mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

DRAFT BASIC ASSESSMENT REPORT AND ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

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

NAME OF APPLICANT: Kwa Nozici Minerals (Pty) Ltd

TEL NO: 0722705207

FAX NO: N/A

POSTAL ADDRESS: 17 Skilpad Street, Meyerton Park, Meyerton

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FILE REFERENCE NUMBER SAMRAD: NW30/5/1/3/2/10449MP

Basic Assessment Process

PROPOSED ESTABLISHMENT OF A SMALL-SCALE ALLUVIAL DIAMOND AND MANGANESE MINING PROJECT FOR KWA NOZICI MINERALS (PTY) LTD

Farm 361 JP, Welverdiend, North West

CSIR Report Number: CSIR/CAS/EMS/MEMO/2015/0001/A

January 2017

Prepared for:
Kwa Nozici Minerals (Pty) Ltd

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1. IMPORTANT NOTICE

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

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

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

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

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

2. OBJECTIVE OF THE BASIC ASSESSMENT PROCESS

The objective of the basic assessment process is to, through a consultative process–

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

(b) identify the alternatives considered, including the activity, location, and technology alternatives;

(c) describe the need and desirability of the proposed alternatives;

(d) through the undertaking of an impact and risk assessment process inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on the these aspects to determine:
   (i) the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and

   (ii) the degree to which these impacts—
      (aa) can be reversed;
      (bb) may cause irreplaceable loss of resources; and
      (cc) can be managed, avoided or mitigated;

(e) through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to—
   (i) identify and motivate a preferred site, activity and technology alternative;
   (ii) identify suitable measures to manage, avoid or mitigate identified impacts; and
   (iii) identify residual risks that need to be managed and monitored.

Requirements according to Appendix 1 of GNR 982 of 4 December 2014– Scope of Assessment and Content of BAR.

Scope of Assessment and Content of BAR	SECTION IN BAR
1) A basic assessment report must contain all the information that is necessary for the competent authority to consider and come to a decision on the application, and must include - (a) details of – i. the EAP who prepared the report; and	Section a)
ii. the expertise of the EAP, including a curriculum vitae;	Section a) Appendix A
(b) the location of the activity, including: (i) the 21 digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	Section b)
(c) a plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale; or, if it is- (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Appendix B (Map B2)
(d) a description of the scope of the proposed activity, including- (i) all listed and specified activities triggered and being applied for; and (ii)a description of the activities to be undertaken including associated structures and infrastructure ;	Section d) Appendix B (Map B2)
(e) a description of the policy and legislative context within which the development is proposed including- (i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are	Section d)i)

Scope of Assessment and Content of BAR	SECTION IN BAR
applicable to this activity and have been considered in the preparation of the report; and (ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments;	Section e)
(f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	Section f)
(g) a motivation for the preferred site, activity and technology alternative;	Section g)
(h) a full description of the process followed to reach the proposed preferred alternative within the site, including: (i) details of all the alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; (iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated; (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives; (vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section h) Section h)ii) Appendix C Section h)iii) Section h)iv) Section v Section vi Section viii)

Scope of Assessment and Content of BAR	SECTION IN BAR
(viii) the possible mitigation measures that could be applied and level of residual risk; **(ix) the outcome of the site selection matrix;** **(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and** **(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;**	**Section ix)**
(i) a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including- **(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and** **(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;**	**Section i)** **Section j)**
(j) an assessment of each identified potentially significant impact and risk, including- **(i) cumulative impacts;** **(ii) the nature, significance and consequences of the impact and risk;** **(iii) the extent and duration of the impact and risk;** **(iv) the probability of the impact and risk occurring;** **(v) the degree to which the impact and risk can be reversed;** **(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and** **(vii) the degree to which the impact and risk can be avoided, managed or mitigated;**	**Section (v)**
(k) where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report;	**Section k)**
(l) an environmental impact statement which contains-	**Section l)**

Scope of Assessment and Content of BAR	SECTION IN BAR
(i) a summary of the key findings of the environmental impact assessment; (i) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Appendix B Section l)i)
(m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr;	Section m)
(n) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Section n)
(o) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section o)
(p) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Section p)
(q) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised;	Section q)
(r) an undertaking under oath or affirmation by the EAP in relation to: (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and	Section r)

Scope of Assessment and Content of BAR	SECTION IN BAR
affected parties; and	
(s) where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	**Section s)**
(t) any specific information that may be required by the competent authority; and	**Section t)**
(u) any other matters required in terms of section 24(4)(a) and (b) of the Act.	**Section u)**

PART A

SCOPE OF ASSESSMENT AND BASIC ASSESSMENT REPORT

3. Contact Person and correspondence address

a) Details of

i) Details of the EAP

Name of the Practitioner: Council for Scientific and Industrial Research (CSIR) (Babalwa Mqokeli)

Tel No.: 021 888 2432

Fax No.: 021 888 2693

Email address: mlevendal@csir.co.za

bmqokeli@csir.co.za

ii) Expertise of the EAP

The Council for Scientific and Industrial Research has been one of the leading organisations in South Africa contributing to the development and implementation of environmental assessment and management methodologies. The CSIR's Environmental Management Services (EMS) unit has over 20 years of experience in environmental management practices, involving conducting environmental assessment and management studies in over 15 countries in Africa. Key sectors of CSIR's work include renewable energy, infrastructure, natural resource management, mining, industrial development and oil and gas. CSIR's environmental assessments are conducted with national legal requirements as well as those of international agencies such as the World Bank, International Finance Corporation and World Health Organisation.

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

Minnelise Levendal: MSc Botany (Stellenbosch University)

Babalwa Mqokeli: MSc Ecological Science, Registered Candidate Natural Scientist (Cand.Sci.Nat.)

Please refer to Appendix A for the CVs

2) **Summary of the EAP's past experience**
(In carrying out the Environmental Impact Assessment Procedure)

Minnelise Levendal is a Senior EAP in the EMS group of the CSIR and has a Master's degree in Biological Science (Botany). She has 16 years of experience in Environmental Management (which includes ten years working as an EAP). Before she joined the CSIR she was employed at the DEA&DP where she assessed EIAs, BAs and EMPs. Minnelise is currently managing various EIAs for wind and solar renewable energy projects in South Africa. Minnelise was the CSIR project manager for the 100 MW Ubuntu Wind Energy Facility near Jeffreys Bay (Environmental Authorisation granted in June 2012), as well as the 50 MW Banna Ba Pifhu Wind Energy Facility proposed by WKN Windcurrent near Humansdorp in the

Eastern Cape (Environmental Authorisation granted in July 2014). She was the project manager of ten BAs for wind monitoring masts in South Africa as part of the National Wind Atlas Project of the Department of Energy. Environmental Authorisation from the DEA for all the ten masts was obtained in 2010. Minnelise is currently managing the Special Needs and Skills Development Programme.

Babalwa Mqokeli has 2 years of experience in the environmental management field, as an ecological scientist. She joined the CSIR in 2015 as an intern under the Special Needs and Skills Development Programme. She is currently undertaking several Basic Assessments under this Programme. Her expertise includes terrestrial and aquatic ecological monitoring.

b) Location of the overall Activity

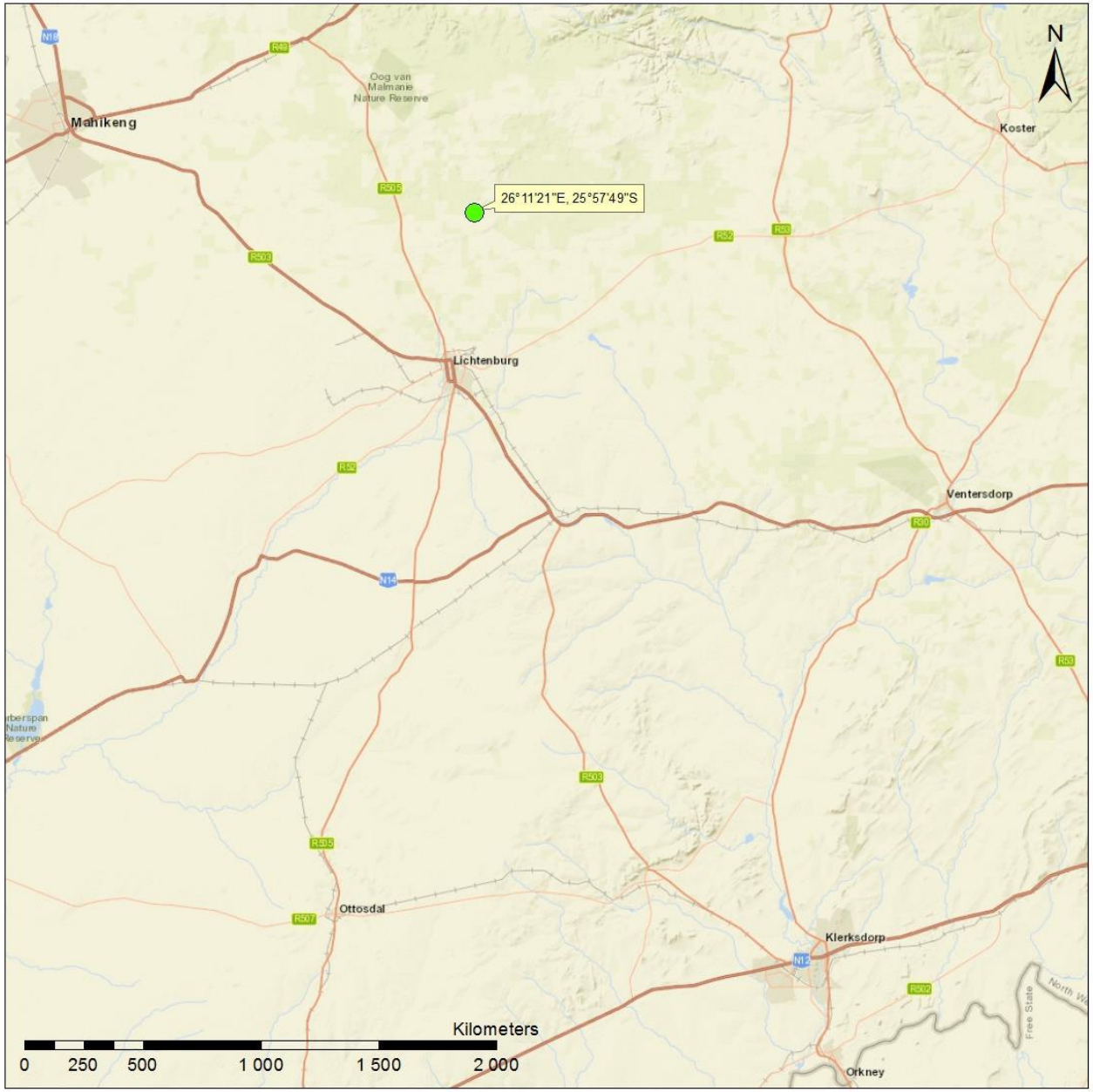
The proposed project is situated on Portions 1 and 35 of Farm No. 361 JP, situated approximately 3km from the Welverdiend village in the North West Province.

