land use of

certain parts of the site as long as the field quality is maintained by never exceeding the grazing capacity. Land use after decommissioning of the project should aim to re-establish the cattle farming potential of the land.

8.1.8.6 Land use and surrounding land use

The province is world renown for the quality of meat Karoo lamb, ostrich, beef and venison produced in the province. The Northern Cape is also well known for the production of wool, mohair, and karakul pelts as well as dates, citrus products, wine, and raisins. Livestock farming is mostly practiced in this area, with irrigation farming most prominent along riverbanks. Livestock farming in the mostly consist out of cattle, sheep, goat and game farming.

8.1.8.7 Land capability

Alluvial Diamond mining has been practiced in South Africa for over 200 years ago. Northern Cape is the first province to discover diamond mining. The proposed site is dominated by quaternary sands and has karoo land capability since it has already been significantly altered by previous mining activities and the potential of this land to be used for agriculture

8.1.9 Palaeontological Impact Assessment

The Heritage Act of South Africa stipulates that fossils and fossil sites may not be altered or destroyed. The palaeontological heritage of South Africa is unsurpassed and can only be described in superlatives. Fossils and palaeontological sites are protected by law in South Africa. Construction in fossiliferous areas may be mitigated in exceptional cases but there is a protocol to be followed. The palaeontological sensitivity of the region is shown in Figure 18 and explained in Table 15.

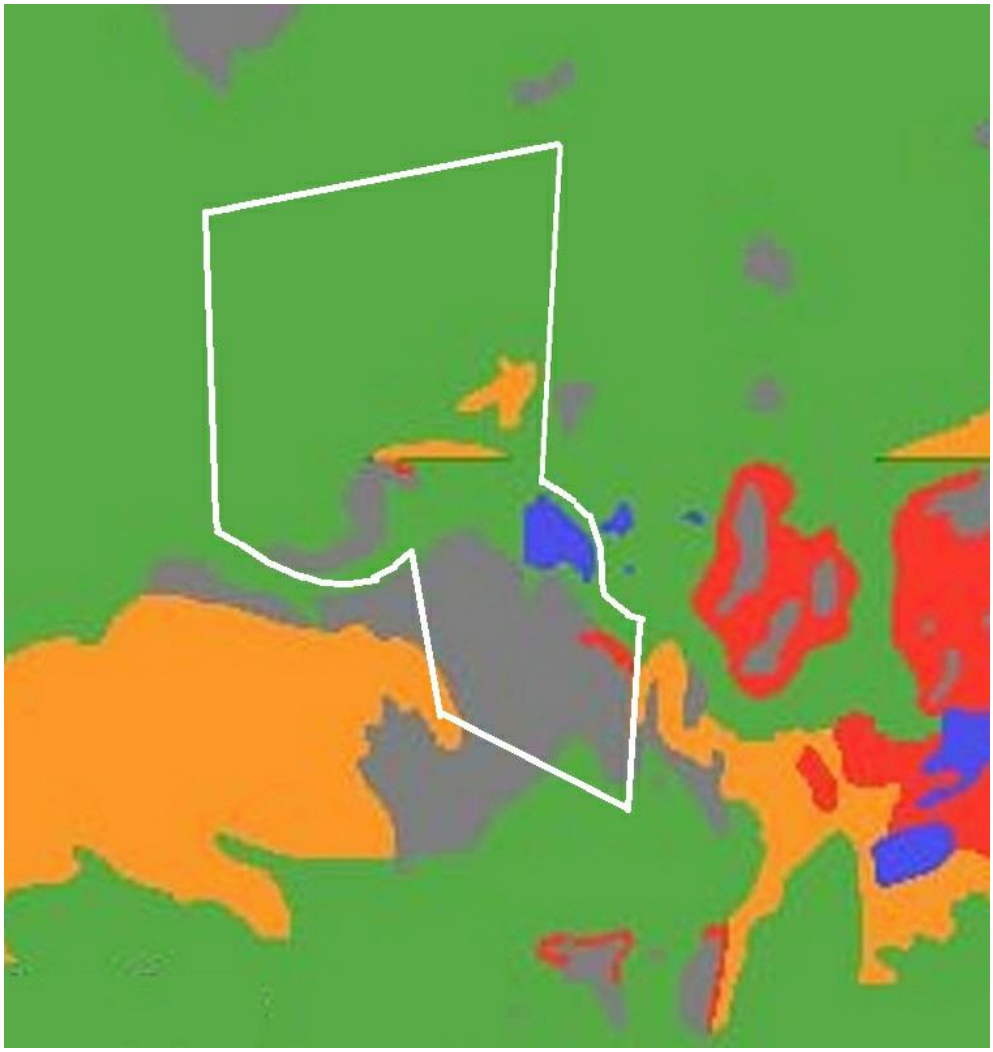


Figure 18: Palaeontological sensitivity of the region (SAHRA, 2019)

Table 15: Palaeontological assessment of the region

Colour	**Palaeontological Significance**	**Action**
RED	VERY HIGH	Field assessment and protocol for finds are required.
ORANGE	HIGH	The desktop study is required and based on the outcome of the desktop study, a field assessment is likely.
GREEN	MODERATE	The desktop study is required.

BLUE	LOW	No palaeontological studies are required however a protocol for finds is required.
GREY	INSIGNIFICANT / ZERO	No palaeontological studies are required.

Although the area covered by the Allanridge Formation is classified as having a Low Palaeontological Sensitivity (see Figure 18), it consists of igneous rocks and is therefore devoid of fossils and of no palaeontological concern.

The Ecca Group of the Karoo Supergroup is regarded as having a Very High Palaeontological Sensitivity. Fossils of a variety of palaeoniscoid fish (Figure 19) and arthropods such as *Notocaristapscotti* (Figure 20) are common in the Whitehill Formation. This formation is famous for the fossils of the swimming reptile *Mesosaurus*(Figure 21) that also occur in South America (Oelofsen&Araujo, 1987). Rare insect wings and cephalochordates have also been found in this formation (McLachlan & Anderson, 1977). Palynomorphs, petrified wood, and other sparse vascular plant remain such as *Glossopteris* leaves and lycopods have been found in this formation (Almond &Pether, 2008; Johnson *et al*., 2009).

The Karoo Supergroup rocks abuts extensive dolerite intrusions at the study site. These igneous intrusions would have caused thermal metamorphosis of the adjacent Karoo rocks which would have had a negative impact on its fossil content.

Figure 19: The palaeoniscoid fish *Ichnolepisbancrofti* (SAM-9338, iZiko South African Museum).

The Quaternary sediments – the alluvium, aeolian sands, and calcrete – in the study area cover most of the Carboniferous to Permian Karoo Supergroup rocks, the Jurassic-aged dolerite and the Randium-aged Allanridge Formation of the Ventersdorp Supergroup in the study area.

The fossil record of the surface calcrete and the overlying aeolian sands and alluvium is sparse, occurs sporadically and is low in diversity and is classified as having a Moderate Palaeontological Sensitivity (see Fig. 3). The fossils that have been discovered in this formation include root casts, burrows, termitaria, ostrich egg shells, mollusc shells and isolated bones (Almond &Pether 2008).

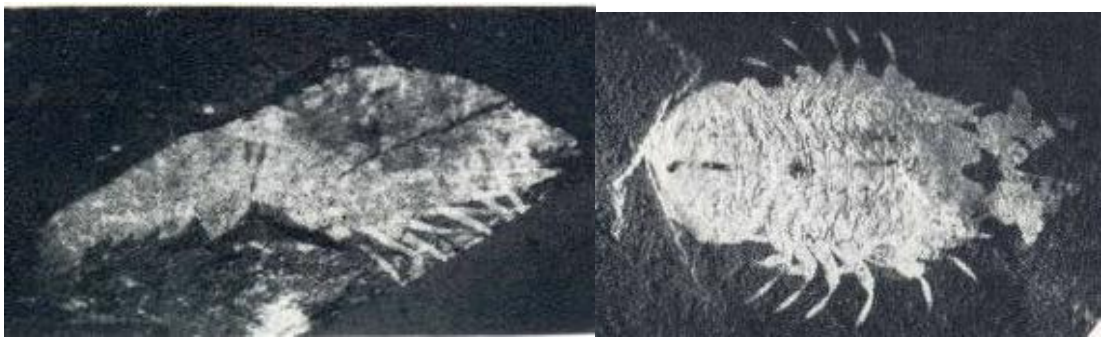


Figure 20: Fossils of the crustacean *Notocaristapscotti* from the Whitehill Formation (adapted from Kensley, 1974)

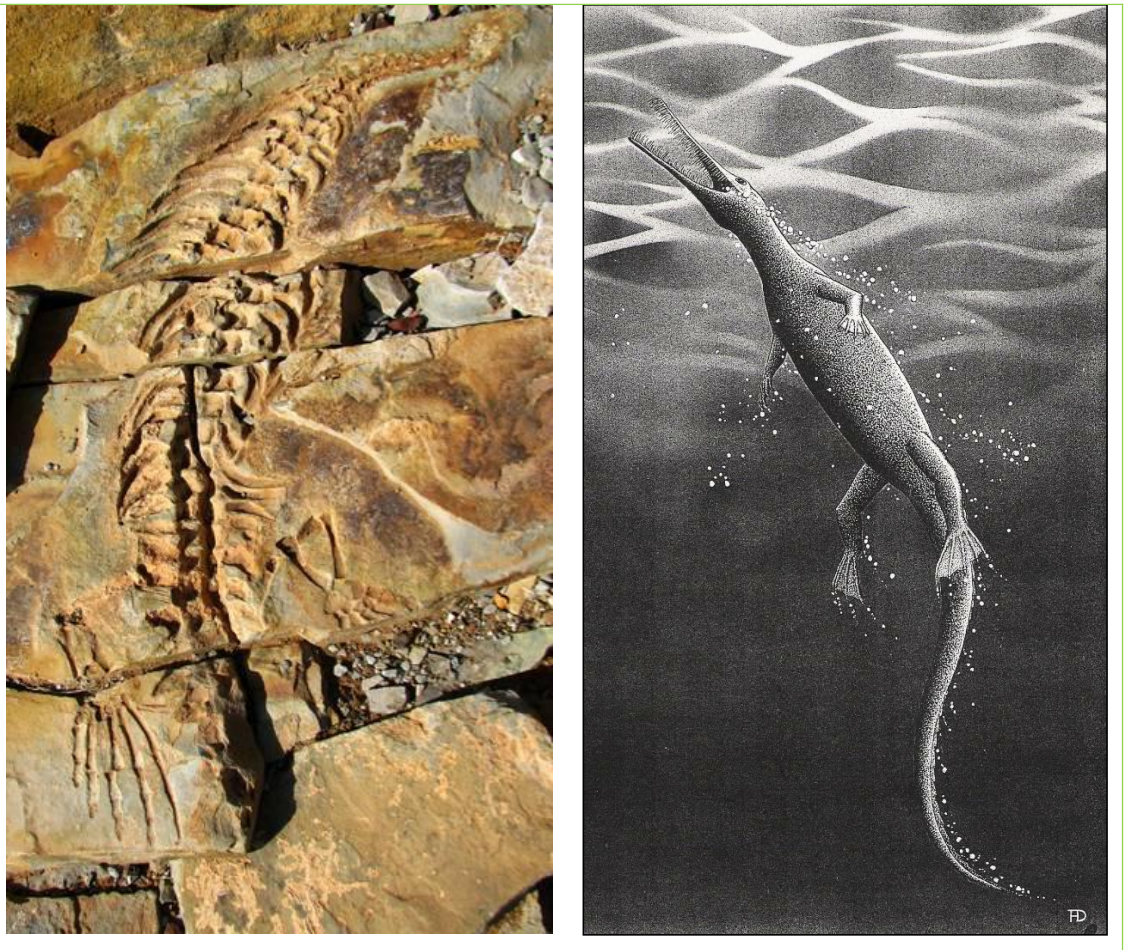


Figure 21: *Mesosaurus* fossil skeleton (left) and reconstruction (right)

PROCEDURE FOR CHANCE PALAEONTOLOGICAL FINDS

Extracted and adapted from the National Heritage Resources Act, 1999 Regulations Reg No. 6820, GN: 548.

The following procedure must be considered in the event that previously unknown fossils or fossil sites are exposed or found during the life of the project:

1. Surface excavations should continuously be monitored by the ECO and any fossil material be unearthed the excavation must be halted.

2. If fossiliferous material has been disturbed during the excavation process it should be put aside to prevent it from being destroyed.

3. The ECO then has to take a GPS reading of the site and take digital pictures of the fossil material and the site from which it came.

4. The ECO then should contact a palaeontologist and supply the palaeontologist with the information (locality and pictures) so that the palaeontologist can assess the importance of the find and make recommendations.

5. If the palaeontologist is convinced that this is a major find inspection of the site must be scheduled as soon as possible in order to minimise delays to the development.

From the photographs and/or the site visit the palaeontologist will make one of the following recommendations:

a. The material is of no value so development can proceed, or:

b. The fossil material is of some interest and a representative sample should be collected and put aside for further study and to be incorporated into a recognised fossil repository after a permit was obtained from SAHRA for the removal of the fossils, after which the development may proceed, or:

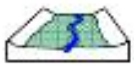
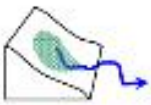
c. The fossils are scientifically important and the palaeontologist must obtain a SAHRA permit to excavate the fossils and take them to a recognised fossil repository, after which the development may proceed.

6. If any fossils are found then a schedule of monitoring will be set up between the developer and palaeontologist in case of further discoveries.

8.1.10 Wetland classification and delineation

The classification of the wetland in the study area was based on the WET-EcoServices technique (Kotze *et al*, 2005). The WET-EcoServices technique identifies seven main types of wetlands based on the hydro-geomorphic characteristics (*See Table 16 below*).

Table 16: Wetland hydrogeomorphic (HGM) types typically supporting inland wetlands in South Africa (Adapted from Kotze et al, 2005)

HYDRO-GEOMORPHIC TYPES	DESCRIPTION	SOURCE OF WATER MAINTAINING THE WETLAND[1]	
		SURFACE	SUB-SURFACE
Floodplain 	Valley bottom areas with a well defined stream channel, gently sloped and characterized by floodplain features such as oxbow depressions and natural levees and the alluvial (by water) transport and deposition of sediment, usually leading to a net accumulation of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*
Valley bottom with a channel 	Valley bottom areas with a well defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterized by the net accumulation of alluvial deposits or may have steeper slopes and be characterized by the net loss of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*/ ***
Valley bottom without a channel 	Valley bottom areas with no clearly defined stream channel, usually gently sloped and characterized by alluvial sediment deposition, generally leading to a net accumulation of sediment. Water inputs mainly from channel entering the wetland and also from adjacent slopes.	***	*/ ***
Hillslope seepage linked to a stream channel 	Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs are mainly from sub-surface flow and outflow is usually via a well defined stream channel connecting the area directly to a stream channel.	*	***
Isolated Hillslope seepage 	Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs mainly from sub-surface flow and outflow either very limited or through diffuse sub-surface and/or surface flow but with no direct surface water connection to a stream channel.	*	***
Depression (includes Pans) 	A basin shaped area with a closed elevation contour that allows for the accumulation of surface water (i.e. it is inward draining). It may also receive sub-surface water. An outlet is usually absent, and therefore this type is usually isolated from the stream channel network.	*/ ***	*/ ***

[1] Precipitation is an important water source and evapotranspiration an important output in all of the above settings

Water source: * Contribution usually small

*** Contribution usually large

*/ *** Contribution may be small or important depending on the local circumstances

Wetland

The field procedure for the wetland delineation was conducted according to the Guidelines for delineating the boundaries of a wetland (South African Water Act, DWAF, 1999). Due to the transitional nature of wetland boundaries, these are often not clearly apparent and the delineations should, therefore, be

regarded as a human construct. The delineations are based on scientifically defensible criteria and are aimed at providing a tool to facilitate the decision making process regarding the assessment of the significance of impacts that may be associated with the proposed developments.

8.1.10.1 Hydrological assessment

The hydrological health of the stream and the wetlands was determined using the WET-Health (2008) techniques. The following changes were considered:

- Changes to water input volumes and pattern (effects of alteration in the upstream catchment).
- Changes to the water distribution and retention patterns of water passing through the wetland (effects of on-site alterations).

8.1.10.2 PES methodology

The Present Ecological Status (PES) Method (DWAF 1999) was used to attempt to establish the integrity of the wetlands in the study area and was based on the modified Habitat Integrity approach developed by Kleynhans (1999, in DWAF 1999). The delineated wetland units were assessed as a whole due to the inability to access all areas. A broad assessment of the PES of all wetlands in the study area is therefore presented. Table 4 shows the criteria for assessing the habitat integrity of palustrine wetlands along with Table 5 describing the allocation of scores to attributes and the rating of confidence levels associated with each score. These criteria were selected based on the assumption that anthropogenic modification of the criteria and attributes listed under each selected criterion can generally be regarded as the primary causes of the ecological integrity of a wetland.

8.1.10.3 EIS methodology

The following method is outlined in Appendix W5 of DWAF (1999). A series of determinants for EIS are assessed on a scale of 0 to 4, where 0 indicates no importance and 4 indicates very high importance. The method is used as a guideline for the professional judgment of individuals familiar with an area and

its wetlands. The relative confidence of each rating is estimated based on a scale of four categories.

8.1.10.4 ES methodology

The assessment of the ecosystem services supplied by the identified wetlands was conducted according to the guidelines as described by Kotze et al (2009). A Level 2 assessment was undertaken which examines and rates the following services:

- Flood attenuation.
- Stream flow regulation.
- Sediment trapping.
- Phosphate trapping.
- Nitrate removal.
- Toxicant removal.
- Erosion control.
- Carbon storage.
- Maintenance of biodiversity.
- Water supply for human use.
- Natural resources.
- Cultivated foods.
- Cultural significance.
- Tourism and recreation.
- Education and research.

8.1.10.5 Aerial assessment

The aerial assessment was conducted using Google earth images and BGIS software. The purpose of this desktop assessment was to see whether any

physical features that would be associated with a stream channel or wetland area was present on the site.

8.1.10.6 Soil assessment

The colours of soil components are often the most diagnostic indicator of hydromorphic soils DWAF (2005). Colours of these components are strongly influenced by the frequency and duration of soil saturation. Generally, the higher the duration and frequency of saturation in a soil profile, the more prominent grey colours become in the soil matrix DWAF (2005).