Table 3-1: Property description and location

Farm Name	JP 361
Application area (Ha)	5 hectares
Magisterial district:	Ditsobotla Local Municipality and Ngaka Modiri Molema District Municipality
Distance and direction from nearest town	36km north of Lichtenburg
21 digit Surveyor General Code for each farm portion	TOJP00000000036100001 TOJP00000000036100035

c) Locality Map

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

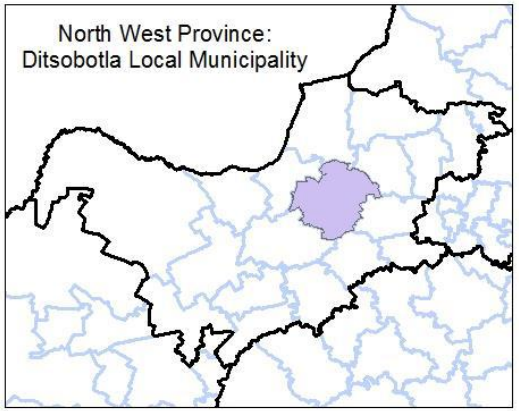


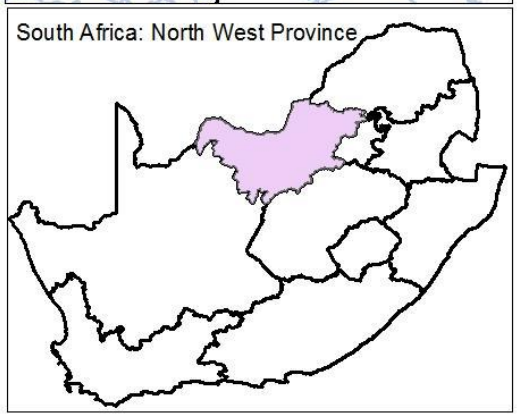
Legend

North West Province

Ditsobotla Local Municipality

Proposed Kwa-Nozici Minerals Site





d) Description of the scope of the proposed overall activity

Provide a plan drawn to a scale acceptable to the competent authority but not less than 1: 10 000 that shows the location, and area (hectares) of all the aforesaid main and listed activities, and infrastructure to be placed on site (Please refer to the site layout map attached as Map 2 in **Appendix B**)

Kwa Nozici Minerals (Pty) Ltd proposes to establish a small-scale diamond and manganese mining operation. The total development area will be approximately 5 hectares, and will have a lifespan of 3 years. The process will include the excavation of pits done in sections, thereafter processing each pit will be closed/filled and a different/new pit will be excavated, within the 5 hectares area. The excavated ore will be transported using a Truck Load Backhoe (TLB) to the 30 x 30m camp site, located within the 5 hectares, for processing; which will involve crushing and/or grading in the 10 Foot Rotary Pan, washing and sorting of minerals.

The following infrastructure will form part of this mining operation:

- 1 x 10 foot Rotary Pan
- Diesel generator (3 phase 10va Kipler)
- Jig
- Stockpile area
- 1 x TLB
- Rain port
- Solar Power Panels
- Existing borehole
- Water pipe Water tank
- Diesel storage tank
- Machinery/vehicle maintenance area
- Storage facility
- Septic toilets
- Security/Workers hut
- Office
- Sorting room
- Stormwater management infrastructure
- Earth Dam

i) Listed and specified activities

Table 3-2: Provisional list of activities identified for the Kwa Nozici Minerals (Pty) Ltd mining operation

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 OFTHE ACTIVITY Ha or m²**	**LISTED ACTIVITY Mark with an X where applicable or affected.**	**APPLICABLE LISTING NOTICE (GNR 982, GNR 983 or GNR 984 985)**
Mining operation requiring a mining permit, including associated infrastructure and earthworks related to the extraction of minerals.	5 Ha	X	GNR 983 of 2014: Activity 21
Clearing of vegetation within the footprint of the proposed mining operation.	5 Ha	X	GNR 983 of 2014: Activity 27 GNR 985 of 2014: Activity 12 (a)(ii)

(ii) Description of the activities to be undertaken

Kwa Nozici Minerals plans to have an open pit mining operation for alluvial diamonds and manganese within a 5 ha area to be located on Portion 1 and 35 of Farm 361JP outside the Welverdiend Village.

PROJECT PHASES:

Construction Phase

- Preparing an area of 900 m^2 for a portable camp site to accommodate infrastructure associated with stockpiling, crushing, washing, sorting and offices etc.
- Site clearing and topsoil removal for mining operation, and excavation of a mining pit up to 4m deep
- Construction of pollution control dam and trenches
- Use of the existing 30 – 70m depth borehole and installing a water pipe (50 mm diameter and 50 – 100m length)
- Installation of a 100 000 litre water tank
- Construction of storm water management facilities upstream of the pits to divert water away from the pit

Operational Phase

- Extraction and transportation of ore
- TLB activity and operation of mining equipment
- Water extraction from borehole and/or tank
- Crushing, washing and sorting of ore in mobile plant
- Storage of diesel and vehicle/machinery maintenance equipment

- Water generation and disposal
- Closure and rehabilitation of the pits

Decommissioning phase

- Demolition and/or removal of mobile camp site infrastructure/equipment and vehicles
- Rehabilitation and restoration of disturbed areas

Kwa Nozici Minerals will be using a mobile camp site for its processing activities, and therefore no infrastructure associated with the camp site will require breaking down or demolishing at closure. The surface area will be rehabilitated by maintaining the general topography of the surrounding area, ensuring that there are no remnants of the structures. Closure and rehabilitation of pits will be undertaken during the operational phase when the activities are completed in those pits. The pollution control dams (PCD) will be removed at closure and the plastic lining will be removed and recycled. At the end of the project life cycle, a thick soil layer of approximately 333 mm will be spread across the disturbed areas; thereafter the soil will be ripped, fertilised and re-vegetated. Post-closure monitoring will assist in determining the success of the rehabilitation and also identify whether any additional measures need to be taken to ensure the area is restored to a reasonable and acceptable condition.

The following facilities are expected to be established on site during the construction and operation phases of the mining operation.

Site facilities during construction:

- Security and/workers hut;
- Sorting room, wash-bays, office, ablution facility (septic toilet)
- Stockpiles
- Machinery/vehicle maintenance area
- Temporary services (power, water)

Site facilities during operation:

- Open pits and trenches
- Ore stockpiles
- Soil stockpiles
- Crushing, washing and sorting plant
- Fuel and material storage facility
- Office and ablution facilities
- Water tank and surface water control measures
- Waste storage facility

e) Policy and Legislative Context

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**	**HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE LEGISLATION AND POLICY CONTEXT.** **(E.g. In terms of the National Water Act a Water Use License has/ has not been applied for)**
The Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)	Mining activities	This BA and EMP report has been compiled in accordance with the Act.
National Environmental Management Act (Act No. 107 of 1998)	Mining activities	This BA is being undertaken in terms of NEMA in order to determine any possible impacts on the environment and to undertake mitigation measures that reduce any potential harm to the environment.
Environmental Impact Assessment Regulations: GNR 982 to 985 of 4 December 2014	Mining activities	Listed activities as per the NEMA EIA Regulations have been considered and authorisation is thus required with regards to the triggering activities.
National Water Act, 1998 (Act No. 36 of 1998)	Mining activities	An application for a water use licence has been submitted to the competent authority and all water uses associated with the proposed project will be exercised upon authorisation.
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)	Not applicable	Listed activities as per the 2013 NEM:WA Regulations have been considered and it has been determined that a waste licence is not required.
The National Heritage Resources Act (Act No. 25 of 1999)	Management/monitoring measures	An application for Heritage Resources review was submitted to SAHRA (Case ID: 9656) in terms of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) as amended, in which consideration of heritage resources was requested. A heritage specialist study was undertaken for the proposed development and a report from

		ASHA Consulting has been included in **Appendix 2.19.2.** of Appendix D.
BGIS (www.bgis.sanbi.org.za)	Baseline environmental description	Used during desktop research to identify sensitive environments within the proposed mining area.
Agricultural Geo-Referenced Information System (AGIS) Comprehensive Atlas	Baseline environmental description	Compilation of this report has made use of the atlas to determine land capability of the site with respect to the proposed development.
Municipal Integrated Development Plan (2015/2016 – 2017/2018)	Needs and desirability of the proposed activities	Municipal plans were used to identify relevant socio-economic information and spatial development information within which the area falls under.
North West Provincial Development Plan	Needs and desirability of the proposed activities	Municipal plans were used to identify relevant socio-economic information and spatial development information within which the area falls under.

f) Need and desirability of the proposed activities.

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

For years, mining has been the driving force behind South Africa's economy and continues to make a valuable contribution to the country's economy. This economy is built on gold and diamond mining, with gold accounting for over a third of the country's exports. South Africa's diamond mining industry was recognised as one of the largest in the world in the year 2009. It is predicted that mining will still play an important role to the economy, most notably through foreign exchange earnings and employment provision. It is also one of the primary sectors that provide employment opportunities for unskilled and semi-skilled people.

The South African mining industry has its origin in small-scale mining activities, with these operations offering much needed employment opportunities and entrepreneurship, as well as contributing to the mineral sector and local economy. Small-scale mining impact on employment is especially observed in the rural areas where there are limited opportunities; providing significant livelihood for rural communities and a means of alleviating poverty.

The proposed project is for a small-scale mining operation near the Welverdiend village, located in the Ditsobotla Local Municipality. The municipality is faced with challenges of high unemployment levels and poverty, making economic development one of the municipality's main priorities and general public needs. Economic sectors identified as important in the Ditsobotla municipality include agriculture, mining and tourism, with these sectors making a significant contribution to the local economy, thus necessitating the need to prioritise and support these sectors. The Ditsobotla municipality contributes the most to the Ngaka Modiri Molema District's Gross value Adding (GVA) in terms of Mining, Manufacturing and in Agriculture, with 63%, 53.7%, and 33.4%, respectively,

highlighting Mining as a substantial contributor to the economy of the district. Based on research of the 2012 Spatial Development Framework review, the 2015/16 Ditsobotla IDP shows that mining contributed approximately 10% of the GVA of the districts' economy in the year 2010. It also contributed towards 1.2% towards local economic employment performance. The IDP highlights the growth and development of the mining sector in this municipality.

The municipality's 2015/16 objective is to also create an enabling environment for job creation and businesses to thrive, with some of its specific strategies aimed at monitoring the implementation of Social Labour Plans by mining businesses in the municipal area in this period. Kwa Nozici Minerals has thus identified an opportunity as the proposed project will add great socio-economic value to the mining industry. It could contribute to the local economic opportunities, the business, ultimately impacting socio-economic development of the area in support of the municipality and district's development opportunities and targets/goals.

g) Motivation for the overall preferred site, activities and technology alternative.

Mining activity areas include known mineral regions of the country such as diamonds where alluvial deposits exist in the Northern Cape and North West. Mining is the most important economic sector in the North West and the area proposed for the project is an area of existing diamond mining activities. The project site is located in Ward 14 (Welverdiend Carlisonia) of the Ditsobotla Local Municipality, and according to the municipality's 2016 Local Economic Development Strategy, the identified flagship projects of this ward are diamond, manganese mining and services. The proposed method of open pit mining allows easy access of machinery to the site and does not require extensive machinery as other methods, making it feasible for small-scale miners. It reduces the overall costs associated with the mining process, thus allowing financial viability in small scale mining of mineral deposits.

Kwa Nozici Minerals would contribute towards local socio-economic development, as it aims to provide employment opportunities to the local people as far as possible, thus stimulating development in the Welverdiend community. The proposed project therefore is an effort to make use of available opportunities and development prospects in line with the Ditsobotla 2016 Local Economic Development Strategy as well as those of the North West Provincial Development Plan aimed to promote Small, Medium and Micro-sized Enterprises (SMME) in communities with mining potential.

h) Full description of the process followed to reach the proposed preferred alternatives within the site.

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

(i) Details of the development footprint alternatives considered.

With reference to the site plan provided as Appendix 4 and the location of the individual activities on site, provide details of the alternatives considered with respect to:

(a) the property on which or location where it is proposed to undertake the activity;

No property alternatives have been considered as the envisaged mining operations will occur in an area of existing mining operations, and also in close proximity to the access road and community in need of such a development. The proposed site is the only land that is available to the applicant.

(b) the type of activity to be undertaken;

No alternatives to the mining of alluvial diamonds and manganese have been considered; mining of these minerals was identified as flagship projects of this specific ward and community.

(c) the design or layout of the activity;

The site layout was determined by considering both spatial and practical mining operation aspects. The proposed layout is more of a security measure, allowing for more effective management of mined ores.

(d) the technology to be used in the activity;

No alternative technology has been considered for the proposed mining activity.

(e) the operational aspects of the activity; and

The optimal operational activities have been proposed, inclusive of the site layout and mobile infrastructure, in consideration of spatial aspects, post-mining appearance, as well as reducing costs associated with stripping down built infrastructure.

(f) the option of not implementing the activity.

The option of not implementing the activity has been considered, and assumes that should the proposed activity not proceed then the status quo would remain. This includes no clearing of land, no digging of trenches, no mining operations on site and no decommissioning at the end of the project life cycle. The fact that this is an area of mineral potential and that the proposed mining would lead to job creation, contribution to the GDP of the municipality and the province, and be an opportunity to improve the local socio-economic situation, therefore the option of not implementing the activity will not be pursued at this stage.

(ii) Details of the public participation process followed

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

A Basic Assessment is required to obtain Environmental Authorisation for Kwa Nozici Minerals (Pty) Ltd's proposed small-scale alluvial diamond and manganese mining operation. A public participation process was undertaken as part of the Basic Assessment process and was done in the following manner:

Notice of the Basic Assessment process has been given by:

(1) placing a Site Notice on the Farm fence;

(2) posting and emailing written notice regarding the proposed development to Interested and Affected Parties, including neighbours and community leader (representing the community in control of the farm), competent authority and other relevant Government departments;

(3) placing an advertisement in the Mahikeng Mail newspaper, which allowed potential Interested and Affected Parties to register and to submit comments within a 30-day period regarding the Basic Assessment of the proposed project;

(4) a copy of the Draft Basic Assessment Report was placed at the Lichtenburg Public Library;

(5) letters notifying I&AP's of the release of the Draft Basic Assessment Report for 30-day review period were sent out on the 25th January 2017;

(6) the Draft Basic Assessment Report is available on the project website: https://www.csir.co.za/environmental-impact-assessment

(7) all comments raised by I&APs during the review of the BID have been captured and addressed within the Draft BA Report;

(8) the Draft BAR was distributed for 30-days to registered I&APs and organs of state. The commenting period ends on **27 February 2017**.

(iii) Summary of issues raised by I&APs

***Please note that the comments are taken verbatim from the comments provided by Interested and Affected Parties**

Interested and Affected Parties		Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this Report where the issues and/or responses were incorporated
Name	**Organisation**				
Victoria Bota	South African National Roads Agency Limited (SANRAL)	01/04/2016	- Kindly send us a locality map of the proposed activity so we ascertain if there are any National Roads in close vicinity of the project.	- Kindly find the attached Background Information Document of the project, Locality map and street map. Please let me know if you require any information in this regard.	The locality map is included as Map 1 in **Appendix B** of the Draft BAR
Collen Mmutle	Department of Local Government & Human Settlements – North west Province	05/04/2016	- The project needs to consider and be guided by the Spatial Development Framework, Integrated Development Plan priorities of the area. The sector plans (Water, Electricity, Sanitation, Human Settlements). - Priority to inclusive and integrated rural economy - Empowerment of local community – individuals and local business in terms of job creation and skills development - Partnerships and linkages of the project to be aligned to government priorities	Thank you for the comments provided. The proposed project is in line with the Ditsobotla Municipality's IDP as it is one of the economic sectors identified as important in this municipality. It also addresses the municipality's Local Economic Development Strategy of 2016.	Kindly refer to Section **f)** and **g)**

Interested and Affected Parties		Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this Report where the issues and/or responses were incorporated
Name	**Organisation**				
Mpho Gumula	Department of Agriculture, Forestry & Fisheries –Control Resource Auditor (Potchefstroom)	12/05/2016	- DAFF: D: LUSM understand that mining is basically a short term activity compared to agriculture. It is for this reason that through Conservation of Agricultural Resources Act 43 of 1983 we seek to encourage, promote and enforce the sound utilisation and management of natural agricultural resources namely water sources, soil and vegetation.	Thank you for the comment. Specialist studies, including an assessment of the Agricultural soil potential, has been undertaken with regards to the proposed project, reports produced thereof provide details of the impacts as well as mitigation measures to reduce negative impacts on the environment, and to inform decision making. According to the Agricultural Geo-Referenced Information System, soils of the general area are loamy and appear relatively shallow with sections of prominent surface rock (dolomite). Land capability of the area is described as non-arable, with moderate potential grazing land. The area is thus not very suitable for cultivation, with grazing capacity estimated at approximately 14 – 17 hectares per large livestock unit.	Kindly refer to Appendix G Refer to Section **f)** and **g)**

				It should be noted that mining is in line with the municipality's IDP and that mining operations are taking place in the surrounding area.	
Betty D. Kaiba	Diamond and Manganese Mining Ward Committee	02/06/2016	- My issues is we don't have roads, we don't have creach (crèches), schools even shops, water in our yard, lack of jobs, our youth they don't have jobs, we are far from everything. So please it can help us so much especially for raising funds for helping us with schools so that our children can learn.	Thank you for the comment. The proposed development aims to address socio-economic issues in the village such as unemployment challenges. Local jobs will be created which will aim to alleviate some of the socio-economic challenges mentioned.	Kindly see Section **g)**

(iv) The environmental attributes associated with the alternatives. (The environmental attributes described must include socio-economic, social, heritage, cultural, geographical, physical and biological aspects)

1. Baseline Environment

1.1. Type of environment affected by the proposed activity.

(its current geographical, physical, biological, socio-economic, and cultural character).