Coloured mottles/ redoximorphic features (soils with variegated colour patters are described as being mottled, with the "background colour" referred to as the matrix and the spots or blotches of colour) are a prominent feature of hydromorphic soils. These features are usually absent in permanently saturated soils, and are at their most prominent in seasonally saturated soils, becoming less abundant in temporarily saturated soils until they disappear in dry soils DWAF (2005).

Hydromorphic soils must display signs of wetness within 50cm of the soil surface (DWAF, 2005). This depth has been chosen due to international experience showing that frequent saturation of the soil within 50cm of the surface is necessary to support hydrophilic vegetation (DWAF, 2005).

According to Collins (2005), the presence or absence of redoximorphic features [features formed by the process of reduction, translocation and oxidation of Iron (Fe) and manganese (Mn) oxides] within the upper 50cm of the soil profile is sufficient enough to identify a hydric soil (soil that has been depleted of oxygen through the chemical process of reduction).

The soil assessment was conducted during a visit to the site. The soil profile was inspected to a depth of approximately 50cm in order to assess for hydric signs such as grey matrix’sand mottles/redoximorphic features.

8.1.10.7 Vegetation assessment

Vegetation is another useful indicator of wetland presence, hydrology, type, and condition. For this reason, it is useful to use vegetation as one of the tools for delineating the wetlands on the study site as it identifies hydrophilic vegetation associated with frequently saturated soils. According to DWAF (2005), when using vegetation indicators for delineation, emphasis should be placed on the group of species that dominate the plant community, rather than on the individual indicator species. Table 17 and Table 18 present the wetland vegetation indicator and classification tools used to aid the delineation and assessment of the wetland.

The baseline characterization of the wetland and riparian flora was conducted by means of visual assessment surveys. The main focus of these investigations was to classify vegetation communities as the main surrogate for biodiversity patterns and to assist with the wetland delineation.

Table 17: Relationship between wetness zones and vegetation types (Adapted from DWAF, 2005:14)

Vegetation	Temporary	Seasonal	Permanent/ semi-permanent
If herbaceous	Predominantly grass species; a mixture of species which occurs extensively in non-wetland areas, and hydrophilic plant species which are restricted largely to wetland areas	Hydrophilic sedge and grass species which as restricted to wetland areas	Dominated by 1. Emergent plants including reeds (*Phragmite australis*), a mixture of sedges and bulrushes (*Typha capensis),* usually 2. Floating or submerged aquatic plants.

If woody	A mixture of woody species which occur extensively in the non-wetland area, and hydrophilic plant species which are restricted largely to wetland areas	Hydrophilic woody species, which are restricted to wetland areas	Hydrophilic woody species, which are restricted to wetland areas. Morphological adaptations to prolonged wetness (e.g. prop roots)

Table 18: Classification of plants according to the occurrence in the wetland (Adapted from Reed, 1998 cf DWAF, 2005:14)

Obligate wetland (ow) species	Almost always grow in wetlands (> 99% of occurrences)
Facultative wetland (fw) species	Usually, grow in wetlands (67-99%) but occasionally are found in non-wetland areas
Facultative (f) species	Are equally likely to grow in wetlands and non-wetlands areas (34-66% of occurrences)
Facultative dry-land (ld) species	Usually, grow in non-wetland areas but sometimes grow in wetlands (1-34 % of occurrences)

Kotze and Marneweck (1999) have developed a method for utilising vegetation as an indicator of wetland conditions. They note that more than 50% cover by fw[1/]ow[2] plants in either the wood of herbaceous layers is a clear sign of hydric (wet soil) conditions. That's if there are some fw/ow plants present but by less than 50% cover is a possible sign of hydric conditions and, that if no fw/ow plants are present then one can assume that there are no hydric conditions present.

8.1.10.8 Assessment of ecological impacts

The information from the baseline assessment undertaken for the project area was used to inform an assessment of the likelihood and significance of potential impacts on the wetlands within the proposed project area. For the purposes of this assessment, the rating of impact significance was undertaken according to the impact assessment methodology for EIAs which is based on the Guideline Document on EIA Regulations of Environmental Affairs and Tourism (DEAT, 1998) and the Integrated Environmental Management Information Series: Impact Significance (DEAT, 2002). This process routinely includes the following tasks: impact identification, impact prediction, and impact evaluation.

8.1.10.9 Identification of mitigation measures

‘Mitigation’ is a broad term that covers all components involved in selecting and implementing measures to conserve/protect the environment and prevent significant adverse impacts as a result of potentially harmful activities to natural ecosystems. The mitigation of negative impacts on aquatic ecosystems, including rivers and wetlands, is a legal requirement for authorisation purposes and must take on different forms depending on the significance of impacts and the particulars of the target area being affected. Examples of mitigation can include changes to the scale, design, location, siting, process, sequencing, phasing, and management and/or monitoring of the proposed activity, as well as restoration or rehabilitation of sites.A specialist working knowledge and experience with other similar wetland assessment and delineation projects were used in compiling the recommended mitigation measures for this project.

8.1.10.10 Results

The field assessment revealed that two wetland types occur on site. And these are Pans as well as Floodplain wetland types. The two wetland types are explained by Ollis, Macfarlane, Job, Sieben, and Snaddon (2013) as follows: -

Hydro-geomorphic unit

The **Depression or pan** wetlands are defined as “a landform with closed elevation contours that increases in depth from the perimeter to a central area of greatest depth, and within which water typically accumulates.”

The third wetland type on site is the **floodplain** wetland. This wetland occurs along the river on site. Floodplain wetland—a wetland area on the mostly flat or gently-sloping land adjacent and formed by an alluvial river channel, under its present climate and sediment load, which is subject to periodic inundation by overtopping of the channel bank. Figure 22 shows the Wetland map of the study are.

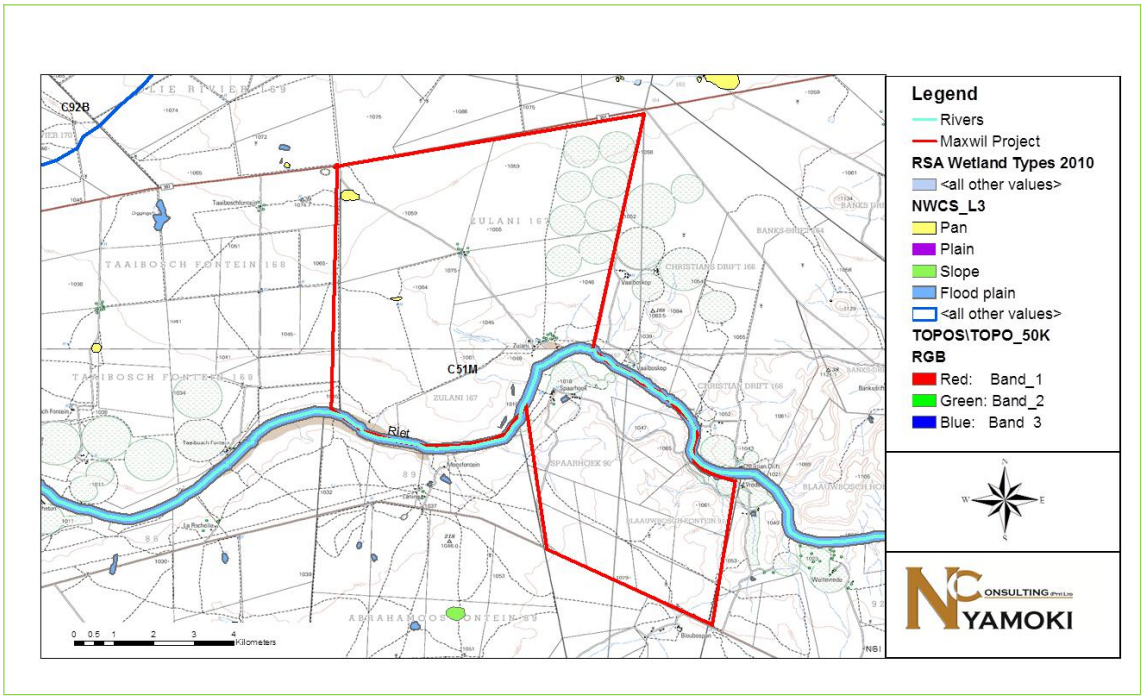


Figure 22: Wetland map for the site

Vegetation indicator

The majority of the site gives an indication of the Savanna biome, *i.e.* it is characterized by a well-developed grass cover as well as shrubs and tree. Along the flood-plain, a combination of herbaceous and woody species was seen. Some of these species could be confirmed as Facultative wetland species (*Typha capensis*) as well as Facultative dry-land species (*Eucalyptus spp., Rhus lancea, Acacia karoo*)

As indicated above the pans/depression were found to be dry and characterized by Facultative dry-land species of which most of them are grasses. These grasses are *Elionurus muticus, Eragrostis lehmanniana, Themeda triandra, Aristida scabrivalvis, Cynodon dactylon, Eragrostis plana, and Miscanthusjunceus.*

Soil Wetness and Soil Form Indicator

According to DWAF (2005), the permanent zone of a wetland will always have either Champagne, Katspruit, Willowbrook or Rensburg soil forms present, as defined by the Soil Classification Working Group (1991). The seasonal and temporary zones of the wetlands will have one or more of the following soil forms present (signs of wetness incorporated at the form level): Kroonstad, Longlands, Wasbank, Lamotte, Estcourt, Klapmuts, Vilafontes, Kinkelbos, Cartref, Fernwood, Westleigh, Dresden, Avalon, Glencoe, Pinedene, Bainsvlei, Bloemdal, Witfontein, Sepane, Tukulu, Montagu. Alternatively, the seasonal and temporary zones will have one or more of the following soil forms present (signs of wetness incorporated at the family level): Inhoek, Tsitsikamma, Houwhoek, Molopo, Kimberley, Jonkersberg, Groenkop, Etosha, Addo, Brandvlei, Glenrosa, Dundee (DWAF, 2005).

Due to the dryness of the pan/depression wetland on site, no hydrosols were identified on the pans. A sign of dry algae/hydrosol was noticed. Hydrosols were easily identified on the floodplain along the River buffer zone (Figure 23).

These features are usually absent in permanently saturated soils, and are at their most prominent in seasonally saturated soils, becoming less abundant in temporarily saturated soils until they disappear in dry soils.

Figure 23: Mottled soil on the edge of a flood-plain wetland

According to the DWAF (2005), soil wetness indicators (i.e. identification of redoximorphic features) are the most important indicator of wetland occurrence due to the fact that soil wetness indicators (redoximorphic features) remain in wetland soils, even if they are degraded or desiccated. It is important to note that redoximorphic features were present in the delineated wetland within the upper 500mm of the soil profile. The presence or absence of redoximorphic features within the upper 500mm of the soil profile alone is sufficient to identify the soil as being hydric (a wetland soil), or non- hydric (non-wetland soil) (Collins, 2005).

PES methodology

The Present Ecological Status (PES) Method (DWAF 1999) was used to attempt to establish the integrity of the wetlands in the study area and was based on the modified Habitat Integrity approach developed by Kleynhans

(1999, in DWAF 1999). The delineated wetland units were assessed as a whole due to the inability to access all areas. A broad assessment of the PES of all wetlands in the study area is therefore presented. Table 19 shows the criteria for assessing the habitat integrity of palustrine wetlands along with Table 20 describing the allocation of scores to attributes and the rating of confidence levels associated with each score. These criteria were selected based on the assumption that anthropogenic modification of the criteria and attributes listed under each selected criterion can generally be regarded as the primary causes of the ecological integrity of a wetland.

Table 19: Habitat integrity assessment criteria for palustrine wetlands (DWAF,1999)

Criteria and attributes	Relevance
Flow Modification	The consequence of abstraction or regulation by impoundments. Changes in the temporal and spatial characteristics of flow can have an impact on habitat attributes such as an increase in the duration of low flow season, resulting in low availability of certain habitat types or water at the start of the breeding, flowering or growing season.
Permanent Inundation	A consequence of impoundment resulting in the destruction of natural wetland habitat and cues for wetland biota.
Water Quality Modification	Originates from the point or diffuse sources. Measure directly by laboratory analysis or assessed indirectly from upstream agricultural activities, human settlements, and industrial activities. Aggravated by a volumetric decrease in the volume of water during low or no flow condition
Sediment Load Modification	A consequence of reduction due to entrapment by impoundments or increase due to land use practices such as overgrazing. Cause of unnatural rates of erosion, accretion or infilling of wetlands and change in habitats.

Canalization	Results in desiccation or changes to inundation patterns of wetland and thus changes in habitats. River diversions or drainage.
Topographic Alteration	A consequence of infilling, ploughing, dykes, trampling, bridges, roads, railway lines and another substrate disruptive activity which reduces or changes wetland habitat directly or through changes in inundation patterns.
Alien/Exotic macrophytes	Alteration of habitat by obstruction of flow and may influence water quality. Dependent upon the species involved and scale of infestation.
Alien/Exotic aquatic fauna	The disturbance of the stream bottom during feeding may influence the water quality and increase turbidity. Dependent upon the species involved and their abundance
Solid waste disposal	A direct anthropogenic impact which may alter habitat structurally. Also, a general indication of the misuse and mismanagement of the river
Vegetation removal	Impairment of the buffer the vegetation forms to the movement of sediment and other catchment runoff products into the river. Refers to physical removal for farming, firewood, and overgrazing.
Exotic vegetation encroachment	Excludes natural vegetation due to vigorous growth, causing bank instability and decreasing the buffering function of the riparian zone. Allochtonous organic matter input will also be changed. Riparian zone habitat diversity is also reduced
Over utilisation of biota	Overgrazing, Over-fishing, etc.

PES of wetlands in the study area

The different types of wetlands in the study area were assessed separately on a broad general scale. The wetlands in the study area all fall between a PESC of B and D as indicated in Table 20.

Table 20: Broad PES values and categories of the wetlands in the study area.

Wetland type	Mean PES value	PESC
Floodplain	3.1	B
Pan	1.9	D

EIS methodology

The following method is outlined in Appendix W5 of DWAF (1999). A series of determinants for EIS (Table 17) is assessed on a scale of 0 to 4, where 0 indicates no importance and 4 indicates very high importance. The method is used as a guideline for the professional judgment of individuals familiar with an area and its wetlands. The relative confidence of each rating is estimated based on a scale of four categories as indicated in Table 18.

EIS of wetlands in the study area

The wetland within and around the study area have EIS categories and EMC values as indicated in Table 20

Table 20: EIS and EMC values of wetlands in the study area.

Wetland	EIS Category (Median value)	EMC
Flood plain	High (2.3)	B
Pan/Depression	Low/marginal (0.9)	D

ES methodology

The assessment of the ecosystem services supplied by the identified wetlands was conducted according to the guidelines as described by Kotze et al (2009). A Level 2 assessment was undertaken which examines and rates the following services:

- Flood attenuation.
- Stream flow regulation.
- Sediment trapping.
- Phosphate trapping.
- Nitrate removal.
- Toxicant removal.
- Erosion control.
- Carbon storage.
- Maintenance of biodiversity.
- Water supply for human use.
- Natural resources.
- Cultivated foods.
- Cultural significance.
- Tourism and recreation.
- Education and research.

These characteristics were scored according to the following general levels of services provided in Table 21:

Table 21: Levels of ecosystem service ratings.

Service rating score	Service rating category
0	Low
1	Moderately low
2	Intermediate
3	Moderately high
4	High

ES of wetlands in the study area

The wetlands in the study area have ES values as indicated in Table 22

Table 22: ES values of wetlands in the study area.

Wetland	ES Value
Floodplain	2
Depression	1

8.1.11 Socio-economic environment

The Siyancuma Local Municipality is situated within the Pixley Ka Seme DM of the Northern Cape Province. It is bordered by the ZF Mgcawu DM in the north and west, Frances Baard DM in the north, Siyathemba LM and Thembelihle LM in the south, and the Free State Province in the east. The municipality is incorporating three urban settlements (Douglas, Griekwastad and Campbell),

three restitution areas (Schmidtsdrift, Bucklands and Kahlani/Maselsfontein), rural areas (Plooysburg, Salt Lake, Witput, Belmont, Graspan, Heuningskloof, Volop), commercial farming areas as well as small farming areas.

8.1.12 Population overview

Pixley ka Seme District Municipality has the third largest population in the Northern Cape and shows a slight increase of 9244 from 2011 to 2016. It represents 28,41 % of the Northern Cape population (Figure 8, Appendix 1). From 2001 to 2011, the total population for Siyancuma Local Municipality showed a negative growth rate of -5.6% with the population decreasing from 39 275 to 37 076 (StatsSA 2011). A further negative growth rate of -3.1% was experienced from 2011 to 2016 when the population decreased from 37 076 to 35 938 (Community Survey 2016).

Table 23 and Figure 24 depict the population figures of the five District Municipalities as in 2011 and 2016:

Table 23: Total Population by District . Source:StatsSa (2011) StatsSa Community Survey (2016)

District	2011	2016
ZF Mgcawu DM	236 783	252 692
John Taole Gaetsewe DM	224 799	242 264
Namaqua DM	115 842	115 488
Francis Baard DM	382 086	387 741
Pixley ka Seme DM	186 351	195 595
TOTAL	**1 145 861**	**1 193 780**

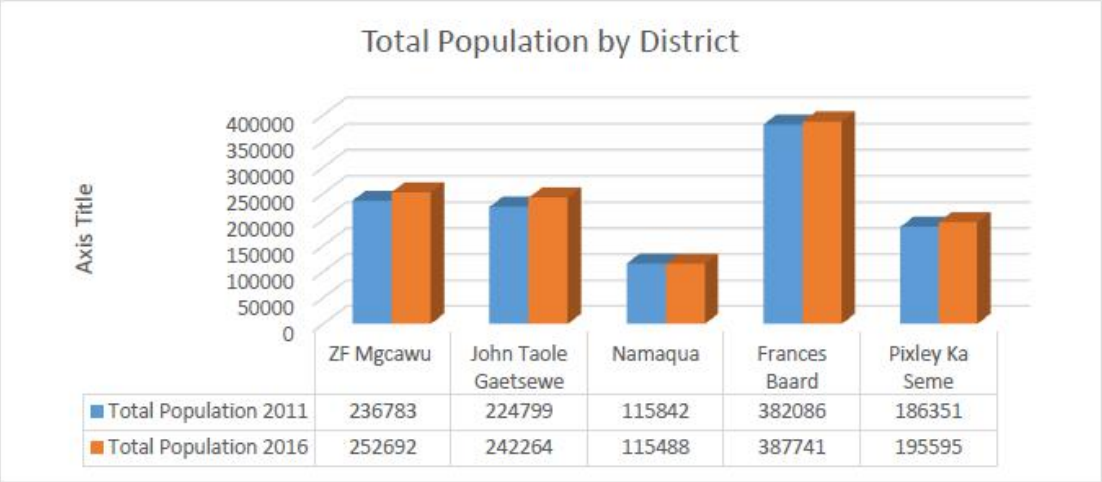


Figure 24: **Total population by District .** Source: StatsSA (2011) & StatsSA Community Survey (2016)

From 2001 to 2011, the total population for Siyancuma Local Municipality showed a negative growth rate of -5.6% with the population decreasing from 39 275 to 37 076 (StatsSA 2011). A further negative growth rate of -3.1% was experienced from 2011 to 2016 when the population decreased from 37 076 to 35 938 (Community Survey 2016). See Figure 25

Possible reasons for the decline in population might be:

● Mortality (deaths that occur within a population).