Site description

The proposed project site is located 3km north of Welverdiend village (also officially known as Carlisonia). The area is rural with mining operations (including many small-scale operations) distributed in the greater region. A gravel road (Manana Road) and a small electricity line traverse the eastern boundary of the site. There is no other infrastructure in the area, and most of the broader region is used mostly for livestock grazing. The site is generally flat, with elevations ranging between 1522 – 1525 meters above mean sea level. The site has sandy surfaces in some areas and comprises of gravel and rock fragments in other areas. Most of the rock fragments are reported to be rich in iron and/or manganese. The site is characterised by natural vegetation with a few small gum trees occurring on site and a large grove of gum trees present outside the site's western corner.

Geology

The geology of the study area and surrounds is dominated by the Chuniespoort Group (Situated within the Transvaal Basin of the Transvaal Supergroup), and specifically the Neorachaean dolomites of the Malmani Subgroup. The chert-rich dolomites (i.e. magnesium-rich calcium carbonate rock) of the Monte Christo Formation, which falls within the Malmani Subgroup, underlie the proposed project area and dip shallowly to the north. The depositional environment of the Malmani Subgroup is interpreted to have been a stable shallow marine platform and basin e.g. something akin to the present day Great Barrier Reef, and has been subdivided into the following formations (oldest to youngest): Oaktree, Monte Christo, Lyttelton, Eccles and Frisco Formations. The ~10-200 m thick Oaktree Formation forms the base of the Malmani Subgroup and consists of carbonaceous shales, stromatolitic dolomites and locally developed quartzites. The Monte Christo Formation (which underlies the proposed project area) is ~300-500 m thick and consists of chert-rich dolomite and oolitic. The remaining Malmani Subgroup formations that overlie the Monte Christo Formation occur north of the proposed mine. The Lyttelton Formation immediately overlies the Monte Christo Formation ~1.5 km north of the proposed mine, consists of 100-200 m of shales, quartzites and stromatolitic dolomites, and is rich in iron and manganese. This is overlain by the 600 m thick cherty dolomites of the Eccles Formation. The Frisco Formation forms the top of the Malmani Subgroup and consists of 400 m of stromatolitic dolomites.

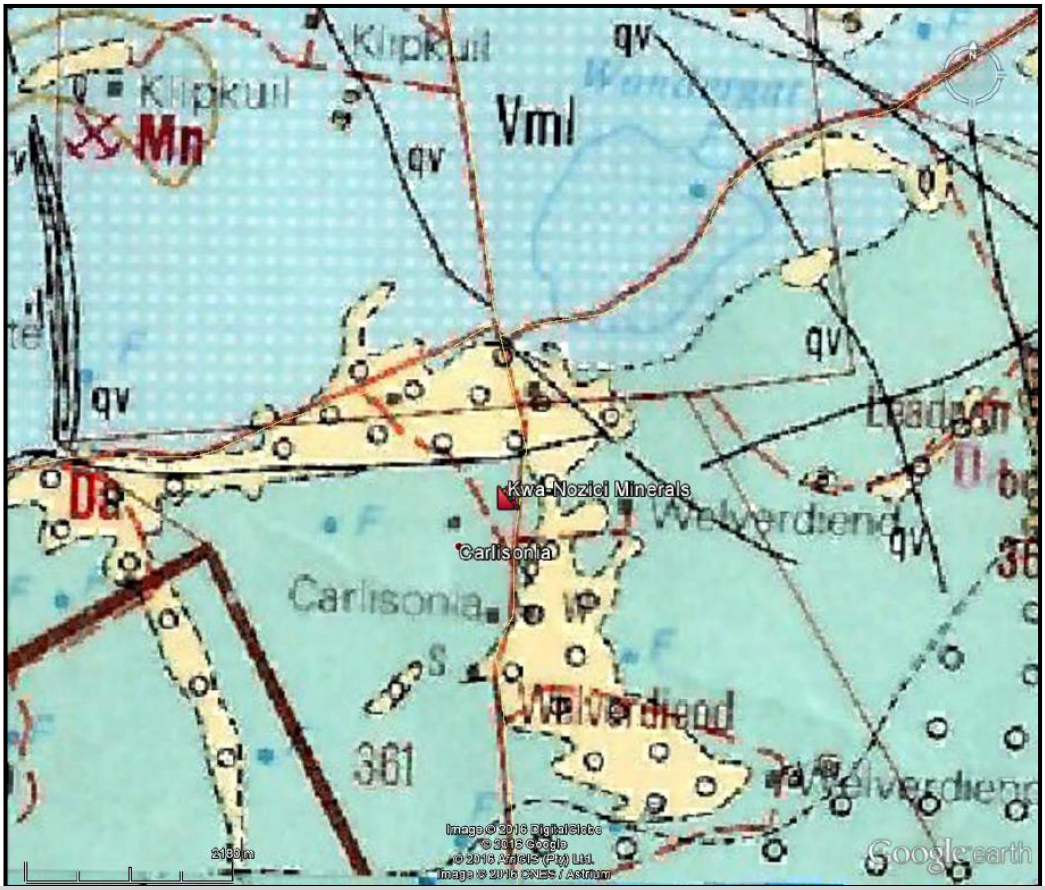


Figure 1-1: Geology from the 2526 Rustenburg 1:250 000 geological map) of the area underlying and surrounding the proposed Kwa Nozici Minerals diamond and manganese mine (red icon indicates the location of the proposed mine). The teal (including dotted and solid) area represents the dolomitic Monte Christo Formation (Vmm), the blue dotted area represents the dolomitic Lyttelton Formation (Vml), and the yellow dotted areas represent overlying Quaternary (sometimes diamondiferous) gravels and surface sediment (Q). Red Mn and Da symbols represent manganese and alluvial diamond mines within the Lyttelton and Monte Christo Formations respectively.

Climate

Climatic conditions in the area can be described as being semi-arid. The closest South Africa Weather Station to the site is in Lichtenburg, approximately 36 km from the site. Lichtenburg receives an average of 447 mm rainfall per annum, with most rainfall occurring mainly during mid-summer. Lowest rainfall occurs in the winter months, June and July (0 mm), with the highest rainfall occurring in January (88 mm). The monthly distribution of daily maximum temperatures for Lichtenburg are observed to range from average midday temperatures of 17.7°C in June to 30°C in January, with a mean annual evaporation of approximately 1850 – 1950 mm per annum. The region is the coldest during June when the mercury drops to 0°C on average during the night. Prevailing wind direction for Lichtenburg is from North to South.

Water Resources

The proposed project falls between the west boundary of the D141A and east boundary of C31A quaternary catchments of the Vaal Water Management Area. The main rivers within these quaternary catchments are the Molopo River (flowing northwestwards into the Orange River) and Harts River (flowing southwestwards into the Vaal River) respectively, although the headwaters of both rivers are approximately 15 km west and south of the proposed mining area respectively. Carlisonia, situated approximately 1 km south of the

proposed mine, forms part of the Matikiring-Carlisonia Cluster in terms of water supply management, and relies solely on groundwater for its water supply.

Soil and land capability

Soils of the general area are loamy and appear relatively shallow with sections of prominent surface rock (dolomite). Land capability of the area is described as non-arable, with moderate potential grazing land. The area is thus not very suitable for cultivation, with grazing capacity estimated at approximately 14 – 17 hectares per large livestock unit.

Biodiversity

Based on information obtained from the Ecological specialist study undertaken by Digby Wells, included in Appendix D, the proposed study area falls within the Carletonville Dolomite Grassland. This vegetation type is not listed as threatened by legislation, however is considered vulnerable by Mucina and Rutherford (2006) as a result of high levels of transformation. Carletonville Dolomite Grassland occurs on slightly undulating plains dissected by prominent rocky chert ridges. Typical plant communities are dominated by the grasses *Loudetia simplex* (Common Russet Grass), *Hyparrhenia hirta* (Common Thatching Grass), *Brachiaria serrata* (Velvet Signal Grass) and *Heteropogon contortus* (Spear Grass). The typical low grasslands are interspersed with low density of high shrubs, with trees mostly absent in this landscape except on ridges/koppies or azonal habitats. Shrubs such as: *Euclea undulata* (Common Guarri), *Searsia magalismontana* (Berg Taaibos), *Zanthoxylon capense* (Small Knobwood) and *Diospyros lycioides* (Bluebush) are scattered in protected places (e.g. among rocks and boulders).