While death is inevitable, the probability of dying is linked to many factors, such as age, sex, race, occupation, social class and deceases like HIV an TB. The incidence of death can reveal much about a population ‘s standard of living and health care.

● Migration (the movement of people)

The movement of a people across a specified boundary, for the purpose of establishing a new residence or to seek new job opportunities.

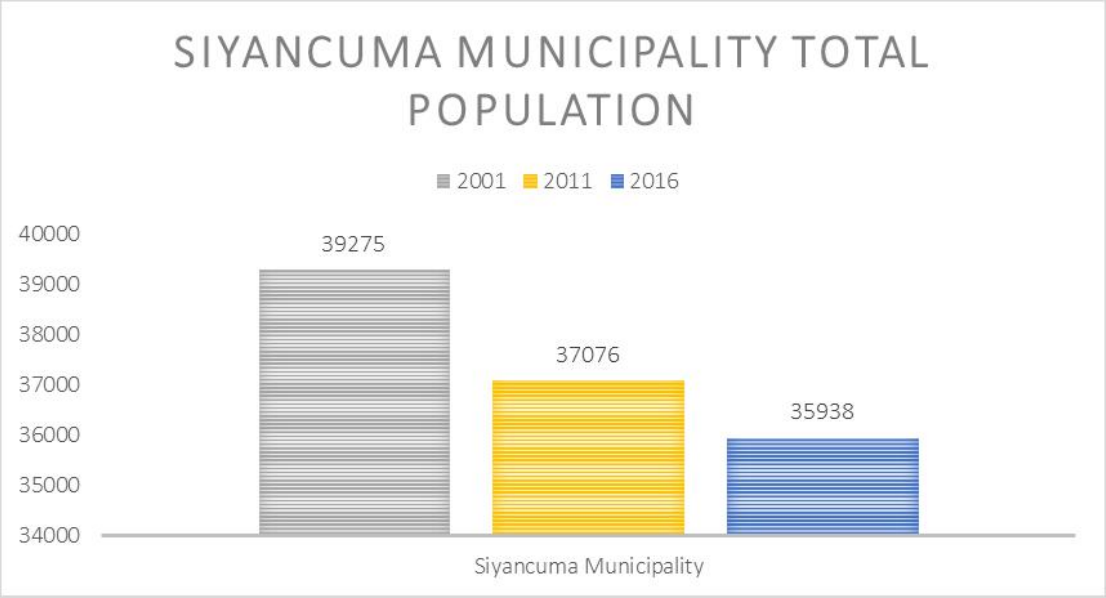


Figure 25: Total population comparison of Siyancuma Local Municipality. Source: StatsSA (2001), StatsSA (2011) & StatsSA Community Survey (2016)

Population by Race

Figure 26 shows the Siyancuma Municipality's total population of 35 938 (2016) which can be broken down as follows:

Coloured – 67,80 %
African – 25,30 %
White – 6,69 %
Asian – 0,21 %

The overall sex ratio (male : female) is more or less 50:50, although it is 48:52 for Coloureds meaning that there are slightly more Coloured females than males.

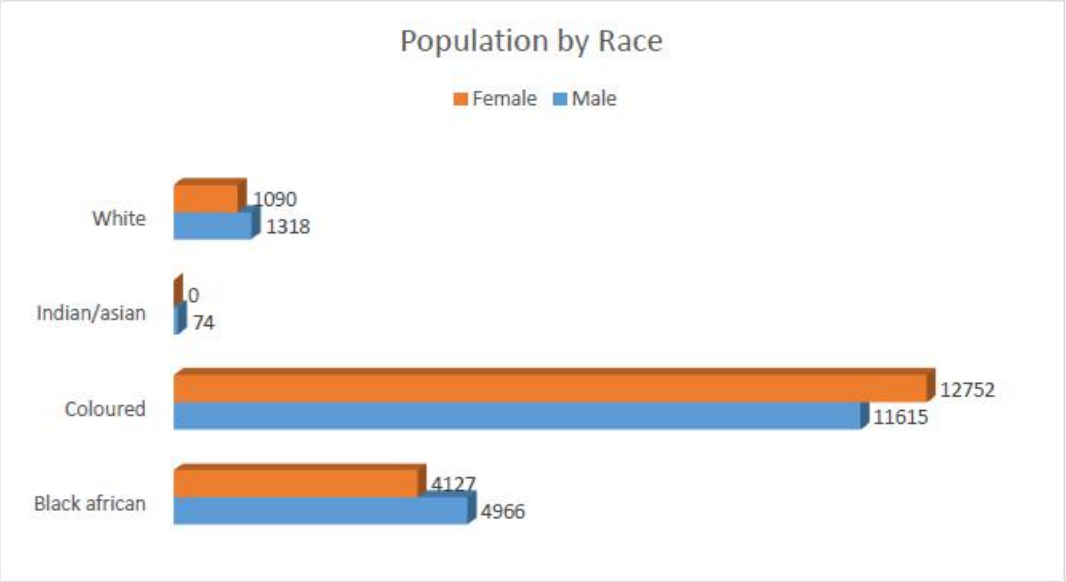


Figure 26: Population by Race. Source: StatsSA Community Survey (2016)

Population by age and sex

Demographic information from the 2016 Community Survey structured the Siyancuma total population as follow (Figure 10, Appendix 1):

Population under 15: 26,2 %

Population 15 to 64: 67,8 %

Population over 64: 6,0 %

It is further evident from the information in the graph that:

age group 15 – 19 is the highest. This group represents education grades 9 – 12, and

forms 12,4 % of the total population. Age group 20 – 34 represents the youth component and forms 27,7 % of the total population. This group characterises the economically active group and will have an impact on the employment and income levels within the municipality.

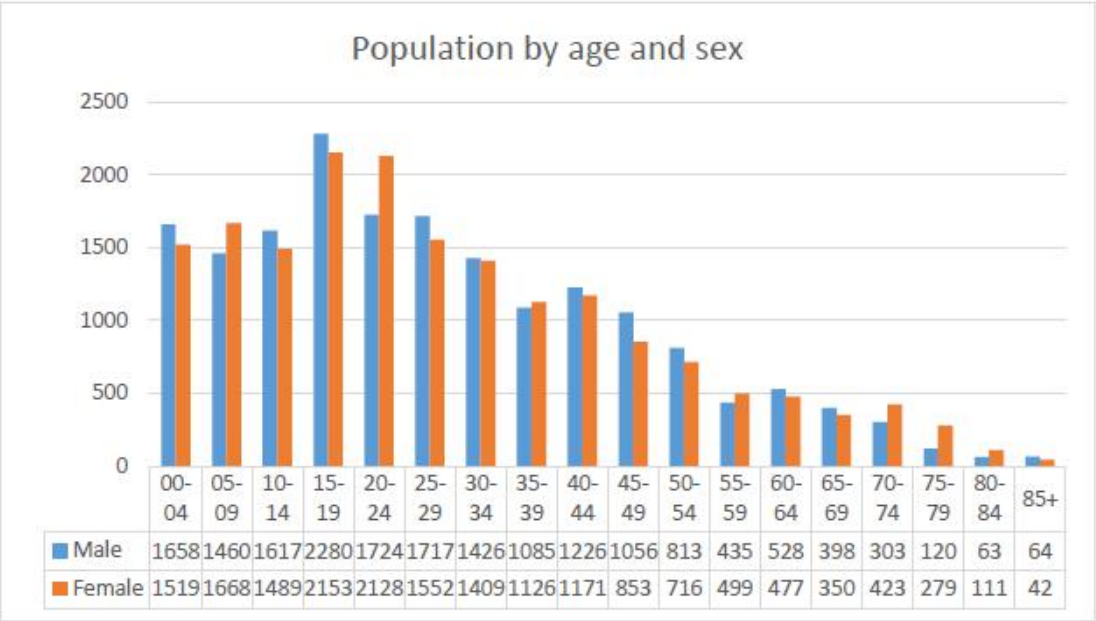


Figure 27**: Population by age and sex.** Source: StatsSA Community Survey (2016)

It is further evident from the information in the graph that:

- age group 15 – 19 is the highest. This group represents education grades 9 – 12, and forms 12,4 % of the total population.
- age group 20 – 34 represents the youth component and forms 27,7 % of the total population. This group characterises the economically active group and will have an impact on the employment and income levels within the municipality.
- from age 70, the mortality rate is higher for males than for females.

8.1.13 Level of education

Level of education in Siyancuma Local Municipality is shown in Table 24.

Table 24: Level of education in Siyancuma Local Municipality (StatsSA Community survey 2016)

	2016	2011
No schooling	9,7 %	16,7 %
Matric	20,4 %	16,8 %
Higher education	8,9 %	5,4 %

The statistics above represent the level of education of the population above the age of 20. It is of significance, because it shows an increase in matric and higher

education qualifications of 3,6% and 3,5% respectively from 2011 to 2016, while the figure for people with no schooling decreases with 7,0%. This represents a positive improvement in terms of increasing the levels of literacy within the municipality.

8.1.14 Service delivery

Energy Supply

Siyancuma Local Municipality is currently facing a big challenge in terms of electricity bulk supply due to the expansion of informal areas. Another challenge is the fact that electrical infrastructure, eg. transformers, are dilapidated and need to be repaired or replaced at very high costs.

According to the Community Survey of 2016, most households (7381) are using in-house prepaid meters, followed by in-house conventional meters (1334). A new trend is taking root where people are installing solar home systems, and 357 such systems were already installed in 2016.

Water supply

Most households in the Siyancuma Local Municipality area have access to water inside the house followed by taps inside the yard. However, many households are still dependant on communal taps.

Health Overview

The sectoral approach that was adopted to analyse the present health facilities of the Pixley Ka Seme district(Table 25) revealed that the National Government has adopted a primary health care strategy that includes making such services available within walking distance of communities. The strategy also includes improvement in sanitation and drinking water supply, etc. Thus the health care systems that presently exist in the District consist of:

- District Hospitals
- Community Healthcare Centres

Table 25: Municipal Health Centres. Source: Siyancuma Municipality (2018)

TOWNS	HOSPITALS/ CHC's	CLINICS
Schmidsdrift	-	1
Campbell	-	1
Griekwastad	1	1
Douglas	1	2
TOTAL	**2**	**5**

8.2 Description of current land use

Land use in the study area is dominated by low shrubland, pivot irrigation field and thicket/dense bush. These dominant land uses suggest that the study location has not been fully developed in terms of human induced activities. Irrigated agriculture covers an area of 16.85 km² as estimated in WR2012 study (Middleton and Bailey, 2012). This irrigation relies on water from the Riet River with abstractions on the storage weir upstream the study area and also along the river.

From the land cover map shown in Figure 28, it was observed that few irrigation activities take place along the boundaries of the proposed mining area. This was further confirmed during a site visit and the reason for such few activities was due to the mountainous and rocky nature of more than half of the proposed mining right area.

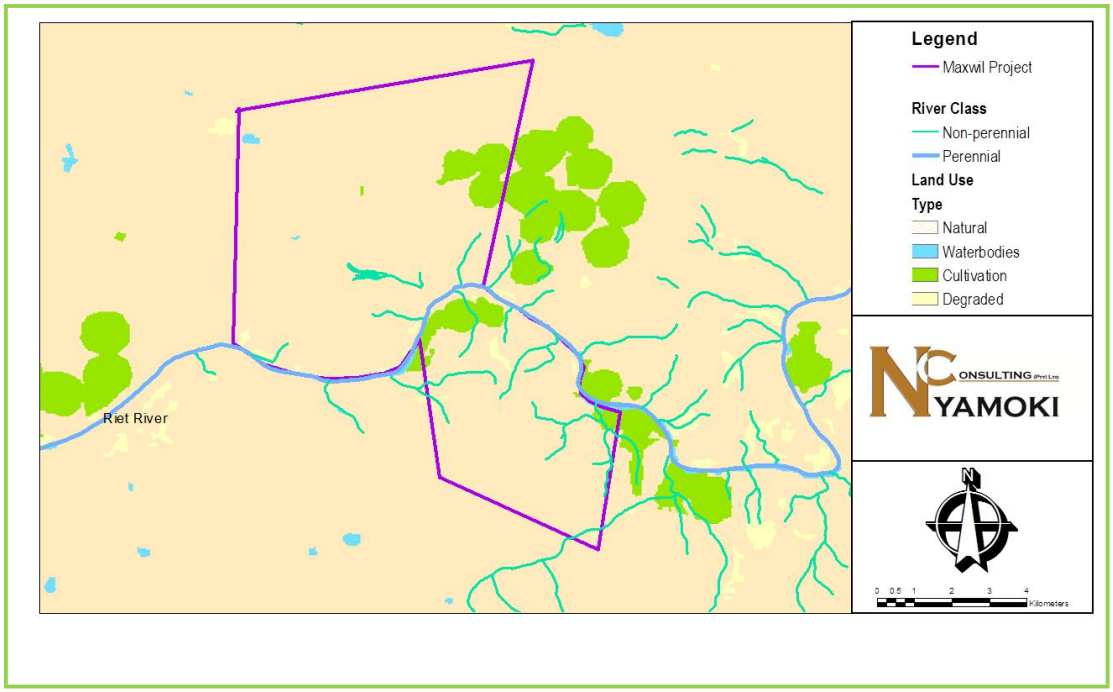


Figure 28: Land use

8.3 Description of specific environmental features and infrastructure on the site

The proposed mining area is characterised by few non-perennial rivers on the farm . The Riet River traverses through the study area. The R357 Main Road from Douglas to Kimberley passes adjacent to the property. Environmental features and infrastructure is shown on the layout map in Figure 29.

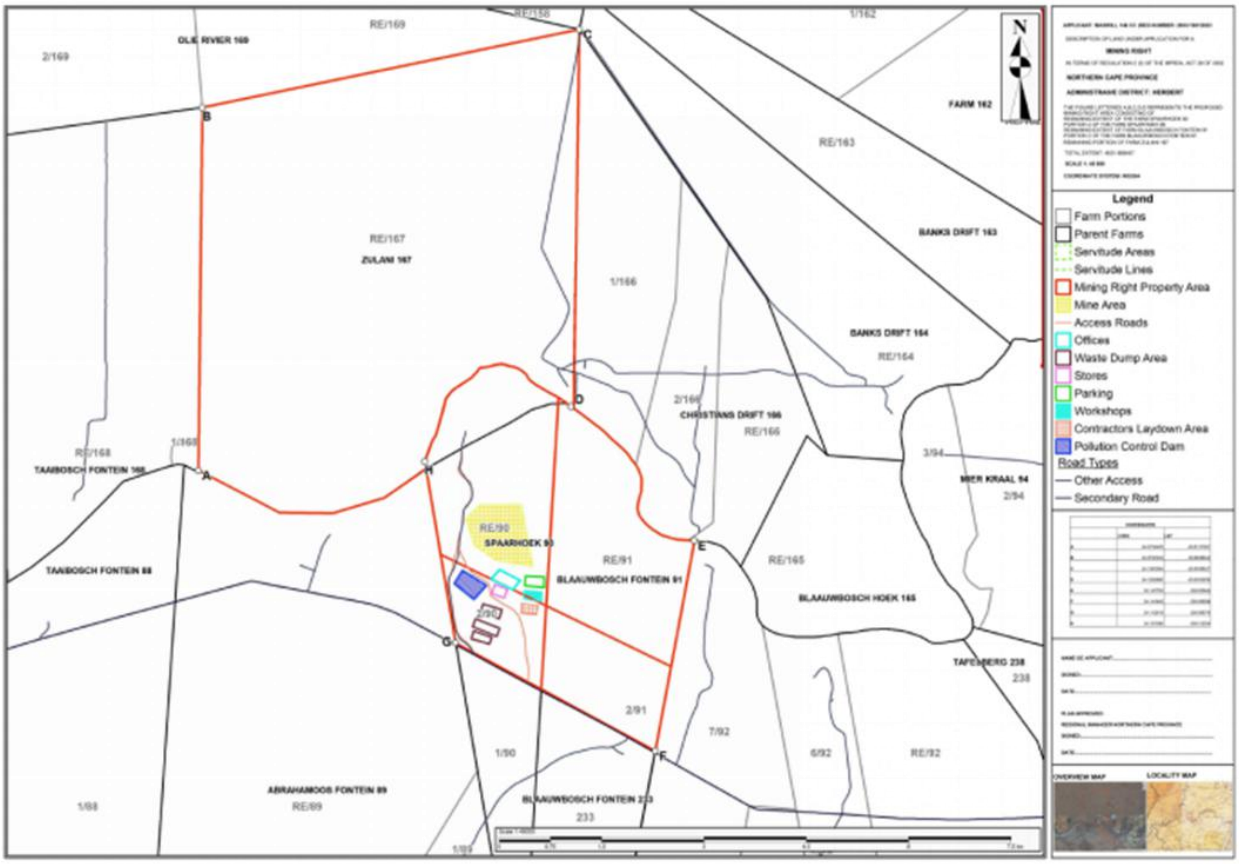


Figure 29: Environmental features and infrastructure

9. IMPACTS ASSESSMENT

9.1 Identified impacts

During this phase (Scoping) the following environmental aspects have been considered and potential impacts identified. Some of these will require further investigation during the EIA Phase:

Air pollution;
Dust emissions from vehicle movement during mining will affect the quality of the air. Mitigation measures such as spraying the haul roads will be practised in order to reduce dust emission.

Biodiversity loss;
Vegetation clearance will result on some animals fleeing to other areas. As soon as the mining is done the fauna will move back to the area. Chances of biodiversity loss are high as a result of noise and vegetation clearance. The current state of aquatic biodiversity is low.

Noise;
Earthmoving machinery and vehicles produce considerable amounts of noise which will affect the farm owners, nearby communities and natural habitat. This impact will be felt during the day working hours.

Heritage site disturbances
Mining activities such as vegetation clearance moving vehicles and influx of people around the heritage resources can lead to accidental disturbance of these resources. The final layout plan will be in such a way that the mining activities and infrastructure will not affect the heritage resources. The

archaeological and cultural heritage combined sensitivity of the study area is generally low, except for the area along the river (Figure 12, Appendix 1).

Traffic impact assessment

Traffic in the study area will increase as a result of construction vehicles that will be moving in and out of the mining area. The possibility of this happening is high and the impact will be felt during the day working hours.

Socio-economic impacts.

Increased level of crime due to an influx of people entering the private property. Disturbance of day to day lives of the farmers due to mining activities. Damages to the farm owners' properties due to mining activities are likely to happen.

Land use conflict

Hydrocarbon spillages from earthmoving machineries and vehicles can lead to soil contamination. Increased movements by vehicles and humans can lead to compaction of the soil. Vegetation clearance also increases the chances of soil erosion.

Topographic change

Removal of top soil during bulk sampling can lead to a change in the topography of the area. After sampling, rehabilitation to the initial state of the surface should be done.

Soil pollution

Improper storage of hydrocarbon fuels lead to contamination of the soil. Leaking of these fuels from vehicles and machineries into the ground also lead to soil pollution.

Surface water contamination

Mining close to the watercourses will contaminate surface water thereby affecting its quality. The effects of water contamination can last for a long time.

Ground water contamination

Spillages of hydrocarbons due to the use of machineries and vehicles that make use of hydrocarbon fuels can result in contamination of groundwater.

The potential impacts to the above listed environments as identified by the stakeholders will be recorded and discussed in order to come up with feasible mitigation measures. The Specialist studies will also aid in identifying the impacts as well as propose the recommended mitigation measures.

9.2 Methodology

This process describes the significance before and after mitigation for the identified impacts. Assessment of each identified potentially significant impact and risk is provided in Table 26.

Table 26: Assessment of each identified potentially significant impact and risk

Environmental Aspect	Activity	Nature of potential impact/risk	Environmental Impact Significance Pre - Mitigation							Impact Management Actions (Proposed Mitigation	Environmental Impact Significance Post Mitigation						
			Consequence			Probability	Frequency: impact	Significance impact	Significance rating	Management and Mitigation Measures	Consequence			Probability	Frequency: impact	Significance impact	Significance rating
			Severity	Spatial	Duration	Frequency:Activity					Severity	Spatial	Duration	Frequency:Activity			
Construction Phase																	
Soil	Stripping and Stockpiling of topsoil	Disturbance of in situ horizon organisation	3	1	2	3	7	46	High	The only mitigation for this impact is to keep the surface disturbance footprint as small as possible. However, horizon inversion/disturbance is a permanent impact	1	1	1	2	1	15	Medium
		Loss of soil fertility through impacts on nutrient cycles	2	1	2	2	7	45	High	Soil nutrient cycles can somehow be maintained by revegetation of topsoil stockpiles and through proper ecological land rehabilitation. Alluvial mining does not involve stripping the whole overburden but rather an area of economic importance.	1	1	2	2	2	16	Medium
	Vehicle traffic and construction of	Soil compaction	2	1	2	2	7	46	High	The project footprint should be kept as small as possible. Traffic should be restricted	1	1	1	2	1	18	Medium

	infrastructure									to haul roads only. Topsoil stripping and stockpiling should not be conducted during wet periods, soil moisture should be below a pre-determined level							
	Trucks and equipment on site and waste generation by construction activities	Soil chemical pollution	3	2	2	2	2	25	Medium	Proper soil contamination prevention measures as outlined in the Soil Management Plan will mitigate the risk, for example, checking vehicles before they drive onto the site.	1	1	1	2	2	12	Low
	Vegetation clearance exposing soil surface to energy of wind and water movement	Soil erosion	3	2	2	2	2	24	Medium	Control soil erosion through the use of geotextiles and revegetation of exposed soil surfaces where possible	1	1	1	1	1	12	Low
Land capability	Soil stripping and construction of infrastructure	Loss of arable land capability	3	2	2	3	7	35	High	Current soil rehabilitation techniques are not able to restore the arable land capability and the loss is therefore permanent	3	2	2	3	7	35	High
		Loss of grazing land capability	2	2	2	2	4	25	Medium	Rehabilitation of land can restore the grazing capacity to a large extend	3	2	2	2	2	24	Medium
		Loss of wetland land capability							High	Avoid wetland areas as far as possible and do not include in areas of surface disturbance	1	1	1	2	2	12	Low
Land use	Establishment of mining infrastructure	Change in land use from agriculture to mining	2	3	2	2	8	34	High	Keep the project surface footprint as small as possible	3	2	2	3	7	35	High
Vegetation	Site preparation and construction will result in the disturbance of and	Disruption of landscape connectivity for fauna as well as	2	2	2	2	2	23	Medium	Vegetation clearing should be kept minimal and the only area to be used for construction should be	2	2	2	2	1	15	Medium

	the loss of vegetation and potentially the loss of protected plant species.	habitat loss.								cleared Where soil disturbance is required for the laying of service infrastructure, the topsoil should be put aside and replaced after the infrastructure has been installed. Areas to be cleared should be demarcated and only those individuals of protected plant species directly within the foot print should be cleared/ removed. No alien or indigenous species should be allowed to invade the natural vegetation and regular monitoring for and clearing of such species should occur. Construction personnel should be restricted to the construction area and access to the surrounding area controlled and monitored. All alien plants present at the site should be controlled at least annually using the best practice methods for the species present Bare soil should be kept to a minimum							

	Construction activities such as the clearing of vegetation would lead to serious potential soil erosion risks.	Increased wind and water erosion	2	2	2	2	2	23	Medium	Particularly on the red sands of the site, precautions should be taken to avoid excessive disturbance and re-vegetation should take place as soon as possible after construction to avoid wind erosion. Wherever possible, roads and tracks should be constructed so as to run along the contour. All roads and tracks running down the slope must have water diversion structures present to redirect runoff and dissipate the energy of the water so as reduce erosion potential. Any extensive cleared areas that are no longer or not required for construction activities should be re-seeded with the locally-sourced seed of suitable species. Bare areas can also be packed with brush removed from other parts of the site, encourage natural vegetation regeneration and limit erosion. All construction vehicles should remain on properly demarcated roads. No construction vehicles should be allowed to drive over the vegetation except where no cleared roads are available. In such cases, a single track should be used and multiple paths should	1	1	2	1	1	11	Low

										not be formed. Regular monitoring for erosion to ensure that no erosion problems are occurring at the site as a result of the roads and other infrastructure. All erosion problems observed should be rectified as soon as possible.							
		Increased alien plant invasion risk	2	2	2	1	1	24	Medium	All maintenance vehicles to remain on the demarcated roads. Soil disturbance and vegetation clearing should be kept to a minimum. Cleared areas that are not going to be used should be re-vegetated with the locally-collected seed of indigenous species. Regular monitoring to ensure that alien plants are not increasing as a result of the disturbance that has taken place.	2	2	1	1	1	18	Medium

Faunal		Impacts on avifauna, mammals, reptiles and amphibians.	1	2	2	2	1	22	Medium	Any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or another suitably qualified person.	1	1	2	2	1	20	Medium
Operational Phase																	
Surface water		Contamination of surface water by loose material in the event of a storm water run-off occurring during the construction of the roads. Runoff from areas where hydro-carbon spills are present may also cause deterioration in surface water quality.	2	3	2	2	2	24	Medium	All hydrocarbon spills to be contained and soils removed. Proper storm water measures to be put in placer to prevent contamination of surface water. This will include the construction of berms/ stockpiles to shield any surface water from mining activities.	1	1	1	2	2	10	Medium
		The quality of surface water may be impacted by poor storage of chemicals, fuel spills, unappropriate waste disposal	2	3	2	2	2	21	Medium		1	1	1	2	2	12	Low
Groundwater		Oil spillages from machinery leaching to groundwater contamination.	3	2	2	2	2	22	Medium	Spillages to be contained in the Stormwater Managenet Structures	1	1	1	2	2	10	Low
		Existing boreholes within the prospecting area may create conduits of flow to the groundwater unless	3	2	2	2	2	24	Medium	All sewage related impact and mitigations to be addresses as part of WULA	1	1	1	2	2	12	Low

		sealed															
Palaeontological Resources	Daily excavation during construction of mining		1	1	1	2	2	12	Low	Should palaeontological resources be found, proper steps of reporting to SAHRA should be followed	1	1	1	2	2	10	Low
Vegetation	Construction activities such as the clearing of vegetation would lead to serious potential soil erosion risks.	Increased alien plant invasion risk	1	1	1	2	2	12	Low	All alien plants present at the site should be controlled at least annually using the best practice methods for the species present.	1	1	1	2	2	10	Low
			1	1	1	2	2	12		Bare soil should be kept to a minimum.	1	1	1	2	2	10	
Faunal	Construction and mining activities	Impacts on avifauna, mammals, reptiles and amphibians.	2	2	1	1	1	16	Medium	No unauthorized persons should be allowed onto the site. Staff present during the operational phase should receive environmental education so as to ensure that no hunting, killing or harvesting of plants and animals occurs.	2	2	1	2	1	13	Medium
Surface water	The proposed open-pit area has not yet been determined; however, it is certain that it will cover a significant portion of the proposed project area. It is inevitable that certain existing non perennial water courses that	Impact of the Removal and Alteration of Natural Water Courses on Catchment Response	2	2	1	1	1	18	Medium	Where mining infrastructure, such as haul roads, are required across natural water courses, new storm water infrastructure, such as pipes and culverts could replace the hydraulic function currently offered by the natural water courses. This infrastructure should be designed for both hydraulic performance and environmental	2	2	1	1	1	10	Low

	collect and convey surface water runoff to Riet River would be removed or altered.									functionality. A thorough assessment of the suitability of the new stormwater infrastructure must be made at the preliminary design stage. The water quality of the Riet River adjacent to the project site should be monitored on a monthly basis as described in the operational management plan.							
	The proposed mining development would require the excavation of open pits and the construction of tailing dams, pollution control dams, process plant, and subsidiary infrastructure. Being classified as "dirty," rain falling on this infrastructure would be captured and contained. Consequently, the quantum of surface water runoff would reduce	Impact of Reduced Peak Runoff and Discharge Volumes on Water Courses	2	2	1	1	1	22	Medium	As the impact is deemed POSITIVE, no mitigating measures were proposed.	2	2	1	1	1	20	Medium
	Smaller storm events have a natural, restorative function in the local	Impact of Reduction in Mean Annual Runoff on Downstream	2	2	1	1	1	10	Low	As it is extremely unlikely that the open pits could be relocated or reduced in extent, other possible	2	2	1	1	1	8	Low

	ecosystem. Conversely, large storm events, while part of the natural cycle, can be destructive. The impact of large storms is presented in the preceding section.	Surface Water Resources								solutions must be found. One such suggestion could be to supply clean water of similar quantity and quality to the Riet River watercourse. This water would replace the lost MAR and provide artificial replenishment which is needed due to the not so good water quality (muddy) at the Riet River.							
	Given the erosion potential of the local soils, it is likely that the construction and operational phases of the proposed development would cause an increase in erosion. Thus an increase in sediment deposition could be expected at the Riet River. In order to limit the environmental impact on faunal and floral communities, it is essential that sediment yield is reduced as far as is possible. Sediment load is measured in terms of Total Suspended Solids (TSS), but through the effective design and deliberate implementation of BMP "treatment	Impact of Increased Sediment Yield on Surface Water Quality	1	1	1	2	2	8	Low	Pollution control dams should be constructed to contain surface water runoff from all dirty areas, such as waste rock stockpiles. Dirty runoff should be directed towards these dams through a well-designed system of berms and channels. The dams should be designed to accommodate and retain transported sediment. It is therefore important that dams are designed to have an adequate dead storage volume The runoff from bare areas, such as haul roads, would need to be collected and conveyed by adequate side drains. This water, which would be high in TSS content, should be attenuated and retained sufficiently to allow sediment to settle prior to the discharge of the sufficiently clean superabundant;	1	1	1	1	1	4	Very Low

	trains, its impact can be mitigated.									Dust mitigation should be implemented in accordance with the air quality impact assessment forming part of this EIA The quality of runoff in watercourses during the rainy season should be monitored and corrective actions taken as appropriate. Baseline water quality was described in Section 4 of this report During the decommissioning phase, all unnecessary bare surfaces and developed zones should be removed and, as far as is possible, restored to their natural state							
		Impact of Increased Pollutant Load on Surface Water Quality	2	2	1	1	1	7	Low	A thorough, regular inspection and maintenance regime should be implemented for the ablution area and facilities; Pump stations should be inspected, serviced and cleaned on a monthly basis, and manholes and underground pipes inspected and cleaned every six months; An emergency response unit should be established to undertake urgent maintenance and repair work after hours;	1	1	1	1	1	3	Very Low

										It is imperative that surface water runoff from the dirty areas (e.g. waste rock stockpiles, tailings dam) be captured and wherever possible, reused in the mining process. Pollution control dams should be deployed. Dirty runoff should be directed towards these dams through a well-designed system of berms and channels; Dirty water not used in the mining process should be adequately treated prior to release. Treatment should be undertaken; All areas where hydrocarbons, such as oils and petroleum fuels are handled (*i.e.* workshops should be bunded and strictly controlled to minimize the risk of accidental spillages; Water quality of runoff into the Riet River should be monitored on a monthly basis and corrective actions taken as appropriate. Baseline water quality was described in Section 4 of this report							
Wetland and aquatic system	Mining activities including vegetation stripping , hydrocarbon storage etc	Water pollution	2	2	3	2	1	26	High	Storage of potentially hazardous materials (e.g. fuel, oil, etc.) should be outside of the 100-year flood line, or within a horizontal distance of 50m from a watercourse or wetland. This applies to the storage of these materials	2	1	1	2	2	10	Low

										and does not apply to normal operation or use of equipment in these areas. Operation and storage of machinery and mining-related equipment must be done outside of wetlands and rivers wherever possible unless authorised by a WUL. Spillages of fuels, oils, and other potentially harmful chemicals should be cleaned up immediately and contaminants properly drained and disposed of using proper solid/hazardous waste facilities (not to be disposed of within the natural environment). Any contaminated soil from the site must be removed and rehabilitated timeously and appropriately. Provide adequate waste disposal facilities (bins) and encourage workers not to litter or dispose of solid waste in the natural environment but to use available facilities for waste disposal. Ensure that any rubbish is regularly cleared from the site, especially from wetlands/streams.							
		Erosion and sedimentation	2	2	2	2	2	24	Low	Excavated material/sediments/spoil from the mining zone (including any foreign materials) should not be	1	1	1	1	1	4	Very Low

										placed or stockpiled within wetlands or river channels, including the riparian zone of streams/rivers.							
		Disturbance of channel banks and soils	2	3	2	2	1	22	Medium	Exposed soils should be rehabilitated as soon as practically possible to limit the risk of erosion. The channel embankments must be rehabilitated to ensure both longitudinal and cross sectional stability against summer floods.	2	3	2	2	1	6	Low
		Disturbance of aquatic vegetation and habitat	1	1	2	2	1	5	Low	Keep the clearing of natural vegetation in wetland areas to a minimum and attempt to ensure that clearing occurs in parallel with the mining progress where practically possible.	2	3	2	2	1	7	
			1	1	2	2	1	5		No wild animal may under any circumstance be hunted, snared, captured, injured, killed, harmed in any way or removed from the site. This includes animals perceived to be vermin.	2	3	2	2	1	3	Very Low
		Temporary disruption of water/sediment fluxes	2	2	1	1	2	20	Medium	Under no circumstance should consideration be given to the excavation of an artificial channel or the damming of wetlands or rivers in such a manner as to totally restrict the flow	2	3	2	2	1	5	Low
		Noise-related disturbance (fauna)	1	1	1	1	1	4	Very Low	Temporary noise pollution due to mining works should be minimized in sensitive areas by ensuring the proper maintenance of equipment and vehicles and tuning of engines and	1	1	1	1	1	3	Very Low

										mufflers as well as employing low noise equipment where possible.							
Decommissioning and Closure																	
Soil	Heavy vehicle traffic to remove infrastructure from the site and return topsoil	Soil compaction	2	3	2	2	8	36	High	Restrict traffic to areas where decommissioning is taking place as well as existing haul roads	2	3	2	2	2	28	Medium
	Possible oil and fuel spills from vehicles and equipment used for decommissioning	Soil chemical pollution	2	3	2	2	2	28	Medium	Check vehicles and equipment entering the site for oil and fuel leaks and inspect the site for possible spillages	1	1	1	2	2	12	Low
Post Closure																	
Soil	Areas where revegetation has not been successful will be exposed to wind and water energy	Soil erosion	2	3	2	2	2	23	Medium	Conduct regular monitoring and use geo-textiles to protect bare soil surfaces or alternative seed mixes to establish vegetation cover	1	1	1	2	2	12	Low

Table 27: Criteria of assigning significance to potential impacts

INTENSITY OF IMPACT	RATING
Insignificant: impact is of a very low magnitude	1
Low: impact is of low magnitude	2
Medium: impact is of medium magnitude	3
High: impact is of high magnitude	4
Very high: impact is of highest order possible	5

EXTENT OF THE IMPACT	RATING
Limited: impact affects the project site	1
Small: impact extends to the boundaries of the mining area	2
Medium: impact extends to neighbouring properties	3
Large: impact affects the surrounding communities	4
Very Large: The impact extends beyond the neighbouring communities	5

DURATION OF THE IMPACT	RATING
Very short-term: impact lasts for a very short time (less than a month)	1
Short-term: impact lasts for a short time (months but less than a year)	2
Medium-term: impact lasts for the for more than a year but less than the life of operation	3
Long-term: impact occurs over the operational life of the proposed extension.	4
Residual: impact is permanent (remains after mine closure)	5

PROBABILITY	RATING
Highly Improbable: Likelihood of the impact arising is estimated to be negligible; <5%. 1	1
Improbable: Likelihood of the impact arising is estimated to be 5-35%. 2	2
Possible: Likelihood of the impact arising is estimated to be 35-65% 3	3
Probable: Likelihood of the impact arising is estimated to be 65-95%. 4	4

Highly Probable: Likelihood of the impact arising is estimated to be > 95%. 5	5

SIGNIFICANCE	RATING
Low	L
Low-Medium	L-M
Medium	M
Medium-High	M-H
High	H

Intensity Rating		
Rating		**Description**
0-4	Very Low	Impacts will not influence the development, social , cultural or natural environment
5-12	Low	Impacts will result in short term effects on the social and / or natural environment. The impacts merits attention however are not deemed largely substantial are likely to have little real effect
13-26	Medium	Impacts will have a medium-term effect on the social and/or natural environment. These impacts need to be considered as constituting a fairly important and usually medium term change to the environment, these impacts can be mitigated by implementing effective mitigation measures.
27-44	High	Effects will be long term on social economic and or bio-physical environment. The impacts could have a major effect on the environment. This may bring forth the consideration of no-go areas/open areas on the 72 development land regardless of mitigations implemented. Mitigation is however possible.
45>	Very High	High Whereby effects will be permanent on the social economic and or bio-physical environment. Such impacts cannot be mitigated.