Figure 1-2: Vegetation occurring on the Kwa Nozici Minerals proposed development site

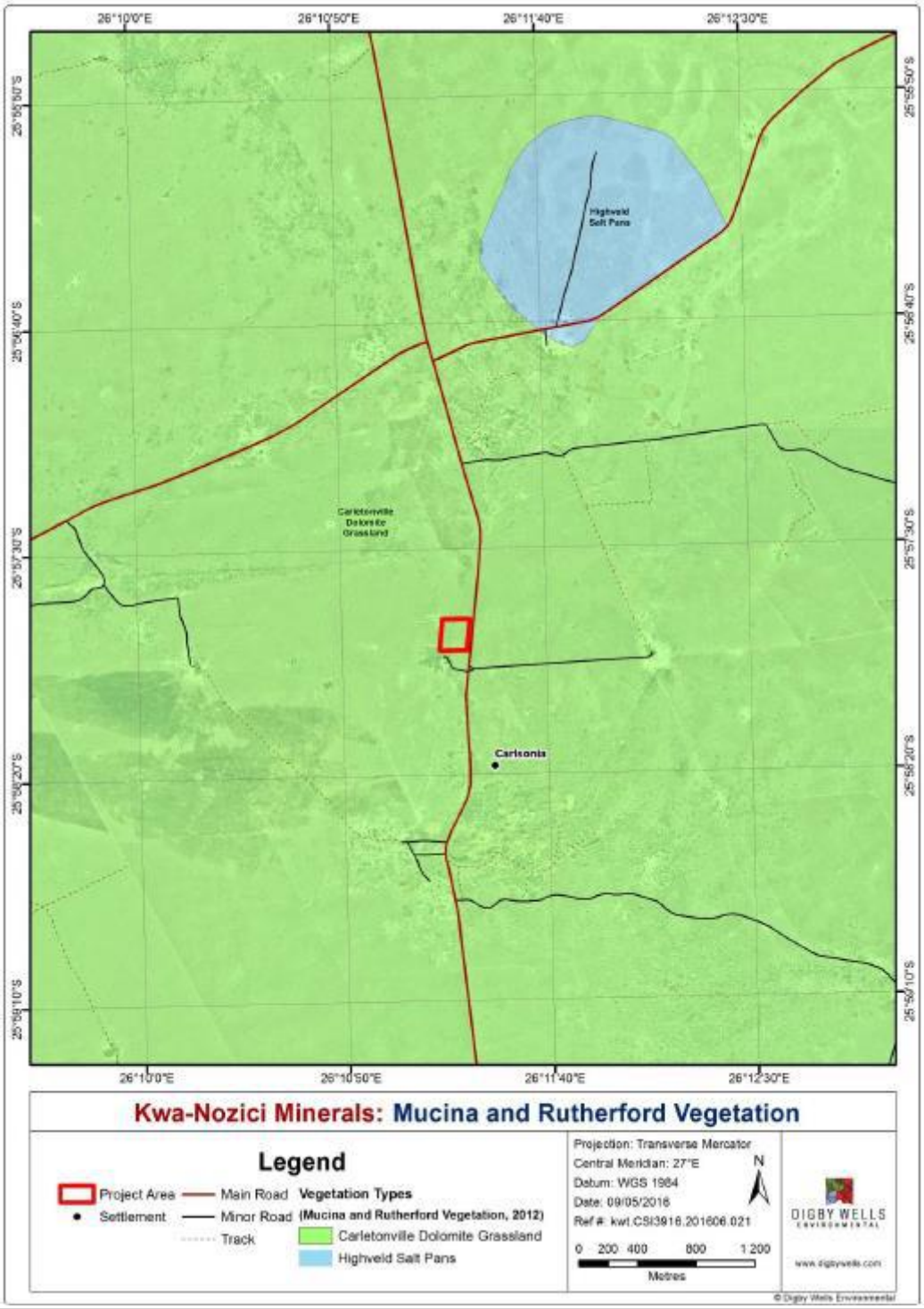


Figure 1-3: <u>Map illustrating the Regional vegetation type, in which the study area occurs in.</u>

The study site can be divided into two main areas: Transformed and Degraded land. The study area includes an alien tree bush clump. The majority of the land area is used for cattle grazing and, as such, is degraded from its natural state. Alien stands fall into the transformed category. Degraded land includes those grassland areas that are currently being used as grazing land, mainly for cattle. Transformed areas contain few or no indigenous species, whereas degraded areas comprise mainly indigenous species with some invasive species in disturbed areas.

Two protected species were encountered during the site walk through, these were, *Boophane disticha (Poison bulb),* declining under SA red data list and possibly *Crinum*

bulbispermum (Orange/Vaal River Lily), protected under the Transvaal Nature Conservation Ordinance, No. 12 of 1983, and declining under SA red data list.

Two flora species of special concern were recorded at the site, and no Red Data fauna species were recorded. The site does not fall within any formally protected areas, Important Bird Areas or areas earmarked for future protected status according to the National Projected Areas Expansion Strategy. None of the remaining habitat was regarded as particularly significant or unique.

Socio-economic

The proposed mining site is located near Welverdiend village, formally known as Carlisonia, which falls in the Ditsobotla Local Municipality, which is approximately 6 477 square kilometres in extent. The 2011 Census revealed that the Ditsobotla Municipality has a population of approximately 168 902 and 44 500 total households, equating to an average household size of 3.8 persons. The figure below reflects the population distribution, indicating a dominant presence of black Africans in this municipality.

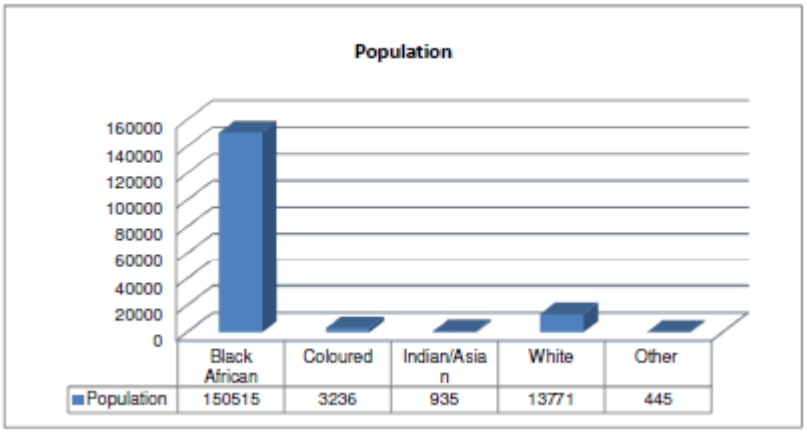


Figure 1-4: Population distribution figure in the Ditsobotla Municipality, obtained from the 2011 Census (Source: Ditsobotla Final IDP 2015/16)

The figure below indicates the age distribution within the Ditsobotla Municipality. Understanding the age structure and population of a municipality is important for planning with regards to the anticipated demands for services and employments opportunities. It allows the municipality to identify the potential need and location of facilities, expected growth in economically active population and potential employment seekers, as well as project and plan for facilities to cater for the older persons.

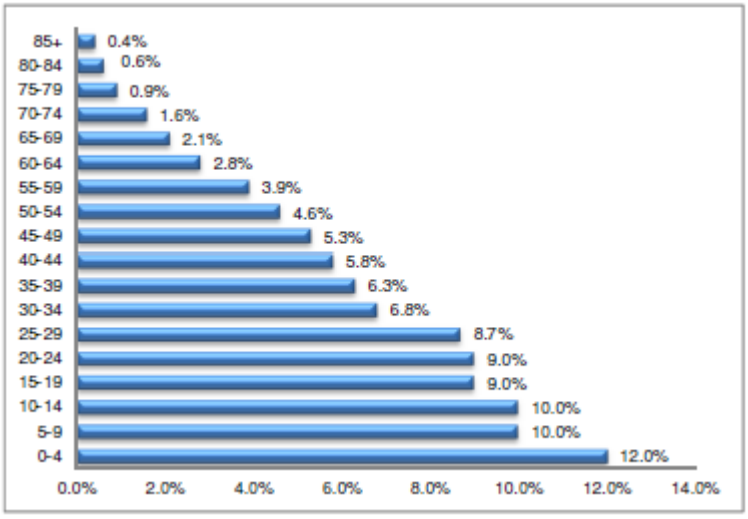


Figure 1-5: Age Structure and population within the

Ditsobotla Municipality (Source: Ditsobotla Final IDP 2015/16

The number of economically active persons for Ditsobotla Local Municipality is 53.5%. Based on the 2012 Ditsobotla Spatial Development Framework (SDF) Review, the unemployment percentage in the municipality is 42.2% and that of employed is 57.8%. The highest average household income is concentrated in the Lichtenburg formal areas, generally comprising in excess of R6 000 per household per month. The average household income in the majority of villages in the rural areas is less than R1 500 per household per month.

The dominant economic sectors for the Municipality include finance and business, wholesale and retail trade, manufacturing and general government services. The mining sector has experienced a negative growth between 2006 and 2010, with an annual average formal employment contribution of 1.1% in this period. This sector is thus one of the municipality's strategic objectives in creating an enabling environment for job creation and business to thrive, with the strategy being that of monitoring the implementation of Social Labour Plans by mining businesses in the municipal area. The mining sector was recorded as the third highest GDP contributing sector (13%) in the municipality in 2012. Mining is one of the sectors that form the backbone of the greater Ngaka Modiri Molema District Municipality, covering local municipalities such as Ditsobotla. The mining sector together with agriculture and tourism are identified as the most profound in terms of economic sectors of the Ditsobotla Local Municipality

The proposed mining site is situated north of Lichtenburg, the general area is rural in nature and characterised by agricultural and mining activities. The farm land in the broader region is mostly used for agriculture in the form of livestock grazing, with many small-scale mining operations scattered throughout the region. The site also has evidence of historic mining activities.

Cultural Heritage

The Heritage study was undertaken by ASHA Consulting, and is included in Appendix D of this BAR. The National Cultural History Museum (1995) conducted a broad survey of the general area, including Farm 361. They report on the presence of Early Stone Age (ESA) artefacts at the diamond mines, while Van Schalkwyk (2008) notes that ESA and Middle Stone Age (MSA) artefacts have been unearthed in the various diamond mines of the area and are also sometimes found along river courses. Further west, the gravels of the lower Vaal River are very well known for the ESA material and fossil animal bones that they have produced (Cooke 1949; Goodwin 1928; Klein 1988; Peringuey 1911). Whether the same degree of archaeological and fossil material might be present further east in palaeo-river channels is not known, but at least some artefactual material has been collected from the region (Mitchell 2002; Peringuey 1911). The National Cultural History Museum (1995) also noted the existence of earlier mining settlements in the area with one (Carlisonia) having been reduced to rubble and another (Grasfontein) being represented solely by its general dealer's shop. In a more detailed survey of a site just north of Lichtenburg, Hutten (2012) was unable to locate any heritage resources. Van Schalkwyk (2008), too, found no Stone Age material on his linear survey extending north-westwards from Lichtenburg through Bakerville. We do know, however, that Later Stone Age (LSA) engravings do occur on dolomitic rocks in the general area (Willcox 1963; Figure 7). The Gestoptefontein-Driekuil Complex is a well-known set of engraving sites occurring some 90 km to the southwest of the study area and that include both Stone Age and historical imagery (Hollman 2011). Iron Age archaeology is well-known to occur in the general region, although the lack of suitable

building rock in the area is the likely reason why kraal structures have not been recorded here. Mason (1968:172) noted that "Iron Age settlers avoided extensive grasslands such as the grasslands of the western Karoo Highveld on the Lichtenburg Plain, possibly because of the rarity of surface streams and low relief which denied water and natural topographic protection to settlers in such territory."

Figure 1-6: Extract of a map showing the distribution of rock engravings (\\\\) and paintings (///) in South Africa. The present study area lies to the northeast of Site 13 (Gestoptefontein) on the map (red oval). Source: Willcox (1963: fig. 2).

In term of historical aspects and the built environment, Lichtenburg was a farming community that developed during the latter half of the nineteenth century. The town itself was established in 1873. The nearby village of Bakerville lies at the site of the early twentieth century diamond diggings.

Lichtenburg saw action during the South African War (a.k.a. Anglo-Boer War). The town was a strategic position and was held by both the Boer and British forces in turn. Colonel Robert Baden-Powell led a large British force to secure the town and surrounding territory in November 1900, but on Sunday 3rd March 1901 some 400 Boers under the joint commands of Generals De la Rey, Smuts, Celliers, Vermaas and Lemmer attacked the town. This was the Battle of Lichtenburg. Fourteen Boers and eighteen British were killed, while 38 Boers and 24 British were wounded (Van Vuuren 2015).

The first diamond to be discovered in the area was found in 1924 on the farm Elandsputte by John Voorendyk when digging a hole to construct a cattle dip. However, the State Geologist at the time, Dr Harger, was unconvinced of the nature of the deposits and it was only two years later when diamonds were again discovered in the area that Dr Harger commenced prospecting. Ironically, and due to a navigational error on his part subsequent work by him was carried out on part of Elandsputte and his rich findings there precipitated the 1926 Lichtenburg diamond rush (Smith 2006). Figures 1.7 and 1.8 show early mining scenes from the area. Voorendyk's cattle dip was declared a National Monument (now a Provincial Heritage Site [PHS]) in 1980 (SAHRA n.d.).

Figure 1-7: Grasfontein Diamond Diggings, 1927 (Source: Smith 2006).

Figure 1-8: Vaalboschpatte Diamond Diggings (Source: Smith 2006).

The National Cultural History Museum (1995) noted that the historic diamond mining landscape was constantly changing as a result of people reworking old mine dumps and sometimes using the material to refill old mine pits. The area was also found to be littered with old equipment and machinery, while a variety of corrugated iron structures dating to the old mining days were also noted.

The National Cultural History Museum (1995) also recorded a number of cemeteries in the area. These were for either black or white people and were generally in very poor condition.

The site inspection done by ASHA Consulting revealed a rectangular stone feature that seems most likely to represent stones cleared to the side of a field and, just outside the study area to its south, a circular stone and cement foundation that may be the base of a reservoir. Some small fossil stromatolites were also found.

None of these heritage resources is deemed to have high cultural significance and, as such, no further heritage actions are required prior to the commencement of mining. However, the project Environmental Control Officer (ECO) and/or mine manager should be aware of the possibility of uncovering fossil wood and/or large stromatolites during excavations.

There was no evidence of any graves within the study area. Unmarked graves are highly unlikely because of the rocky substrate. There are no built heritage features within the study area.

The cultural landscape is poorly developed and relates to two aspects. The first and older aspect is the agricultural one. The area is used for livestock grazing and, as such, fences and other features of the landscape like gum tree plantations have been created for agricultural purposes. The second and more important aspect is the landscape of alluvial diamond digging from the late 1920s Lichtenburg diamond rush. The present site was not subjected to much activity in this regard with only a few small excavations and spoil heaps testifying to this activity having occurred. Further afield though there was plenty of activity with the landscape being severely pock-marked as a result. Fairly large-scale digging occurred some 1.4 km north and 1.3 km south of the present study area.

1.2. Description of the current land uses.

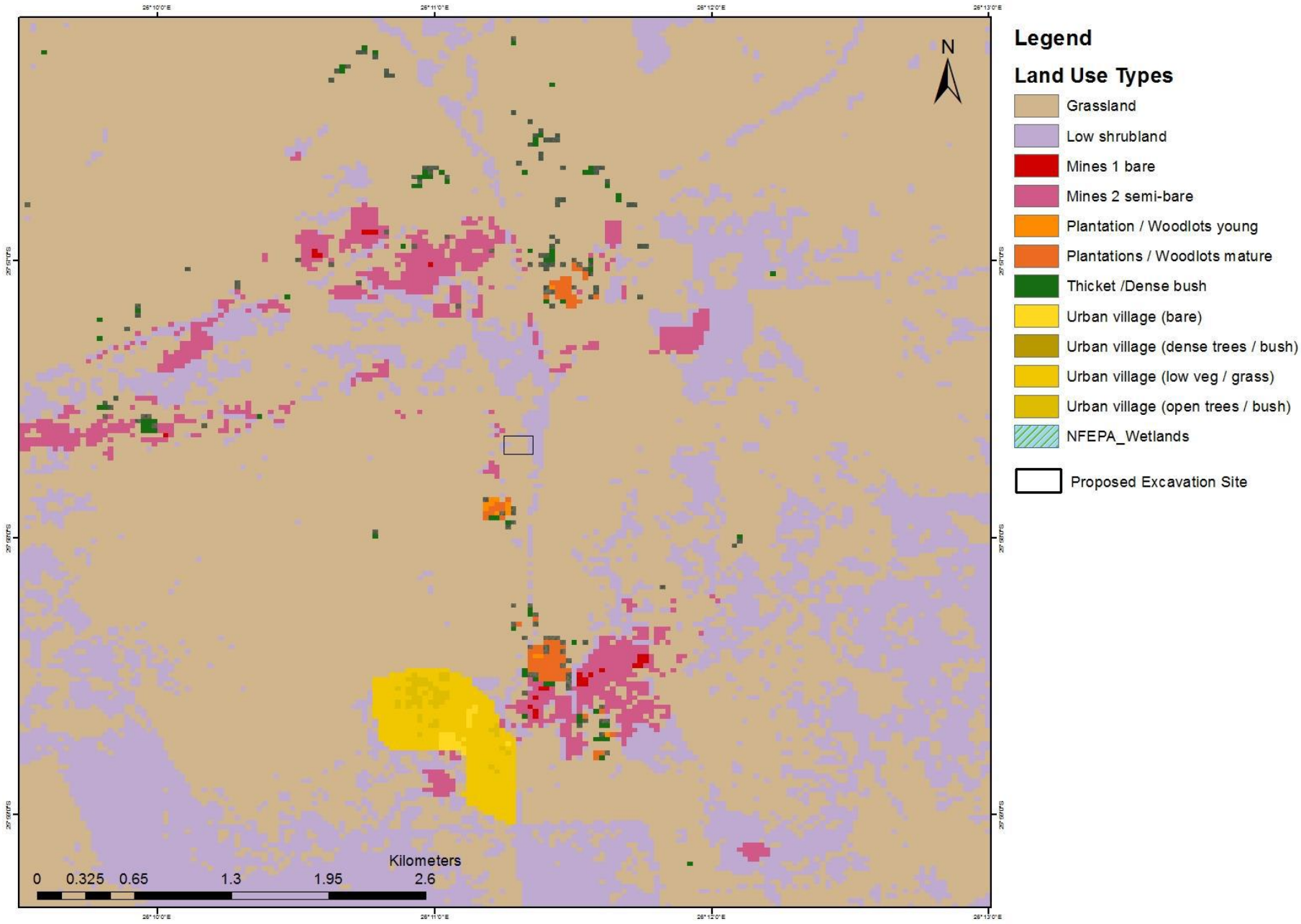
The farm land in the broader region is mostly used for agriculture in the form livestock grazing, with many small-scale mining operations scattered throughout the region. The site is covered with indigenous vegetation of mixed shrubland/grassland, as well as alien bushclumps. Gum trees from a nearby plantation have encroached into the south-western corner of the site. There is also historic evidence of mining activities in the south-western corner of the site, in the form of shallow holes and spoil heaps that have eroded with time. The majority of the land area is used for cattle grazing and, as such, is degraded from its natural state.