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

The mining activities will have positive impact to the surrounding community that is +-8 km away. Employment opportunities that will be provided by the proposed project will improve socio economic standard of the surrounding community of Siyancuma.

Mining activities will have positive impact however they also have negative impacts on the receiving environment and other aspects on the surrounding area. Table 28 shows the negative impacts as a result of the proposed mining activities.

Table 28: Summary of the positive and negative implications and risks of the proposed activity and identified alternatives.

Negative impacts	Description of the impacts
Surface disturbances	Surface disturbance will occur as a result of boreholes that are to be drilled. The compaction of ground will also occur during construction and mining phases.
Air pollution	Dust will be generated from the movement of vehicles and the mining equipment. Emissions of smoke from vehicles which are not well serviced.
Noise pollution	Noise from vehicles, mining machineries will be created during the mining period which may affect the land owner, neighbouring/ adjacent farm owners.
Soil pollution	Contamination of soil may occur from accidental hydrocarbon spillages from the machineries, hydrocarbon storage and refuelling point
Vegetation loss	Where new roads will be created, the vegetation will be disturbed and/or destroyed. Removal of vegetation will lead to vegetation loss. Where the firebreak will be created, the vegetation will be disturbed and/or destroyed. Vegetation cover will be disturbed and / or destroyed where the stockpile areas will be established.

Fauna disturbances	Animals within the mining area will automatically relocate to other places.
Loss of authentic value	Littering of domestic and industrial waste during mining.
Topography	Excavation will disturb the topography of the area.
Surface and ground water contamination	If accidental hydrocarbons spills are not removed with immediate effect after they spill, this may lead to surface and ground water contamination.
Health risk to workers or general public	This can happen if workers or general public members inhale excessive dust or drink contaminated water as a result of the mining activities taking place. This can also occur if the Mine Health and Safety Act is not implemented
Heritage site	Existing heritage features may be disturbed during the construction and operational phases.
Veld Fire	Veld fire may occur as a result of negligence or improper awareness.
Conflict of land use	Mining activities will have conflict with the current land-use.
Farm animals theft/ poaching	This may occur if access to the farm is not controlled. Lack of awareness classes.

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

Mitigation measures must be implemented in order to minimise the impacts caused by the proposed project activities. The mitigation measures ensure that the project considers the environment and the predicted impacts in order to minimise impacts and achieve sustainable development. These measures are discussed more in detail in Chapter 15 of this report as well as in Part B or the EMPr section.

9.5 The outcome of the site selection Matrix. Final layout plan

The site layout as presented in Figure 3 is not necessarily final, this will still be assessed to make sure that it does not coincide with the sensitive environmental features that have been identified by the specialist studies such as the surface and ground water resources, burial sites, abandoned buildings as well as infrastructure such as roads, railway line etc. If any heritage

resources are discovered during the mining activities, the layout plan will definitely have to change.

9.6 Motivation where no alternatives sites were considered

The applicant was interested in applying for a diamond prospecting licence with the hope of eventually mining the deposit. Different sites were analysed for potential diamond mineralisation, some properties did not have sufficient quantities or had little potential to host diamonds. Some already had existing diamond prospecting licenses. The above reasons led the applicant to disregard the properties for an application of a diamond prospecting licence.The application for prospecting was processed and eventually led to the application for a mining right.

9.7 Statement motivating the preferred site

The site is preferred for its potential to host the diamond orebody. This is based on its geological location and supported by a desktop study conducted on the area. Specialist studies conducted on the study area have identified some sensitive environmental features but have not ruled the site out for mining activities. Recommendations given by specialists will be followed in order to minimise and mitigate the impacts that will be caused by mining activities.

10. FULL DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY, ACCESS AND RANK THE IMPACTS AND RISKS THE ACTIVITY WILL IMPOSE ON THE PREFERRED SITE (IN RESPECT OF THE FINAL LAYOUT PLAN) THROUGH THE LIFE OF THE ACTIVITY

The process of identifying, accessing and ranking the impacts the activity will have on the preferred site involved stakeholders and specialist studies.

Through the Public Participation Process (PPP), meetings with the stakeholders will form part of the process in order to introduce the stakeholders to the proposed project and for them to give feed back on how they think the project will affect them and the environment they live in. The PPP is still in process, where stakeholders will be notified of every stage that the proposed project is at. Comments made by stakeholders will be incorporated in this report. In conjunction with the PPP, specialist studies were conducted on the application area to identify, access and recommend mitigation measures for the impacts. The specialist studies conducted are:

- Hydropedology, Soil and Land Capability
- Surface Water
- Hydrogeology
- Ecology
- Wetland study
- Palaeontological Impact Assessment

The studies have concluded that the proposed activities will have impacts on the receiving environment. Recommendations on how the impacts can be avoided where possible, minimised and mitigated were made.

Criteria that will be used in assessing the environmental aspects will include, but not limited to: Nature of impact, extent, duration, probability, severity, intensity and significance.

11. SUMMARY OF SPECIALIST REPORTS

Specialist studies conducted on the proposed mining area are summarised in the Table below

Table 29: Summary of specialist reports

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED
Ecological Study Assessment	Although there is a variety of highly sensitive ecological receptor in the area including the surrounding area, the current mining development components are restricted to areas of moderate to low sensitivity. A further characteristic is the low extent of habitat loss and ecological interference resulting from the mining development components. The major impacts associated with the development are likely to occur during the construction phase of the development, with operational phase impacts generally being very low on account of the low disturbance levels likely to be generated at this time. Many of the construction phase impacts cannot be fully mitigated as they are	X	Part A: EIR Part B of the EMPr

	unavoidable consequences of the development, but they can be mitigated accordingly Important mitigation recommendations associated with the mining development would include ensuring that the disturbed footprint is kept to a minimum, translocation sensitive species prior to construction/mining site clearance and ensuring compliance to the recommended mitigation measures by any contractors (project proponent) used on the project. Provided that the mitigation measures as suggested can be implemented, then the overall impact of the development components would be of low overall significance and it is not likely that the development would result in an overall net loss of biodiversity or long-term degradation of the receiving environment.		
Surface Water Hydrology Study	The proposed activity is for alluvial diamond mining of which this mining takes place along the flood plains of the water course. Appropriate baseline information including rainfall data, depth-duration-frequency design rainfall estimates, evaporation data as well as both regional and local hydrological characteristics have been considered for the proposed mining project site. Peak flows and hydrographs were developed as part of this study for the catchment over the site. The HEC-RAS model was applied to provide an indication of what	X	Part A: EIR Part B of the EMPr

	areas would be inundated by the respective flood flows for 1:50 and 100 – year events. The results were in compliance with Government Notice 704 (Government Gazette 20118 of June 1999). As such, the buffers have been included to ensure that where the flood line is less than 100 metres away from the watercourse, then a minimum watercourse buffer distance of 100 metres is maintained with respect to the location of slime dams, stockpile dump site, and other dirty water infrastructure areas. Surface water samples were analysed to ensuring baseline water quality can be quantified prior to mining with potential impact subsequently monitored and quantified over time. An analysis of mean annual runoff was undertaken as part of the study using the WR2012 dataset. The WR2012 mean annual estimate of runoff for the study area has been decreasing since 1990 until 2012. The site's MAR contribution to the quaternary catchment was 3% pre-development and this was expected to decrease during the mining phase. On account of the average climate characterized by average evaporation rates exceeding the average rainfall, streamflow across the side was non-perennial, however, a perennial Riet River flows adjacent the study site which joins the Vaal River in Douglas. There may be excess stream flows in the wet season that would need to be appropriately managed within the proposed mining right area.		

	This baseline study, therefore, indicates that the proposed open cast mining project may not have a significant impact on the hydrology of the study area and the entire quaternary catchment C51M. However, caution should be exercised to ensure that the river courses are protected.		
Hydrogeological Studies	● Possible sources for groundwater contamination are fuelled leakage, spillage from machinery and waste. DWS overarching water quality management principles are; (1) protection of human health and (2) protection of the environment. It is therefore recommended that 2 boreholes should be drilled to monitor groundwater level fluctuation and also groundwater quality biannually. The first borehole should be drilled adjacent Riet River to monitor pollution plume towards the river, the second borehole should be drilled on the western side of the proposed mining area to monitor water level and pollution towards the irrigated land and the household's borehole. ● Groundwater should be treated before used for domestic purposes ● The aquifer risk assessment was ranked medium and therefore it needed medium protection from the proposed	X	Part A: EIR Part B of the EMPr

	activities ● Based on the observations and analysis conducted for the study area, it is therefore envisaged that the mining activity may have minimal impacts on the receiving environment and should be granted provided that the mitigation is implemented.		
Palaeontological Impact Assessment	Due to the proximity of dolerite intrusions to the potentially fossiliferous Ecca Group rocks at the study site, it is likely that its fossil content was destroyed through thermal metamorphosis. In the rare event that a significant fossil find is made in the Quaternary deposits or in the sedimentary rocks of the Karoo Supergroup rocks during construction, the ECO should take the following steps: **Procedure For Chance Palaeontological Finds** Extracted and adapted from the National Heritage Resources Act, 1999 Regulations Reg No. 6820, GN: 548. The following procedure must be considered in the event that previously unknown fossils or fossil sites are exposed or found during the life of the project: 1. Surface excavations should continuously be monitored by the ECO and any fossil material be unearthed the excavation must be halted. 2. If fossiliferous material has been disturbed during the excavation	X	Part A: EIR Part B of the EMPr

	process it should be put aside to prevent it from being destroyed. 3. The ECO then has to take a GPS reading of the site and take digital pictures of the fossil material and the site from which it came. 4. The ECO then should contact a palaeontologist and supply the palaeontologist with the information (locality and pictures) so that the palaeontologist can assess the importance of the find and make recommendations. 5. If the palaeontologist is convinced that this is a major find inspection of the site must be scheduled as soon as possible in order to minimise delays to the development. From the photographs and/or the site visit the palaeontologist will make one of the following recommendations: a. The material is of no value so development can proceed, or: b. The fossil material is of some interest and a representative sample should be collected and put aside for further study and to be incorporated into a recognised fossil repository after a permit was obtained from SAHRA for the removal of the fossils, after which the development may proceed, or: c. The fossils are scientifically important and the palaeontologist		

	must obtain a SAHRA permit to excavate the fossils and take them to a recognised fossil repository, after which the development may proceed. 6. If any fossils are found then a schedule of monitoring will be set up between the developer and palaeontologist in case of further discoveries.		
Hydropedology, Soil and Land Capability	**Soil management during the construction phase** From the perspective of conserving the soil properties that will aid mine rehabilitation during the closure phase, the key factors to consider during the preparation for the construction phase of the mining project are to minimise the area affected by the development, minimise potential future contact of toxic or polluting materials with the soil environment and to maximise the recovery and effective storage of soil material that will be most useful during the rehabilitation process after mining is complete. Some of these measures will minimise a combination of impacts simultaneously while other measures are specific to one impact. **Soil management during the operational phase** Soil management should be an on-going strategy through the operational phase as soil disturbing activities will continue in areas	X	Part A: EIR Part B of the EMPr

	where mining continues, and new areas are developed through mining activities. As new stockpiles are created, they should be re-vegetated immediately to prevent erosion and resulting soil losses from these stockpiles. It is recommended that vegetation removed during land clearance be composted during the operational phase and that this compost is used as a soil ameliorant for soil rehabilitation purposes. **Soil management during the decommissioning/rehabilitation phase** At decommissioning, the pits will be backfilled and covered with a layer of topsoil. Some regarding and re-contouring will be carried out. Soil management in the decommissioning phase will include the following: ● **Site preparation** Once the site has been cleared of infrastructure and potential contamination, the slope must be re-graded (slope) in order to approximate the pre-mining aspect and contours. The previous infrastructure footprint area must be ripped a number of times in order to reduce soil compaction. The area must then be covered with topsoil material from the stockpiles. ● **Seeding and re-vegetation** Once the land has been prepared, seeding and re-vegetation will		

	contribute to establishing a vegetative cover on the disturbed soil as a means to control erosion and to restore disturbed areas to beneficial uses as quickly as possible. The vegetative cover reduces erosion potential, slows down runoff velocities, physically binds soil with roots and reduces water infiltration through evapotranspiration. Indigenous species will be used for the re-vegetation, the exact species will be chosen based on research available and then experience as the further areas are re-vegetated. **Soil management during the closure phase** During the closure phase activities include the maintenance and aftercare of final rehabilitated land. In this regard, frequent visual observations should be undertaken to confirm if vegetation has re-established and if any erosion gulleys have developed. In the event that vegetation has not re-established and erosion gulleys have developed, remedial action should be taken.		
Wetland Assessment and Delineation	Pan/Depression, as well as flood plain wetland units, have been identified on site. The presence of the wetland is important to an area for a number of reasons,	X	Part A: EIR Part B of the EMPr

	as these wetlands must not be affected in any way by the development. The wetland areas and associated buffer must be kept free from all development unless authorised by a water use licence. The most important potential impacts that the proposed development could exert on the wetland relate to the (indirect) impact of sedimentation as well as water quality issues. It is important that stormwater from the surrounding development be discharged in such a way as to not affect the hydrological or morphological state of the wetland. In order to best conserve the wetland areas ● No mining should take place within a wetland area; ● A 50 meters' buffer zone has been provided for all pans/depressions wetlands on site; ● Due to the sensitivity and the importance of the		

	river a 100 meters' buffer zone has been provided for the Floodplain wetlands; and ● All the proposed buffer-zones must not have encroached during the mining phase. The provided buffer-zones are to create a 'no go' zone for any vegetation removal or activity that allows the wetland and river enough space to ensure that the habitat integrity is maintained and the human footprint does not encroach on it. The buffer zone also ensures that mining activities do not occur at temporary wetland zones, which are zones that would be wet during wetter seasons, years or floods.		

12. ENVIRONMENTAL IMPACT STATEMENT

12.1 Summary of the key findings of the environmental impact assessment

- The proposed mining activity will have minimal potential for groundwater contamination ad therefore should be granted provided that the mitigation is implemented;
- A large portion of the study area is classified under Moderate Palaeontological Sensitivity where only a desktop study is required followed by Insignificant Palaeontological Sensitivity where no palaeontological studies are required ;
- It was identified during Environmental Impact Assessment that if all negative impacts are avoided and where they cannot be avoided they can still be mitigated and managed throughout the lifespan of the mining activities, they will be insignificant;
- The area studied for the proposed opencast diamond mine and supporting infrastructure has a *"wilderness land"* land capability. Although the Shortlands form in this area has wilderness land capability, no areas of the study site are currently used for crop production. Livestock farming has been observed on site. The proposed opencast diamond mine and supporting infrastructure project and will have high to medium impacts upon soil and land capability properties as well as current land uses in the areas where the footprint will cause a surface disturbance. These impacts can be reduced by keeping the footprint minimised where possible and strictly following soil management measures pertaining to the minimisation of compaction and management and monitoring of any possible soil pollution sources such as vehicles traversing over the site;
- The major impacts associated with the development are likely to occur during the construction phase of the development, with operational phase impacts generally being very low on account of the low disturbance levels likely to be generated at this time. Many of the construction phase impacts

cannot be fully mitigated as they are unavoidable consequences of the development, but they can be mitigated accordingly;

- This baseline study, therefore, indicates that the proposed open cast mining project may not have a significant impact on the hydrology of the study area and the entire quaternary catchment C51M. However, caution should be exercised to ensure that the river courses are protected;
- The most important potential impacts that the proposed development could exert on the wetland relate to the (indirect) impact of sedimentation as well as water quality issues. It is important that stormwater from the surrounding development be discharged in such a way as to not affect the hydrological or morphological state of the wetland.

12.2 Final Site Map

A map showing the environmental features, land use and the proposed project supporting infrastructure has been attached as shown in Figure 3 and in Appendix F . The map is subject to revision where required, the final revised maps showing the layout of the proposed project will be submitted to the DMR on granting of the mini+--mining right.

12.3 Summary of the positive and negative implications and risks of the proposed activity and identified alternatives

The proposed project will have implications on the society and the environment of Siyancuma. Mining activities will create jobs for the local communities as well as lead to the upliftment of the communities in the form of jobs and other services that will be provided to the community due to the presence of a mine. Skills development, training and mentoring as well as health services will form part of the benefits to the community. The local economy will certainly improve.

Although mining activities have impacts on the environment, the specialist studies conducted have concluded that mining can still take place as long as the mitigation measures are followed . The planned activities negative impacts can be controlled and avoided or minimised. Mitigation measures suggested by specialist studies will be used to manage and control any potential impact.

The negative impacts to the environment and the community will include:

Poor access control to farms may impact on cattle movement, breeding and grazing practices;

Potential water and soil pollution resulting from hydrocarbon spillages and soil erosion which may impact on the water resources utilised by the communities and landowners;

Potential water and soil pollution resulting from hydrocarbon spills and soil erosion which may impact on ecosystem functioning;

Influx of job seekers to site may compromise safety and security of farm dwellers;

Potential visual impacts by mining activities as well as vegetation clearance;

Increased vehicle activity within the area resulting in potential destruction and disturbance of flora and fauna as well as increased ambient noise levels.

13. PROPOSED IMPACT MANAGEMENT OBJECTIVES AND THE IMPACT MANAGEMENT OUTCOMES FOR INCLUSION IN THE EMPr

The EMP objectives:

The main objective of the EMPr is to provide information, guideline, and management measures to be implemented during the mining period. By following the information provided on the EMPr, impacts on the environment, cultural and social aspects will be avoided. Sensitive areas will not be disturbed if the EMP document is implemented effectively.

The applicant will operate on the principle that “prevention is better than cure” and so will institute procedures to reduce the risk of environmental emergencies from taking place. These will include ensuring that all contracts specify that the contractors are required to comply with all the environmental

measures specified in the EMP document, environmental awareness training, on-going risk assessment and emergency preparedness.

Through implementation of the proposed mining activities and the mitigation measures it is anticipated that the identified environmental impacts, heritage impacts and social economic conditions aspects could be mitigated and managed successfully. Through implementation of the mitigation and management measures within the EMPr, it is anticipated that through the following management or mitigation measures impacts can be effectively managed:

- Theft risk can be mitigated through avoiding accommodating employees on site and restriction of access to employed people only;
- Surface disturbances, visual impact and topographic changes could be minimised by practising concurrent rehabilitation throughout the mining period. By doing this the area can easily be returned to its natural state;
- Surface and ground water pollution can be avoided by management of contaminated soil and by avoiding accidental hydrocarbon spills;
- Noise pollution can be managed by putting necessary silencers on machines and through communication with the affected parties and also environmental awareness of the employees;
- In terms of emergencies responses, all employees will be equipped with emergency services numbers, including the local emergency response unit and fire fighting service. All employees should be made aware of emergency procedures that are to be followed during emergencies.

Monitoring of the required mitigation measures will have to take place daily on site by the appointed Environmental Control Officer (ECO). Annual monitoring audits are to take place by an appointed independent EAP to compile the required annual environmental compliance report required by the DMR.

14. FINAL PROPOSED ALTERNATIVES

Changes to the initial layout plan will only be made if it is identified that the environmental features and the palaeontological resources mentioned in the specialist reports will in any way be disturbed by the proposed mining activities. The current site plan is designed in a way that does not disturb the identified these resources and the environmental features.

15. ASPECTS FOR INCLUSION AS CONDITIONS OF AUTHORISATION

Any aspects which have not formed part of the EMPr that must be made conditions of the Environmental Authorisation

- The applicant or the Project Manager (PM) must inform the farm owners and adjacent farm owners 30 days prior to any commencement of the mining activities;
- A map showing the mining or excavation locations should be submitted to the relevant landowners, the DWS and DMR prior to the commencement of the mining activities;
- The applicant must appoint security officials in order to control access to the mining area to avoid theft and burglary;
- No activities may be undertaken within 500 m of wetlands and/or within 100 m of watercourses without approval from the DWS;
- The financial provision must be adjusted annually by means of guarantee and or by provision and submitted to DMR;
- A minimum distance of 500 m from any dwellings or infrastructure must be kept and
- No relocation of heritage resources may be undertaken without the approval of SAHRA.

16. DESCRIPTION OF ANY ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

The assumptions made and the gaps in knowledge with regard to this project are as follows:

- The public participation process will provide ample opportunity for stakeholders to express any issues and concerns.
- It is assumed that information provided by Maxwill is accurate;
- The gaps of this EIA report are that it does not include final comments from competent authorities and other state departments. Uncertainties also exist on the actual final size, extent and depth of the opencast pits. The final size will only be known when actual mining activities have taken place;
- The Draft EIAR/EMPR will be updated and comments from the stakeholders will be incorporated into the Final EIAR/EMPR to be submitted to the DMR;
- It is assumed that the specialist studies completed ie. Palaeontological Impact Assessments, Surface water Hydrology, Ecological Study, Soil, Land use and Land Capability as well as Hydrogeological Assessment study for this project to assess the baseline information are sufficient.

17. REASONED OPINION AS TO WHETHER THE PROPOSED ACTIVITY SHOULD OR SHOULD NOT BE AUTHORISED

Desktop studies conducted on the proposed study location indicated that there is potential for diamond mineralisation. This was also confirmed through prospecting which influenced the current stage of mining. The majority of impacts after mitigation are rated as low to medium. All impacts have been assessed, evaluated and mitigation measures are in place to minimize any disturbance as a result of mining activities. Monitoring of activities will take place on site every two weeks by the ECO and daily by the PM. Annual

monitoring audits will be done by an appointed independent EAP to compile the required annual Environmental Compliance report by the DMR. The Environmental Compliance report will then be submitted to the competent authority. The EAP therefore does not foresee any reason why the activities should not be authorised.

17.1 Conditions that must be included in the authorisations, compilation and approval of EMPr

- A copy of authorisations must be kept on site where the activities are taking place. The authorisation must be produced to any authorised official of the competent authority upon requests and must be made available for inspection by any employee or agent of the holder of the authorisation who works or undertakes work at the property;
- Where any of the applicant's contact details changed, including the name of the responsible person where the applicant is a juristic person, the physical or postal address and/or telephonic details, the applicant must notify the DMR as soon as the new details become known to the applicant;
- The holder of the authorisation must notify the department, in writing and within twenty four (24) hours, if any condition of this authorisation cannot be or is not adhered to. Any notification in terms of this condition must be accompanied by reasons for the non-compliance. Non-compliance with a condition of this authorisation may result in criminal prosecution or other actions provided for in the National Environmental Management Act 107 of 1998 and its regulations;
- All areas on site that are disturbed must be rehabilitated using locally occurring indigenous plant species;
- The mining site must be clearly demarcated; clear signage must be erected; and access controlled;
- Faunal species should not be trapped at any given chance, killed or hunted during all phases of the mining work;

- Appointed ECO should visit the area at least once a week and Site Manager on a daily basis.
- The EMPr, Environmental Authorisation and the layout plan must always be on site during mining activities.
- A minimum distance of 500 m from any dwellings or infrastructure must be kept;
- Landowners as well as land occupiers must be re-consulted at least 30 days prior to any mining activities undertaken on their properties;
- A map detailing the mining and infrastructure locations should be submitted to the relevant landowners, the DWS and DMR prior to the commencement of the mining activities;
- No activities may be undertaken within 500 m of wetlands and/or within 100 m of watercourses without approval from the DWS;
- A wetland delineation study must be conducted before commencement of the mining activities;
- No relocation of heritage resources may be undertaken without the approval of SAHRA
- Planning of mining sites including design and siting of access routes must avoid heritage sites.
- Graves must be avoided and protected insitu. Where not possible, they must be exhumed by qualified professionals;
- Any water abstracted from the water resources for the use in mining activities requires a General Authorisation/Water Use License in terms of the National Water Act 36 of 1998 from the Department of Water and Sanitation. The applicant must obtain an authorisation, either through a water use license or general authorisation, for the abstraction of water from a surface body for use in mining activities.;
- If fossiliferous material has been disturbed during the excavation process it should be put aside to prevent it from being destroyed;
- The fossils are scientifically important and the palaeontologist must obtain a SAHRA permit to excavate the fossils and take them to a recognised fossil repository, after which the development may proceed.

12.2 Rehabilitation requirements

Final rehabilitation, decommissioning and closure plan. GNR 1147 lists a number of requirements for the final Rehabilitation, Decommissioning and Closure Plan. This plan must include or describe the following:

- Must be measurable and auditable;
- Must take into consideration the proposed post-mining end use of the affected area;
- Must contain information that is necessary for the definition of the closure vision, objectives, design, and relinquishment criteria;
- Indicate what infrastructure and activities will ultimately be decommissioned, closed, removed and remediated;
- The risk drivers determining actions, indicating how the closure actions will be implemented to achieve closure relinquishment criteria; and
- Indicate monitoring, auditing and reporting requirements.

Mining Rehabilitation Closure and Liability Plan addresses the requirements stipulated above as soon as the final site layout detailing all infrastructures associated to the mining activities have been defined and finalised.

18. PERIOD FOR WHICH ENVIRONMENTAL AUTHORISATION WILL BE REQUIRED

The Environmental Authorisation will be required for a period of 10 years.

19. UNDERTAKING

The requirements of this section are provided at the end of the EMPr.

20. FINANCIAL PROVISION

The amount that is required to both manage and rehabilitate the environment in respect of rehabilitation is **R 591, 765**

Table 30 : Cost estimate

CALCULATION OF THE QUANTUM

Applicant: **MAXWILL 146 CC** **DMR Ref No:** **NC30/5/1/2/2/10148MR**

Evaluators: **Ndi Geological Consulting Service (Pty) Ltd** **Date:** **9/12/2019**

No.	Description	Unit	A Quantity	B Master Rate	C Multiplication factor	D Weighting factor 1	E=A*B*C*D Amount (Rands)
1	Dismantling of processing plant and related structures (including overland conveyors and powerlines)	m3	200	14.55	1	1	2910
2 (A)	Demolition of steel buildings and structures	m2	0	202.63	1	1	0
2(B)	Demolition of reinforced concrete buildings and structures	m2	0	298.61	1	1	0
3	Rehabilitation of access roads	m2	5000	36.26	1	1	181300
4 (A)	Demolition and rehabilitation of electrified railway lines	m	0	351.93	1	1	0
4 (A)	Demolition and rehabilitation of non-electrified railway lines	m	0	191.96	1	1	0
5	Demolition of housing and/or administration facilities	m2	0	405.26	1	1	0
6	**Opencast rehabilitation including final voids and ramps**	**ha**	**0.45**	**206254.16**	**0.52**	**1**	**48263.47344**
7	Sealing of shafts adits and inclines	m3	0	108.78	1	1	0
8 (A)	Rehabilitation of overburden and spoils	ha	0.04	141626.44	1	1	5665.0576
8 (B)	Rehabilitation of processing waste deposits and evaporation ponds (non-polluting potential)	ha	0	176393.17	1	1	0
8 (C)	Rehabilitation of processing waste deposits and evaporation ponds (polluting potential)	ha	0	512329.37	1	1	0
9	Rehabilitation of subsided areas	ha	0	118590.81	1	1	0
10	General surface rehabilitation	ha	1	112192.03	1	1	112192.03
11	River diversions	ha	0	112192.03	1	1	0
12	Fencing	m	500	127.98	1	1	63990
13	Water management	ha	0	42658.57	1	1	0
14	2 to 3 years of maintenance and aftercare	ha	0.5	14930.5	1	1	7465.25
15 (A)	Specialist study	Sum	0			1	0
15 (B)	Specialist study	Sum				1	0
					Sub Total 1		421785.811
1	Preliminary and General		50614.29732		**weighting factor 2** 1		50614.29732
2	Contingencies		42178.5811				42178.5811
					Subtotal 2		514578.69
					VAT (15%)		77186.80
					Grand Total		**591765**

20.1 Explain on how the aforesaid amount was derived

The amount was derived using a DMR Guideline format which makes use of a set template for which defined rates and multiplication factors are used. The multiplication and weighting factors which ultimately define the rate to be used are determined by amongst others the topography, classification of the mine according to the mineral mined, the risk class of the mine and its proximity to built-up or urban areas.

The calculations included costs such as general surface rehabilitation, demolition of infrastructure, opencast rehabilitation, specialist studies amongst others.

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

The financial provision of **R 591, 765** will be provided for from operating expenditure. The applicant intends to make this financial provision to DMR in a form of bank guarantee or cash deposit.

21. DEVIATIONS FROM THE APPROVED SCOPING REPORT AND PLAN OF STUDY

21.1 Deviations from the methodology used in determining the significance of potential environmental impacts and risks

21.2

No deviations from the Draft and/or Final Scoping report have been made

21.2 Motivation for the deviation

No suggestions have been made by I&APs that justified deviations from the Final Scoping Report.

22. OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

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

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

I. Coordination and cooperation between organs of state in the consideration of assessments where an activity falls under the jurisdiction of more than one organ of state;

II. that the findings and recommendations flowing from an investigation, the general objectives of integrated environmental management laid down in this act and the principles of Environmental Management set out in section 2 are taken into account in any decision made by an organ of state in relation to any proposed policy, programme, process, plan or project;

III. that a description of the environment likely to be significantly affected by the proposed activity is contained in such application;

IV. investigation of the potential consequences for or impacts on the environment of the activity and assessment of the significance of those potential consequences or impacts; and

V. public information and participation procedures which provide all interested and affected parties, including all organs of state in all spheres of government that may have jurisdiction over any aspect of the activity, with a reasonable opportunity to participate in those information and participation procedures; and

b. must include, with respect to every application for an Environmental Authorisation and where applicable –

I. investigation of the potential consequences or impacts of the alternatives to the activity on the environment and assessment of the significance of those potential consequences or impacts, including the option of not implementing the activity;
II. investigation of mitigation measures to keep adverse consequences or impacts to a minimum;
III. investigation, assessment and evaluation of the impact of any proposed listed or specified activity on any national estate referred to in section 3(2) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999), excluding the national estate contemplated in section 3(2)(i)(vi) and (vii) of that Act;
IV. reporting on gaps in knowledge, the adequacy of predictive methods and underlying assumptions, and uncertainties encountered in compiling the required information;
V. investigation and formulation of arrangements for the monitoring and management of consequences for or impacts on the environment, and the assessment of the effectiveness of such arrangements after their implementation;
VI. consideration of environmental attributes identified in the compilation of information and maps contemplated in subsection (3); and
VII. provision for the adherence to requirements that are prescribed in a specific Environmental Management Act relevant to the listed or specified activity in question." Section 24 (3)(a) and (7) of NEMA states the following:

"24 (3) The Minister, or an MEC with the concurrence of the Minister, may compile information and maps that specify the attributes of the environment in particular geographical areas, including the sensitivity, extent, interrelationship and significance of such attributes which must be taken into account by every competent authority."

"24 (7) Compliance with the procedures laid down by the Minister or an MEC in terms of subsection (4) does not absolve a person from complying with any

other statutory requirement to obtain authorization from any organ of state charged by law with authorising, permitting or otherwise allowing the implementation of the activity in question."

22.1.3 The purpose of Part A and Part B of this report fulfills the requirements stipulated in section 24 of NEMA. This report resulted with the outcomes of the detailed impact assessment carried out and provides recommendations from a broad spectrum of expertise. Impact on the socio-economic conditions of any directly affected person

Negative impacts on directly affected parties:

- Livestock theft as a result of uncontrolled access to the farm;
- Potential water and soil pollution as a result of neglected soil contamination;
- Negative visual impact;
- Dust generation;
- Surface disturbances as a result of mining;
- Impact on the livestock within the farm as results of drilled boreholes and sample trenches.

Positive impacts on directly affected parties:

- Establishment, repairs and upgrade of roads on farm will aid to improve the economic conditions of the farm.
- Employment opportunities will improve socio economic standard of the surrounding community.
- Mitigation measure to the impacts of the socio-economic condition of any directly affected person:
- Reasonable and effective methods must be implemented to reduce the liberation of dust from operational activities;
- Dust suppression measures such as water dampening from trailer to be used if and when required;

- Mine staff will train all staff on recognition and importance of fauna and livestock.
- Hunting, snaring, capturing or interfering with any fauna and landowner's livestock is forbidden and will be a punishable offence;
- The areas demarcated for mining must be the minimum reasonably required which will involve the least possible disturbance to the environment and must be fenced to restrict any fauna entering the drilled and trenched area;
- Drilled boreholes must be capped with steel or concrete immediately after drilling completed.
- Using drip trays and taking precautions on the refuelling point. If any soil is contaminated during the life of the mining activities, it will be immediately scooped, bagged and stored in the enclosed containers or plastic to be removed with the industrial waste to a recognized licensed facility for further treatment. Small spills will be treated on site using bio-sorb, bio-shock or oil cap. This will minimise surface or ground water pollution;
- The current land use is farming/grazing land and after rehabilitation of all disturbed area as a result of mining activities, the area will be returned to its possibly original state and can again be used as a grazing land.

22.1.4 Impact on any national estate referred to in section 3 (2) of the National Heritage Resources Act

Although no significant archaeological materials were identified on the proposed mining site, the applicant is reminded that unavailability of archaeological material does not mean absence, archaeological material might be hidden underground, and as such the applicant is reminded to take precautions during mining. The proposed mining may be approved subject to the following recommendations:

- No mining activities are allowed within 20m range from the recorded burial
- Mining teams must be informed of the existence of burial sites and the potential of encountering unmarked graves within the mining site.

A palaeontological desktop study was conducted which rated the study area as a moderate palaeontological sensitivity area where only a desktop study is required.

22.1.5 Other matters required in terms of sections 24(4)(a) and (b) of the Act

The significant identified impacts investigated by specialists who informed the EIR findings are considered sufficient. Should any other potential impacts be identified during the public participation process, they will be considered and incorporated in the report.

PART B: ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1. DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

1.1 Details of EAP

Details of the EAP are included in Part A Section 3.1

1.2 Description of the Aspects of the Activity

The EAP hereby confirms that the requirements to describe the aspects of the activity that are covered by the draft EMP are included in Part A of this report.

1.3 Composite Map

Appendix F shows a composite map with superimposed activities that will take place on the mining site.

The specialist studies conducted on the proposed project location identified impacts that the project will have on the environment. The impacts can however still be minimised if mitigation measures are implemented. Some of the environmental features identified by specialist studies are the Riet River. The current composite map is created in a way that seeks to avoid the environmental feature and leaving the correct buffer distances. Although all the known environmental features have been taken into consideration when creating the map, more archaeological materials could still be discovered during mining and the composite map will have to be adjusted accordingly.

1.4 Description of impact management objectives including management statements

1.4.1 Determination of closure objectives

The goal upon decommissioning and closing of the mining activities will be communicated with all relevant parties. Decommissioning includes mitigation of all negative environmental impacts and that there are no amendments to the

receiving environment. Disturbed areas will be back filled and shaped to an acceptable state and in line with environmental legislation and policies.
It should be noted that upon closure all disturbed areas will be back filled and rehabilitated. The Environmental Management Programme has been prepared to provide basic environmental management for the contractors, employees, and visitors to the mining area.

Specific attention will be given to the following:

- To prevent the sterilization of any ore reserves;
- To prevent the establishment of any permanent structures or features during mining period;
- To manage and limit any impact to the surface and groundwater aquifers in such a way that an acceptable water quality and yield can still be obtained, when a closure certificate is issued;
- To safeguard the safety and health of humans and animals during mining period;
- The last closure objective is that the mine is closed efficiently, cost effectively and in accordance with government policy;
- Capping of all drilled boreholes;
- Back filling of trenches;
- Re-establishment of biodiversity;
- Re-establishment of vegetation species;
- Return the land to possibly its original state;
- To ensure that all fencing is left as it was in pre-mining status.

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

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

This section describes the approach taken by the EAP in preparation of Part B of this report.