1.3. Description of specific environmental features and infrastructure on the site.

There is a gravel road and small electricity line alongside the eastern edge of the site, with no infrastructure occurring on site and general area. There are two boreholes within close proximity of the proposed mining site. The proposed mining site is predominantly covered by mixed shrubland/grassland, as well as alien bushclumps.

1.4. Environmental and current land use map.

(Show all environmental, and current land use features)



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

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

1. Construction Phase

1.1. <u>Site preparation and vehicular activities</u>

Nature of potential Impact/risk	Extent	Duration	Consequence	Probability	Significance	Reversibility of impact	Irreplaceability of receiving environment/resource	Can impact be avoided?	Can impact be managed or mitigated?
Loss of vegetation and faunal habitat	Site	Long-term	Moderate	Very likely	Moderate	Moderate (rehabilitation after construction)	Moderate	No	Yes
Exposed soil susceptible to erosion	Site	Medium-term	Moderate	Likely	Low	Moderate (rehabilitation after construction)	Moderate	No	Yes
Noise generation	Site	Short-term	Slight	Very likely	Very low	Non-reversible	Low	No	Yes
Dust emissions	Site	Short-term	Slight	Very likely	Very low	Non-reversible	Low	No	Yes
Soil and water resources contamination	Local	Medium-term	Moderate	Likely	Low	Non-reversible	Moderate	No	Yes
Destruction of archaeology	Site	Permanent	Slight	Unlikely	Very low	Non-reversible	High	Yes	Yes
Destruction of palaeontology	Site	Permanent	Moderate	Very likely	Low	Non-reversible	High	No	Yes
Erosion of cultural landscape	Local	Long-term	Slight	Very likely	Very low	High (with rehabilitation)	Moderate	No	Yes
Impact on health, and safety of workers	Site	Medium-term	Moderate	Likely	Low	Non-reversible	Moderate	No	Yes

1.2. Site clearing and topsoil removal for mining operation, and construction of a mining pit

Nature of potential Impact/risk	Extent	Duration	Consequence	Probability	Significance	Reversibility of impact	Irreplaceability of receiving environment/resource	Can impact be avoided?	Can impact be managed or mitigated?
Loss of vegetation and faunal habitat	Site	Long-term	Moderate	Very likely	Moderate	Moderate (rehabilitation after construction)	Moderate	No	Yes
Exposed soil susceptible to erosion	Site	Medium-term	Moderate	Likely	Low	Moderate (rehabilitation after construction)	Moderate	No	Yes
Noise generation	Site	Short-term	Slight	Very likely	Very low	Non-reversible	Low	No	Yes
Dust emissions	Site	Short-term	Slight	Very likely	Very low	Non-reversible	Low	No	Yes
Soil and water resources contamination	Local	Medium-term	Moderate	Likely	Low	Non-reversible	Moderate	No	Yes
Topography and visual alteration	Site	Medium-term	Substantial	Likely	Moderate	High (rehabilitation during closure)	Low	No	Yes
Soil disturbance resulting in the spread of alien plant species	Site and Local	Long-term	Substantial	Likely	Low	Low (rehabilitation after construction)	Moderate	No	Yes
Loss of Species of Special Concern	Site and Local	Long-term	Substantial	Very likely	Moderate	Low (rehabilitation after construction)	Moderate	No	Yes
Disturbance of fauna	Site and Local	Medium-term	Moderate	Likely	Low	Non-reversible	Moderate	No	Yes

Nature of potential Impact/risk	Extent	Duration	Consequence	Probability	Significance	Reversibility of impact	Irreplaceability of receiving environment/resource	Can impact be avoided?	Can impact be managed or mitigated?
Sinkhole development	Site	Long-term	Severe	Extremely unlikely	Very low	Low	Low	No	Yes
Destruction of archaeology	Site	Permanent	Slight	Unlikely	Very low	Non-reversible	High	Yes	Yes
Destruction of palaeontology	Site	Permanent	Moderate	Very likely	Low	Non-reversible	High	No	Yes
Erosion of cultural landscape	Local	Long-term	Slight	Very likely	Very low	Low (with rehabilitation)	Moderate	No	Yes
Impact on health, and safety of workers	Site	Medium-term	Moderate	Likely	Low	Non-reversible	Moderate	No	Yes

1.3. Construction of pollution control dam, trenches, water pipes, storm water management facilities

Nature of potential Impact/risk	Extent	Duration	Consequence	Probability	Significance	Reversibility of impact	Irreplaceability of receiving environment/resource	Can impact be avoided?	Can impact be managed or mitigated?
Loss of vegetation and faunal habitat	Site	Long-term	Moderate	Very likely	Moderate	Moderate (rehabilitation after construction)	Moderate	No	Yes
Exposed soil susceptible to erosion	Site	Medium-term	Moderate	Likely	Low	Moderate (rehabilitation after construction)	Moderate	No	Yes
Noise generation	Site	Short-term	Slight	Very likely	Very low	Non-reversible	Low	No	Yes
Dust emissions	Site	Short-term	Slight	Very likely	Very low	Non-reversible	Low	No	Yes
Soil and water resources contamination and siltation	Local	Medium-term	Moderate	Likely	Low	Non-reversible	Moderate	No	Yes
Topography and visual alteration	Site	Medium-term	Substantial	Likely	Moderate	Moderate (rehabilitation during closure)	Low	No	Yes
Soil disturbance resulting in the spread of alien plant species	Site and Local	Long-term	Moderate	Likely	Low	Low (rehabilitation after construction)	Moderate	No	Yes
Loss of Species of Special Concern	Site and Local	Long-term	Substantial	Very likely	Moderate	Moderate (rehabilitation after construction)	Moderate	No	Yes
Disturbance of fauna	Site and Local	Medium-term	Moderate	Likely	Low	Non-reversible	Moderate	No	Yes

Nature of potential Impact/risk	Extent	Duration	Consequence	Probability	Significance	Reversibility of impact	Irreplaceability of receiving environment/resource	Can impact be avoided?	Can impact be managed or mitigated?
Destruction of archaeology	Site	Permanent	Slight	Unlikely	Very low	Non-reversible	High	Yes	Yes
Destruction of palaeontology	Site	Permanent	Moderate	Very likely	Low	Non-reversible	High	No	Yes
Erosion of cultural landscape	Local	Long-term	Slight	Very likely	Very low	Low (with rehabilitation)	Moderate	No	Yes
Impact on health, and safety of workers	Site	Medium-term	Moderate	Likely	Low	Non-reversible	Moderate	No	Yes

1.4. Preparing an area of 900 m^2 for a portable camp site to accommodate infrastructure associated with stockpiling, crushing, washing, sorting and offices etc.

Nature of potential Impact/risk	Extent	Duration	Consequence	Probability	Significance	Reversibility of impact	Irreplaceability of receiving environment/resource	Can impact be avoided?	Can impact be managed or mitigated?
Loss of vegetation and faunal habitat	Site	Long-term	Moderate	Very likely	Moderate	Moderate (rehabilitation after construction)	Moderate	No	Yes
Exposed soil susceptible to erosion	Site	Medium-term	Moderate	Likely	Low	Moderate (rehabilitation after construction)	Moderate	No	Yes
Noise generation	Site	Short-term	Slight	Very likely	Very low	Non-reversible	Low	No	Yes
Dust emissions	Site	Short-term	Slight	Very likely	Very low	Non-reversible	Low	No	Yes
Soil and water resources contamination and siltation	Local	Medium-term	Moderate	Likely	Low	Non-reversible	Moderate	No	Yes
Topography and visual alteration	Site	Medium-term	Substantial	Likely	Moderate	Moderate (rehabilitation during closure)	Low	No	Yes
Soil disturbance resulting in the spread of alien plant species	Site and Local	Long-term	Moderate	Likely	Low	Low (rehabilitation after construction)	Moderate	No	Yes
Loss of Species of Special Concern	Site and Local	Long-term	Substantial	Very likely	Moderate	Moderate (rehabilitation after construction)	Moderate	No	Yes
Disturbance of fauna	Site and Local	Medium-term	Moderate	Likely	Low	Non-reversible	Moderate	No	Yes

Nature of potential Impact/risk	Extent	Duration	Consequence	Probability	Significance	Reversibility of impact	Irreplaceability of receiving environment/resource	Can impact be avoided?	Can impact be managed or mitigated?
Destruction of archaeology	Site	Permanent	Slight	Unlikely	Very low	Non-reversible	High	Yes	Yes
Destruction of palaeontology	Site	Permanent	Moderate	Very likely	Low	Non-reversible	High	No	Yes
Erosion of cultural landscape	Local	Long-term	Slight	Very likely	Very low	Low (with rehabilitation)	Moderate	No	Yes
Impact on health, and safety of workers	Site	Medium-term	Moderate	Likely	Low	Non-reversible	Moderate	No	Yes