Environmental Management Approach

Globally, there are a number of tools or guideline documents available to assist or describe environmental management. The purpose of an EMPr (Part B of this report) is to describe the process of managing identified potential environmental impacts and risks described in Part A of this report (EIR) throughout the entire life span (from implementation, operation, and decommissioning) of the proposed mining project. The IEM (Integrated Environmental Management) tool used for managing the identified environmental impacts by the EAP in this document is the Environmental Management System (EMS). This approach will assist the project to achieve continual improvement in environmental performance.

Specialist recommendations

A number of specialist investigations formed part of the EIA process and resulted in a number of findings and recommendations. These reports provided specific mitigation and management measures as a recommendation. These findings have been considered throughout the development of the EMPr.

1.4.3 Potential risk of Acid Mine Drainage

Acid Mine Drainage (AMD) is caused when sulphur bearing materials mix with water. The chemical formula of diamond is C, which in turn is a chemical formula for carbon. Diamond in its purest form is formed from carbon. Nitrogen can be present in diamonds in trace elements. Other elements that can be present in diamonds owing the different colours to them are amongst the others boron and hydrogen. Diamonds do not contain sulphur bearing materials and for that reason they do not pose any risk for AMD.

1.4.4 Steps taken to investigate, assess, and evaluate the impact of acid mine drainage

No steps were taken to investigate, assess, and evaluate the impact of acid mine drainage, as this potential risk is not foreseen as part of diamond mining related activities.

1.4.5 Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage

No risk expected

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

No risk expected.

1.4.7 Volumes and rate of water use required for the operation

The volume and rates will be determined with the water use license application.

1.4.8 Has a water use licence has been applied for?

Water will be abstracted from the Riet River for mining and this constitutes a Section 21 water use under Section 21 (a) Abstracting water from a water source. Consultation with the DWS is still ongoing with regard to an integrated water use licence in terms of Section 21 of the National water act 36 of 1998 to undertake the following activities is applied for:

(a) taking water from a water resource;
(b) storing water;
(c) impeding or diverting the flow of water in a watercourse;
(d) altering the bed, banks, course or characteristics of a watercourse;
(e) disposing of waste in a manner which may detrimentally impact on a water resource.

1.4.9 Impacts to be mitigated in their respective phases

Impacts to be mitigated are outlined in Table 31 below

Table 31: Measures to rehabilitate the environment affected by the undertaking of any listed activity

ACTIVITIES (E.g. For mining - drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route etc…etc…etc E.g. For mining,- excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and excavations, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)	**PHASE** (of operation in which activity will take place. State; Planning and design, Pre-Construction' Construction, Operational, Rehabilitation, Closure, Post closure).	**SIZE AND SCALE** of disturbance (volumes, tonnages and hectares or m²)	**MITIGATION MEASURES** (describe how each of the recommendations in herein will remedy the cause of pollution or degradation and migration of pollutants)	**COMPLIANCE WITH STANDARDS** (A description of how each of the recommendations herein will comply with any prescribed environmental management standards or practices that have been identified by Competent Authorities)	**TIME PERIOD FOR IMPLEMENTATION** Describe the time period when the measures in the environmental management programme must be implemented Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. .With regard to Rehabilitation, therefore state either:-. Upon cessation of the individual activity or. Upon the cessation of mining, bulk sampling or alluvial diamond mining as the case may be.
Literature Review	Planning	-	Mitigation not proposed	-	-
Geological Mapping	Planning	--	-	-	-
Geophysical Mapping	Planning	-	-	• -	-
Site establishment	Construction	1 ha	• Existing tracks must be used as far as practicable. • Avoid veld fires, • The mining area will be demarcated	The applicant will make sure that the employees comply with the standard laid out in the	Mitigation measures will be implemented when required. However, other mitigations measures such as existing

			by means of fence. • The area for fuel storage will be demarcated by means constructing a cement slab with bund walls around. • Sensitive areas like gullies and dry wash will be avoided. • Large established trees and bushes will also be avoided. • If any fauna species is found during site establishment stage, they will be relocated to other portions of the farm.	Environmental Management Programme and the Environmental Authorisation including their conditions and /or conditions identified by Competent Authority. This to be done by way of regular EATC (training) and regular Environmental inspection and auditing.	tracks will be implemented from the commencement of this activity until cessation of activity.
Vegetation clearance	Construction & Operational	1 ha	• Existing tracks must be used as far as practicable. • Large trees and bushes to be left in situ as far as is practically possible • Avoid veld fires, Where vegetation clearance is unavoidable, preferable to brush cut at surface level and retains root structure in place. • The individuals of any protected plant	• Compliance with EMPR • Compliance with Competent Authorities requests and regulation • EATC and ECO inspection	• Mitigation measures to be in place prior to activity. • In event of an critical incident with environmental significance , remedial and mitigation to be Immediately carried out

			species should be retained *in situ* wherever possible. Permits have to be obtained from NCDENC and/or DAFF for the removal of protected species from the site.		on site
Temporal construction of access roads	Construction	4ha^2	• Avoid unnecessary construction of newly roads and use existing roads. • Dust suppression methods will be implemented. • limit a speed to 30kh/h • Limit road width to 3m • Avoid new road construction over listed trees and shrubs and other sensitively identified areas such as loose sands and dry wash areas.	• Compliance with EMPR • Compliance with Competent Authorities requests and regulation • EATC and ECO inspection	• Mitigation measures to be in place prior to activity. • In event of an critical incident with environmental significance , remedial and mitigation to be Immediately carried out on site
Temporary topsoil storage area	Construction		• Remove topsoil from all areas that will be subject to excavations. • Topsoil will be stored on the high ground of the mining area outside flood plain, stockpiles will be at the maximum of 2m in height to prevent	• Compliance with EMPR • Compliance with Competent Authorities requests and regulation	• Immediate when topsoil is grubbed and stockpiled

			crushing of seed stock and micro-organisms. • Berms built around stockpile to divert storm water • Topsoil to be covered with shade cloth or netting to prevent wind removal and desiccation or • Topsoil stockpile will not be disturbed or used for construction/ maintenance of roads.	• EATC and ECO inspection	
Temporary Mobile office	Construction & Operation	0.07 ha	• On removal and rehabilitation the compacted surface will be ripped to a depth of 300mm in order to allow regrowth. • When establishing the office and veg clearance is unavoidable, preferable to brush cut at surface level and retain root structure in place to bind and hold soil and to aid rehab after removal of site office.	• Compliance with EMPR • Compliance with Competent Authorities requests and regulation	Immediate when office is installed on mine and after removal off site

Ablution area	Construction & Operation	>16m^2	• The containers will be emptied by qualified applicant regularly to avoid health risk. • Doors will be kept latched at all times to prevent toilet paper from blowing into veld. • Facility will be locked during mine closure weekends when personnel on not on site	• Compliance with EMPR • Compliance with Competent Authorities requests and regulation • EATC and ECO inspection	ongoing and with weekly regularity throughout life of mine
Settling dam		1ha	• Rehabilitate land back to arable state	• Compliance with EMPR • Compliance with Competent Authorities requests and regulation • EATC and ECO inspection	Mitigation measures will be implemented when required. However, other mitigations measures such as existing tracks will be implemented from the commencement of this activity until cessation of activity.
Vehicle parking		1ha	• The containers will be emptied by qualified applicant regularly to avoid health risk.		Mitigation measures will be implemented when required. However, other mitigations

					measures such as existing tracks will be implemented from the commencement of this activity until cessation of activity.
Water pipelines		1ha	• Rehabilitate as soon as possible	• Compliance with EMPR • Compliance with Competent Authorities requests and regulation • EATC and ECO inspection	Mitigation measures will be implemented when required. However, other mitigations measures such as existing tracks will be implemented from the commencement of this activity until cessation of activity.
Water reservoir		0.4ha	• Waste should be disposed of properly. • Spills should be cleaned up immediately	• Compliance with EMPR • Compliance with Competent Authorities requests and regulation • EATC and ECO inspection	

Contractor's camp		0.1ha	• Ensure availability of topsoil for rehabilitation purpose	• Compliance with EMPR • Compliance with Competent Authorities requests and regulation • EATC and ECO inspection	Mitigation measures will be implemented when required. However, other mitigations measures such as existing tracks will be implemented from the commencement of this activity until cessation of activity.
Temporarily storage of hydrocarbons	Construction & operational	0.05ha	• Hydrocarbon will be stored within the sealed mobile containers. • Drip trays will be placed under each stationary equipment or vehicles to avoid soil contamination which may lead to water pollution • Taking precautions on the refuelling point. • If any soil is contaminated during the life of the mining activities, it will be immediately scooped, bagged and stored in the enclosed containers or plastic to be removed	• Compliance with EMPR • Compliance with Competent Authorities requests and regulation. • EATC and ECO inspection.	Throughout Operational period of the mine.

			with the industrial waste to a recognized licensed facility for further treatment. • Small spills will be treated on site using bio-sorb, bio-shock or oil cap. • No smoking signage to be in place at Fuel Safe Storage areas. Fire Hydrant to be in place at Fuel Safe Storage areas and to be serviced, and charged.		
Mining	Operational	4499.8323 ha	• Tarpaulins will be placed on the ground to prevent oil, grease, hydraulic fluid and diesel • Spills during emergency repairs. • All oil spills will be remedied using approved methodologies. • The contaminated soils will be removed and disposed of at a licensed waste disposal facility. • All waste generated from the excavations and the campsite will be		

			collected in proper receptacles and removed top registered disposal facilities e.g., sewage treatment plant, sold waste disposal site or hydrocarbon recycling or treatment facilities. • No topsoil shall be stored within 100 m of water courses and drainage lines or within 500 m of wetlands and riparian areas. • The soils must be used for the back filling and rehabilitation of the sumps. • The rehabilitated sump must be seeded with recommended seed mix. • Migration of animal life due to disturbance caused proposed project: • Where possible drill sites shall be located within degraded environments. • Poaching will be prohibited at the mining sites.		

			• Excavation and use of campsite may result in the generation of surface water • runoff contaminated with silt (sedimentation) and possibly hydrocarbon fluids should		
Final rehabilitation	Rehabilitation	4499.8323 ha	• Topsoil will be spread over the rehabilitated area in order to allow regrowth of vegetation. All machinery will be removed from the site. • Ripping of all remaining compacted surface • Removal of all marked containers and disposed waste at a registered facility • All equipment and mobile infrastructure will be moved out of the mining area.–	• Compliance with EMPR • Compliance with Competent Authorities requests and regulation	Upon cessation of mining, during rehabilitation phase.
Monitoring	Closure	4499.8323 ha	Monitoring of all rehabilitated areas will be done to make sure if vegetation is growing and if not other mitigation measures as seeding of the area will	• Compliance with EMPR • Compliance with Competent Authorities requests and regulation	Post closure and post rehabilitation.

			be considered. All invader species will be monitored and removed from all rehabilitated areas		

1.5 Impact Management Outcomes

A description of The Impact Management Outcomes caused by prospecting activities are outlined in Table 32 below.

Table 32: A description of impact management outcomes

ACTIVITY (whether listed or not listed). (E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and excavations, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.).	**POTENTIAL IMPACT** (e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc.…etc…)	**ASPECTS AFFECTED**	**PHASE** In which impact is anticipated (e.g. Construction, commissioning, operational Decommissioning, closure, post-closure)	**MITIGATION TYPE** (modify, remedy, control, or stop) through (e.g. noise control measures, storm-water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc. etc) E.g. Modify through alternative method. Control through noise control Control through management and monitoring Remedy through rehabilitation..	**STANDARD TO BE ACHIEVED** (Impact avoided, noise levels, dust levels, rehabilitation standards, end use objectives) etc.
Literature Review	None	N/A	Planning	-	-
Geological Mapping	None	N/A	Planning	-	-
Geophysical Mapping	N/A	N/A	Planning	N/A	N/A
Site establishment	Vegetation loss Compaction of ground	Environment & fauna	Construction	• Remedy through rehabilitation and re-vegetation. • Remedy through ripping of compacted ground	Rehabilitation standards. Site to be rehabilitated to former land use with similar biodiversity component as pre-mining and to acceptable visual standard.
Vegetation clearance	Vegetation loss			• Avoid unnecessary removal of vegetation Using	Vegetation to be regenerated to resemble former species

	soil erosion	Environment & fauna	Construction & operational	existing roads as far as practicable Remedy through rehabilitation and re-Vegetation. Control through dust suppression methods	composition. Alien intrusion to be eradicated.
Construction of access roads	Vegetation loss Dust Ground compaction	Environment & animals	Construction & operational	• Using existing roads as far as practicable • Remedy through rehabilitation • Control through management and monitoring.	Impact avoided, dust levels and rehabilitation standards. Avoid construction as far as practically possible Roads will be less than 3m width Roads to avoid sensitive areas and Listed Vegetation After rehab and closure new roads will be left in situ to aid landowner and provide improved farm infrastructure.
Topsoil removal and stockpiling	Erosion Dust Ground compaction	Environment & people	Construction & operational	• Storm water control measures, • Dust control measures and monitoring • Remedy through ripping of compacted ground/surface	Impacts control and dust levels
Temporal Mobile office site	Ground compaction	Environment	Construction & operational	Remedy through ripping of compacted ground/surface	Surface under where structure was situated to be rehabilitated, to ensure vegetation will adequately regrow and biodiversity and former land use is re-established.

Ablution area	Health risk	Environment & people	Construction & Operational	Control through management and monitoring	Regular cleaning Maintain adequate health standard and compliance with O H & S. Keep doors closed
mining	Vegetation - loss	Environment and fauna	Operational phase	• Avoid unnecessary removal of vegetation • Using existing roads as far as practicable • Remedy through rehabilitation and re-vegetation. • Control through dust suppression methods. • Control through management and monitoring. • Closing all excavation to prevent fauna from falling into. • Concurrent rehabilitation or creation of buffer zone. • Using drip tray, taking precautions on the refuelling point. • If any soil is contaminated during the life of the mining activities, it will be immediately scooped, bagged and stored in the enclosed containers or plastic to be removed with the industrial waste to a recognized licensed facility for further treatment. • Small spills will be treated on site using bio-sorb, bio-shock or oil cap. • Avoid soil contamination throughout the life span of the mine. • Employees will be provided with proper personal	Impact avoided, noise levels, dust levels, rehabilitation standards and end use objectives) Land surface where excavations were situated to be rehabilitated, to ensure vegetation will adequately regrow and biodiversity and former land use is re-established.
	-Surface disturbances	Environment and fauna			
	Biodiversity loss	Environment and fauna			
	Visual impacts	People			
	Soil pollution	Environment			
	Surface and ground Water pollution	Environment & people			
	Health risk to workers or general public	people			
	Heritage resource disturbances	Heritage sites			
	Soil erosion	Environment			

				protective equipment. • If any heritage site or resource is identified during the mining period, it will be reported to SAHRA. • Creation of berms, and proper storage of topsoil stockpiles. • Environmental awareness. • Rehabilitation and return the area to its original state, • Seeding of rehabilitated area if vegetation did not grow natural in order to attract fauna. • Marked containers will be utilized to store domestic waste. • Employees will be inducted on how to sort their waste. • Waste will be taken to the municipality dumping site on the weekly basis • Noise will be kept minimal on working hours and monitoring. • Ripping of road. • Avoid construction of newly roads and use existing roads.	
	Veld Fire	Environment, fauna and people			
	Domestic waste generation	Environment			
	Noise	People and fauna			
Final rehabilitation	Dust	people	Decommissioning	• Topsoil will be spread over the rehabilitated soil in order to allow regrowth of vegetation. • All machinery will be removed from the site. • Ripping of all remaining compacted surface	Rehabilitation standard to be achieved. Former vegetation species and Biodiversity to be re-instated as far as possible, alien infestation to be controlled.
	Noise	People and animals			
	Domestic waste	environment			

					Former land use objectives standards to be re-instated to livestock grazing
Monitoring	-	Environment	Closure and post closure	• Monitoring of all rehabilitated areas will be done to make sure if vegetation is growing and if not other mitigation measures as seeding of the area will be considered. • All invader species will be monitored and removed from all rehabilitated areas	Rehabilitation and end land use Rehabilitation standard to be achieved. Former vegetation species and Biodiversity to be re-instated as far as possible, alien infestation to be controlled. Former land use objectives standards to be re-instated to livestock grazing

1.6 Impact management actions

Impact management actions are presented in Table33

Table 33: A description of impact management actions

ACTIVITY whether listed or not listed. (E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and excavations, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.).	**POTENTIAL IMPACT** (e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc….etc…)	**MITIGATION TYPE** (modify, remedy, control, or stop) through (e.g. noise control measures, storm-water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc. etc) E.g. Modify through alternative method. Control through noise control Control through management and monitoring Remedy through rehabilitation..	**TIME PERIOD FOR IMPLEMENTATION** Describe the time period when the measures in the environmental management programme must be implemented Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. .With regard to Rehabilitation, therefore state either:-.. Upon cessation of the individual activity or. Upon the cessation of mining, bulk sampling or alluvial diamond mining as the case may be.	**COMPLIANCE WITH STANDARDS** (A description of how each of the recommendations in 2.11.6 read with 2.12 and 2.15.2 herein will comply with any prescribed environmental management standards or practices that have been identified by Competent Authorities)
Literature Review	None	-	-	-
Geological Mapping	None	-	-	-
Geophysical Mapping	-	-	-	-
Site establishment	• Vegetation loss • Compaction of ground	• Remedy through rehabilitation and re-vegetation. • Remedy through ripping of compacted ground	Mitigation measures will be implemented when required. However, other mitigations measures such as existing tracks will be implemented from the commencement of this activity until cessation of activity.	The applicant will make sure that the employees or anyone who enter the mining area must comply with the environmental management standards as stipulated on the environmental authorization and EMPR. The applicant will work in accordance with listed activity no.20 of NEMA regulations.
Vegetation clearance	• Vegetation loss	• Avoid unnecessary removal of	• Mitigation measures to be in place prior to	The applicant will make sure that the employees or anyone who enter the mining

	• soil erosion	vegetation Using existing roads as far as practicable Remedy through rehabilitation and re-Vegetation. Control through dust suppression methods	activity. • In event of an critical incident with environmental significance , remedial and mitigation to be Immediately carried out on site	area must comply with the environmental management standards as stipulated on the environmental authorization and EMPR. The applicant will work in accordance with listed activity no.20 of NEMA regulations.
Construction of access roads	• Vegetation loss • Dust • Ground compaction	• Using existing roads as far as practicable • Remedy through rehabilitation • Control through management and monitoring.	• Mitigation measures to be in place prior to activity. • In event of an critical incident with environmental significance , remedial and mitigation to be Immediately carried out on site	The applicant will make sure that the employees or anyone who enter the mining area must comply with the environmental management standards as stipulated on the environmental authorization and EMPR. The applicant will work in accordance with listed activity no.20 of NEMA regulations.
Topsoil removal and stockpiling	• Erosion • Dust • Vegetation loss	• Storm water control measures, • Dust control measures and monitoring • Remedy through ripping of compacted ground/surface	• Immediate when topsoil is grubbed and stockpiled	The applicant will make sure that the employees or anyone who enter the mining area must comply with the environmental management standards as stipulated on the environmental authorization and EMPR. The applicant will work in accordance with listed activity no.20 of NEMA regulations.
Temporal Mobile office site	• Surface compaction • Vegetation loss	• Remedy through ripping of compacted ground/surface	Immediate when office is installed on mine and after removal off site	The applicant will make sure that the employees or anyone who enter the mining

				area must comply with the environmental management standards as stipulated on the environmental authorization and EMPR. The applicant will work in accordance with listed activity no.20 of NEMA regulations.
Temporal Storage of dumps	• Visual impact • Surface compaction • Vegetation loss	• Storm water control measures, • Dust control measures and monitoring • Remedy through ripping of compacted ground/surface	• Mitigation measures to be put in place prior to establishment of waste dump. • Ongoing mitigation and waste dump maintenance throughout life period of mine.	The applicant will make sure that the employees or anyone who enter the mining area must comply with the environmental management standards as stipulated on the environmental authorization and EMPR. The applicant will work in accordance with listed activity no.21 of NEMA regulations.
Ablution area	• Health risk	• Control through management and monitoring	ongoing and with weekly regularity throughout life of mine	The applicant will make sure that the employees or anyone who enter the mining area must comply with the environmental management standards as stipulated on the environmental authorization and EMPR. The applicant will work in accordance with listed activity no.20 of NEMA regulations.

Mining	• Vegetation loss • Surface disturbances • Biodiversity loss • Visual impacts • Soil pollution • Surface and ground Water pollution • Health risk to workers or general public • Heritage resource disturbances • Soil erosion • Veld Fire • Domestic waste generation • Noise	• Avoid unnecessary removal of vegetation • Using existing roads as far as practicable • Remedy through rehabilitation and re-vegetation. • Control through dust suppression methods. • Control through management and monitoring. • Concurrent rehabilitation. • Using drip tray, taking precautions on the refuelling point. • If any soil is contaminated during the life of the mining activities, it will immediately be scooped, bagged and stored in the enclosed containers or plastic to be removed with the industrial waste to a recognized licensed facility for further treatment. • Small spills will be treated on site using bio-sorb or oil cap. • Avoid soil contamination throughout the life span of the mine. • Employees will be provided with proper personal protective	Throughout mining period and upon cessation of the individual activity	The applicant will make sure that the employees or anyone who enter the mining area must comply with the environmental management standards as stipulated on the environmental authorization and EMPR. The applicant will work in accordance with listed activity no.20 of NEMA regulations.

		equipment • If any heritage site or resource is identified during the mining period, it will be reported to SAHRA. • Creation of berms, and proper storage of topsoil stockpiles. • Environmental awareness. • Rehabilitation and return the area to its original state, • Seeding of rehabilitated area if vegetation did not grow natural in order to attract fauna. • Marked containers will be utilised to store domestic waste. • Employees will be inducted on how to sort their waste. • Waste will be taken to the municipality dumping site on the weekly basis • Noise will be kept minimal on working hours and monitoring. • Ripping of road. • Avoid construction of newly roads and use existing roads. • Dust suppression methods will be implemented.		

Vehicle maintenance	• Soil pollution	No maintenance will be done on site	Immediate on repair of any vehicle or plant equipment	The applicant will make sure that the employees or anyone who enter the mining area must comply with the environmental management standards as stipulated on the environmental authorization and EMPR. The applicant will work in accordance with listed activity no.20 of NEMA regulations.
Vehicles movement within the mining area.	• dust • noise • Ground compaction	• Noise levels must comply with OHS regulations. • Noise generating activities should be restricted to normal working hours. Mine is noted to be remote from any settlement and human habitation • Vehicle exhaust systems should be in good state of maintenance with standard noise suppression equipment. • Personnel will wear PPE, specifically ear muffs to suppress noise levels when using machinery. • Ripping of the compacted ground to 300m in order to allow vegetation growth	throughout mining period and upon cessation of the individual activity	The applicant will make sure that the employees or anyone who enter the mining area must comply with the environmental management standards as stipulated on the environmental authorization and EMPR. The applicant will work in accordance with listed activity no.20 of NEMA regulations.

		Dust suppression measure will be applied in order to control and manage dust.		
Hydrocarbon storage *(kindly note this is optional since mobile diesel tanker is a preferred choose to be used)*	• Soil pollution • Water pollution	• Pollution control measures • Hydrocarbon will be stored within the sealed mobile containers. • Drip trays will be placed under each stationary equipment or vehicles to avoid soil contamination which may lead to water pollution • Taking precautions on the refuelling point. • If any soil is contaminated during the life of the mining activities, it will be immediately scooped, bagged and stored in the enclosed containers or plastic to be removed with the industrial waste to a	Throughout Operational period of the mine	The applicant will make sure that the employees or anyone who enter the mining area must comply with the environmental management standards as stipulated on the environmental authorization and EMPR. The applicant will work in accordance with listed activity no.20 of NEMA regulations.

		recognized licensed facility for further treatment. • Small spills will be treated on site using bio-sorb or oil cap.		
Final rehabilitation	• Dust • Noise • Domestic waste	• Topsoil will be spread over the rehabilitated areas in order to allow regrowth of vegetation. • All machinery will be removed from the site. • Ripping of all remaining compacted surface	Upon cessation of mining, during rehabilitation phase.	The applicant will make sure that the employees or anyone who enter the mining area must comply with the environmental management standards as stipulated on the environmental authorization and EMPR. The applicant will work in accordance with listed activity no.20 of NEMA regulations.
Monitoring		• Monitoring of all rehabilitated areas will be done to make sure if vegetation is growing and if not other mitigation measures as seeding of the area will be considered. • All invader species will be monitored and removed from all rehabilitated areas	Post closure and post rehabilitation.	The applicant will make sure that the employees or anyone who enter the mining area must comply with the environmental management standards as stipulated on the environmental authorization and EMPR. The applicant will work in accordance with listed activity no.20 of NEMA regulations.

2 FINANCIAL PROVISION

2.1 Determination of the amount of financial provision

2.1.1 Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under regulation 22 (2) (d) as described in 2.4 herein

The closure objectives are to create a post-mining state as close as possible to the pre-mining state of the environment. This can be accomplished by the correctness of rehabilitation and proper after-care activities.

- To prevent the sterilization of any ore reserves;
- To prevent the establishment of any permanent structures or features
- To manage and limit any environmental impact to the surface water and groundwater aquifers in such a way that an acceptable water quality and yield can still be obtained, when a closure certificate is issued;
- To safeguard the safety and health of humans and animals within the area;
- Capping of all drilled boreholes;
- Back filling of all sample pits;
- Re-establishment of biodiversity;
- Re-establishment of vegetation species;
- Return the land to landowner possibly the same as the pre mining;
- To ensure that all fencing is left as it was in pre-mining status;
- The last closure objective is that the mine is closed efficiently, cost effectively and in accordance with relevant policies.

2.1.2 Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties

The EAP confirms that all mitigation measures and closure objectives will be communicated further with the interested and affected parties.

2.1.3 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

The goal of rehabilitation with respect to the area where mining took place is to leave the area similar to its previous state prior mining activity. All other equipment and material used during operation will be removed from the area. Removal of these materials shall be done on a continuous basis and not only at the final stage of rehabilitation and closure.

- All boreholes will be capped to prevent any injury to fauna;
- Rehabilitation of drilled boreholes and trenches will be done immediately after is completed to prevent degradation of the environment and to prevent injuries to animals;
- All compacted areas will be ripped to a depth of 300mm in order to allow vegetation to re-grow;
- Mobile equipment will be removed from the site;
- The area will be seeded with surrounding plant species if necessary, this will attract back local animal life into the area;
- Waste containers will be removed from the site;
- No latent or residual impact may be encountered after completion of rehabilitation and back filling;
- The area will be returned to possibly its previous state.

2.1.4 Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives

The main objectives of both rehabilitation plan and closure plans are aligned. The goal of rehabilitation with respect to the area where mining and trenching took place is to leave the area similar to its previous state prior mining activity. All other equipment and material used during the lifespan of the mining will be removed from site, including other waste material. Removal of these materials shall be done on a continuous basis and not only at the final phase of rehabilitation and closure. To achieve this, the applicant has to practice concurrent rehabilitation from the commencement of the mining activities to

the end. This could be accomplished by effectively implementing the EMPr condition and adhering to them at all times. The financial provision for rehabilitation and management of negative impact will assist to achieve the rehabilitation plan together with the closure objectives.

2.1.5 Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guidelines

Table 34 shows how the final amount was derived

Table 34: Calculation of the quantum

CALCULATION OF THE QUANTUM

Applicant: **MAXWILL 146 CC** **DMR Ref No:** **NC30/5/1/2/2/10148MR**

Evaluators: **Ndi Geological Consulting Service (Pty) Ltd** **Date:** **9/12/2019**

No.	Description	Unit	A Quantity	B Master Rate	C Multiplication factor	D Weighting factor 1	E=A*B*C*D Amount (Rands)
1	Dismantling of processing plant and related structures (including overland conveyors and powerlines)	m3	200	14.55	1	1	2910
2 (A)	Demolition of steel buildings and structures	m2	0	202.63	1	1	0
2(B)	Demolition of reinforced concrete buildings and structures	m2	0	298.61	1	1	0
3	Rehabilitation of access roads	m2	5000	36.26	1	1	181300
4 (A)	Demolition and rehabilitation of electrified railway lines	m	0	351.93	1	1	0
4 (A)	Demolition and rehabilitation of non-electrified railway lines	m	0	191.96	1	1	0
5	Demolition of housing and/or administration facilities	m2	0	405.26	1	1	0
6	**Opencast rehabilitation including final voids and ramps**	**ha**	**0.45**	**206254.16**	**0.52**	**1**	**48263.47344**
7	Sealing of shafts adits and inclines	m3	0	108.78	1	1	0
8 (A)	Rehabilitation of overburden and spoils	ha	0.04	141626.44	1	1	5665.0576
8 (B)	Rehabilitation of processing waste deposits and evaporation ponds (non-polluting potential)	ha	0	176393.17	1	1	0
8 (C)	Rehabilitation of processing waste deposits and evaporation ponds (polluting potential)	ha	0	512329.37	1	1	0
9	Rehabilitation of subsided areas	ha	0	118590.81	1	1	0
10	General surface rehabilitation	ha	1	112192.03	1	1	112192.03
11	River diversions	ha	0	112192.03	1	1	0
12	Fencing	m	500	127.98	1	1	63990
13	Water management	ha	0	42658.57	1	1	0
14	2 to 3 years of maintenance and aftercare	ha	0.5	14930.5	1	1	7465.25
15 (A)	Specialist study	Sum	0			1	0
15 (B)	Specialist study	Sum				1	0
					Sub Total 1		421785.811
1	Preliminary and General		50614.29732		**weighting factor 2** 1		50614.29732
2	Contingencies		42178.5811				42178.5811
					Subtotal 2		514578.69
					VAT (15%)		77186.80
					Grand Total		**591765**

2.1.6 Confirm that the financial provision will be provided as determined

Maxwill hereby confirms that the financial provision to the amount of **R 591,765** will be provided as determined either by bank guarantee or cash deposit.

Mechanism for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon.

3 MONITORING OF IMPACT MANAGEMENT ACTIONS

Monitoring of impact management actions will be done on a daily basis by either the PM or the ECO. Employees and appointed contractors will be work shopped for them to be able to identify, mitigate and minimise environmental impacts that maybe caused by the mining activities.

3.1 Monitoring and reporting frequency

Performance assessment or environmental report will be submitted annually to the Department of Mineral Resources. The ECO will prepare and submit a weekly environmental report to the Site Manager and instruct mitigation measures to the identified deviation.

3.2 Responsible persons

Maxwill will appoint an ECO that will be responsible for the implementation of Environmental Management Programme.

3.3 Time period for implementing impact management actions

Implementation of Environmental Management Programme/ will be done throughout the mining period.

3.4 Mechanisms for monitoring complacence

The manner in which complacence will be monitored is detailed in Table 35

Table 35: Mechanisms required for monitoring complacence

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCYAND TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
Vehicular movement	Dust	-Roads and dusty areas will be sprayed by water when there is a need. -This impact will be monitored throughout the day and where it is encountered it will be suppressed by means of spraying water. -Atmospheric Pollution Prevention Act will be followed at all times. -Dust fall-out buckets are properly located and this must also be monitored throughout the day. -Monitoring of dust exposure will includes use of active air sampling, passive dust collectors. -The National Environment Management: Air Quality Act, 2004 (Act No.39 of 2004) will be adhered to at all times.	Site Manager and Environmental Control Officer	Daily and ongoing Reporting will be done weekly Time period for implementing impact management is immediately.

		The Mine Health and Safety Act, 1996 (Act No. 29 of 1996) as amended and other legislation or regulations will also be adhered to at all times to avoid air pollution.		
Contamination of soil as a result of Hydrocarbons storage and refuelling point	Soil & Water pollution	Vehicles and equipment will be monitored before the commencement of any daily mining activity to avoid any soil contamination which may lead to ground water contamination. Surface water will be protected by adhering to The National Water Act, 1998 (Act No. 36 of 1998).	Environmental Control Officer will be responsible for all monitoring programmes. The site manager will be responsible overall monitoring programs.	Daily and ongoing Reporting will be done weekly Time period for implementing impact management is immediately.
Vehicles movement	Noise	Bureau of Standards Code of Practice for the Measurement and Assessment of Occupational Noise for Hearing Conservation Purposes, SABS 083 as amended, in any place at or in any mine or works where persons may travel or work, exceeds 82 dB (A), the site manager will take the necessary steps to reduce the noise below this level. Noise monitor machine will be used to monitor noise generated from the mining activities if is exceeding the standard. The following will be adhered to:	Environmental Control Officer and Site Manager	Daily and ongoing Reporting will be done weekly Time period for implementing impact management is immediately.

		a) The Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) – Section 7. b) The Mine Health and Safety Act, 1996 (Act No. 39 of 1996) as amended. c)The Road Traffic Act, 1997 (Act No. 93 of 1997);		
Removal of vegetation and mining	Interference with existing land use	-Inform landowners in writing of intent and comply with reasonable request to reduce the impact. -Negotiate compensation for interference with landowner/lawful occupier -Visual confirmation of rehabilitation -Approval of rehabilitation by landowner/lawful occupier	Site Manager	Daily and ongoing Reporting will be done weekly Time period for implementing impact management is immediately.
Clearance of vegetation	Vegetation loss	-Site clearance to be kept to a minimum and avoid unnecessary removal of vegetation. -Visual inspection to make sure that vehicle utilise the existing tracks as possible. -No removal, disturbance or pruning of large to medium shrubs or tress -Visual marking of sensitive species	Environmental Control Officer and Site Manager	Daily and ongoing Reporting will be done weekly Time period for implementing impact management is 3 months.

Movement of vehicles, poaching	Displacement, injury and death of local fauna;	-Site clearance to be kept to a minimum -Visual marking of sensitive species and areas -Visual inspection of fencing and/or other safety measures -On site log to be kept	Site Manager	Daily and ongoing Reporting will be done weekly Time period for implementing impact management is immediately.
Removal of topsoil	Soil erosion;	Visual confirmation of soil erosion controls, soil profile disturbance and topsoil management where required.	Environmental Control Officer and Site Manager	Daily and ongoing monitoring
Waste generation and disposal	Land pollution	-Visual inspection that waste does not accumulate inside or outside drill site. -All waste such as oil spills must be stored separately and disposed of at a registered facility. -Proof of disposal must be kept on site. -EMP checklist will be compiled and utilised during the mining period.	Environmental Control Officer and Site Manager.	Daily and ongoing Reporting will be done weekly basis. Time period for implementing impact management is immediately.

3.5 Indicate the frequency of the submission of the performance assessment report

Environmental or performance assessment report will be submitted to the Department of Mineral Resources annually.

3.6 Environmental Awareness Plan

Document that will be guiding the awareness plan will be provided to the Site Manager by the ECO. By so doing employees will have to conduct daily Environmental talk before commencement of daily activity.

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

Training will be provided to all employees. Initial environmental induction and or awareness will be conducted before commencement of any daily activity to all employees.

3.6.2 Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment

Safety, Health and Environmental talks will be done with employees by the Site Manager or the ECO with the employees and contractors on a daily basis. Visitors will be given induction before they can commence with the purpose of the visit.

3.7 Specific information required by the competent authority

- Maxwill 146 CC hereby confirms that the financial provision will be reviewed on an annual basis and the report of such review will be submitted to DMR.
- The Performance Assessment or Environmental Report will be compiled and submitted to the DMR annually or upon request by DMR.

4. UNDERTAKING

The EAP herewith confirms

a) the correctness of the information provided in the reports; ☒

b) the inclusion of comments and inputs from stakeholders and I&APs ; ☒

c) the inclusion of inputs and recommendations from the specialist reports where relevant; ☒ and

d) that the information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties are correctly reflected herein. ☒

Signature of the environmental assessment practitioner:

NDI Geological Consulting Services (Pty) Ltd

Name of company:

2019/10/14

Date:

-END-

APPENDICES

Appendix 1: Environmental Assessment Practitioner Declaration of Interest

Appendix 2: EAP's Curriculum Vitae

Appendix 3: Location Map indicating Proposed Area

Appendix 4: Public Participation Comments

Appendix 5: Impact Assessment

Appendix 6: Composite Map

Appendix 7: Specialist Studies Reports

Appendix 7_1: Ecological Specialist Studies Report

Appendix 7_2: Hydrogeological Specialist Studies Reports

Appendix 7_3: Palaeontological Desktop Studies Reports

Appendix 7_4: Hydropedology, Land and Soil Capability Specialist Studies Report

Appendix 7_5: Surface Water Hydrology Specialist Studies Reports

Appendix 8: Meeting Minutes