2. Operation Phase

2.1. <u>Extraction and transportation of ore</u>

Nature of potential Impact/risk	Extent	Duration	Consequence	Probability	Significance	Reversibility of impact	Irreplaceability of receiving environment/resource	Can impact be avoided?	Can impact be managed or mitigated?
Impact on groundwater and aquifer	Local	Medium-term	Slight	Very likely	Very low	Non-reversible	Moderate	No	Yes
Impact on upstream tributaries and water in the catchment	Local	Short-term	Slight	Unlikely	Very low	Non-reversible	Moderate	No	Yes
Noise generation	Site	Long-term	Substantial	Very likely	Moderate	Non-reversible	Low	No	Yes
Air quality and dust emissions	Site	Short-term	Slight	Very likely	Very low	Non-reversible	Low	No	Yes
Soil and water resources contamination	Local	Medium-term	Moderate	Likely	Low	Non-reversible	Moderate	No	Yes
Destruction of archaeology	Site	Permanent	Slight	Unlikely	Very low	Non-reversible	High	Yes	Yes
Destruction of palaeontology	Site	Permanent	Moderate	Very likely	Low	Non-reversible	High	No	Yes
Erosion of cultural landscape	Local	Long-term	Slight	Very likely	Very low	Low (with rehabilitation)	Moderate	No	Yes
Impact on health, and safety of workers	Site	Medium-term	Moderate	Likely	Low	Non-reversible	Moderate	No	Yes

2.2. TLB activity and operation of mining equipment

Nature of potential Impact/risk	Extent	Duration	Consequence	Probability	Significance	Reversibility of impact	Irreplaceability of receiving environment/resource	Can impact be avoided?	Can impact be managed or mitigated?
Loss of vegetation and faunal habitat	Site	Long-term	Moderate	Very likely	Moderate	Moderate (rehabilitation after construction)	Moderate	No	Yes
Exposed soil susceptible to erosion	Site	Long-term	Moderate	Likely	Low	Moderate (rehabilitation after construction)	Moderate	No	Yes
Noise generation	Site	Long-term	Slight	Very likely	Very low	Non-reversible	Low	No	Yes
Dust emissions	Site	Long-term	Slight	Very likely	Very low	Non-reversible	Low	No	Yes
Soil and water resources contamination and siltation	Local	Medium-term	Moderate	Likely	Low	Non-reversible	Moderate	No	Yes
Topography and visual alteration	Site	Medium-term	Substantial	Likely	Moderate	Moderate (rehabilitation during closure)	Low	No	Yes
Soil disturbance resulting in the spread of alien plant species	Site and Local	Long-term	Moderate	Likely	Low	Low (rehabilitation after construction)	Moderate	No	Yes
Loss of Species of Special Concern	Site and Local	Long-term	Substantial	Very likely	Moderate	Moderate (rehabilitation after construction)	Moderate	No	Yes
Disturbance of fauna	Site and Local	Medium-term	Moderate	Likely	Low	Non-reversible	Moderate	No	Yes
Impact on health, and safety of workers	Site	Medium-term	Moderate	Likely	Low	Non-reversible	Moderate	No	Yes

2.3. Water extraction from borehole and/or tank

Nature of potential Impact/risk	Extent	Duration	Consequence	Probability	Significance	Reversibility of impact	Irreplaceability of receiving environment/resource	Can impact be avoided?	Can impact be managed or mitigated?
Noise generation	Site	Long-term	Slight	Likely	Very low	Non-reversible	Low	No	Yes
Dust emissions	Site	Long-term	Slight	Likely	Very low	Non-reversible	Low	No	Yes
Topography and visual alteration	Site	Long-term	Moderate	Likely	Low	Moderate (rehabilitation during closure)	Low	No	Yes
Groundwater quantity	Local	Long-term	Substantial	Extremely unlikely	Very low	Non-reversible	Moderate	No	Yes

2.4. Crushing, washing and sorting of ore in mobile plant

Nature of potential Impact/risk	Extent	Duration	Consequence	Probability	Significance	Reversibility of impact	Irreplaceability of receiving environment/resource	Can impact be avoided?	Can impact be managed or mitigated?
Air quality and dust emissions	Local	Long-term	Moderate	Very likely	Low	Non-reversible	Low	No	Yes
Impact on hydrogeology (contamination) due to spills or seepage	Site	Short-term	Moderate	Likely	Low	Non-reversible	Moderate	No	Yes
Noise generation	Site	Long-term	Moderate	Likely	Low	Non-reversible	Low	No	Yes
Visual impact	Site	Long-term	Moderate	Likely	Low	High (post closure)	Low	No	Yes

2.5. Storage of diesel and vehicle/machinery maintenance equipment

Nature of potential Impact/risk	Extent	Duration	Consequence	Probability	Significance	Reversibility of impact	Irreplaceability of receiving environment/resource	Can impact be avoided?	Can impact be managed or mitigated?
Air quality	Site	Long-term	Slight	Likely	Very low	Non-reversible	Low	No	Yes
Surface water impacts	Local	Long-term	Substantial	Extremely unlikely	Very low	Non-reversible	Moderate	No	Yes
Impact on hydrogeology and soil contamination due to spills or seepage	Site	Short-term	Moderate	Likely	Low	Non-reversible	Moderate	No	Yes
Visual impact	Site	Long-term	Moderate	Likely	Low	High (post closure)	Low	No	Yes

2.6. Waste generation and disposal

Nature of potential Impact/risk	Extent	Duration	Consequence	Probability	Significance	Reversibility of impact	Irreplaceability of receiving environment/resource	Can impact be avoided?	Can impact be managed or mitigated?
Air quality	Local	Long-term	Moderate	Likely	Low	Non-reversible	Low	No	Yes
Surface water impacts	Local	Long-term	Moderate	Extremely unlikely	Very low	Non-reversible	Moderate	No	Yes
Impact on hydrogeology and soil contamination due to spills, seepage or hazardous substances	Site	Short-term	Moderate	Likely	Low	Non-reversible	Moderate	No	Yes
Topography and visual alteration	Site	Medium-term	Moderate	Likely	Low	High (post closure)	Low	No	Yes

3. Decommissioning phase

3.1. Demolition and/or removal of mobile camp site infrastructure/equipment

Nature of potential Impact/risk	Extent	Duration	Consequence	Probability	Significance	Reversibility of impact	Irreplaceability of receiving environment/resource	Can impact be avoided?	Can impact be managed or mitigated?
Destruction of vegetation	Site	Short-term	Substantial	Likely	Moderate	Moderate (rehabilitation post closure)	Moderate	Yes	Yes
Establishment and spread of alien plant species	Site and Local	Long-term	Substantial	Very likely	Moderate	Low (rehabilitation post closure)	Moderate	No	Yes
Impact on groundwater and aquifer	Local	Medium-term	Moderate	Very likely	Low	Non-reversible	Moderate	No	Yes
Impact on upstream tributaries and water in the catchment	Local	Medium-term	Moderate	Extremely unlikely	Very low	Non-reversible	Moderate	No	Yes
Topography and visual impact	Site	Short-term	Moderate	Very likely	Neutral	-	Low	Yes	Yes
Noise generation	Site	Long-term	Substantial	Very likely	Moderate	Non-reversible	Low	No	Yes
Air quality and dust emissions	Local	Short-term	Slight	Very likely	Very low	Non-reversible	Low	No	Yes
Impact on health, and safety of workers	Site	Medium-term	Moderate	Likely	Low	Non-reversible	Moderate	No	Yes

3.2. Rehabilitation and restoration of disturbed areas

Nature of potential Impact/risk	Extent	Duration	Consequence	Probability	Significance	Reversibility of impact	Irreplaceability of receiving environment/resource	Can impact be avoided?	Can impact be managed or mitigated?
Impact on groundwater and aquifer	Local	Medium-term	Moderate	Very likely	Low	Non-reversible	Moderate	No	Yes
Impact on upstream tributaries and water in the catchment	Local	Medium-term	Moderate	Likely	Low	Non-reversible	Moderate	No	Yes
Topography and visual impact	Site	Long-term	Moderate	Very likely	Low	Non-reversible	Low	Yes	Yes
Noise generation	Site	Long-term	Substantial	Very likely	Moderate	Non-reversible	Low	No	Yes
Air quality and dust emissions	Site	Short-term	Slight	Very likely	Very low	Non-reversible	Low	No	Yes
Impact on land capability	Site	Long-term	Substantial	Likely	Moderate	Non-reversible	Moderate	No	Yes

(vi) Methodology used in determining and ranking the nature, significance, consequence, extent, duration and probability of potential environmental impacts and risks;

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

APPROACH TO THE BASIC ASSESSMENT

1) METHODOLOGY OF IMPACT ASSESSMENT

According to the DEA IEM Series guideline on "Impact Significance" (2002), there are a number of quantitative and qualitative methods that can be used to identify the significance of impacts resulting from a development. The process of determining impact significance should ideally involve a process of determining the acceptability of a predicted impact to society. Making this process explicit and open to public comment and input would be an improvement of the EIA/BA process. The CSIR's approach to determining significance is generally as follows:

- Use of expert opinion by the specialists ("professional judgement"), based on their experience, a site visit and analysis, and use of existing guidelines and strategic planning documents and conservation mapping (e.g. SANBI biodiversity databases);
- Review of specialist assessment by all stakeholders including authorities such as nature conservation officials, as part of the report review process (i.e. if a nature conservation official disagreed with the significance rating, then we could negotiate the rating); and
- Our approach is more a qualitative approach - we do not have a formal matrix calculation of significance as is sometimes done.

2) SPECIALIST CRITERIA FOR IMPACT ASSESSMENT

The following methodology has been provided by the CSIR to the specialist who conducted the Ecological assessment, NSS, for incorporation into their specialist assessment:

Assessment of Potential Impacts

The assessment of impact significance is based on the following conventions:

Nature of Impact - this reviews the type of effect that a proposed activity will have on the environment and should include "what will be affected and how?"

Spatial Extent - this should indicate whether the impact will be:
- Site specific;
- Local (<2 km from site);
- Regional (within 30 km of site); or
- National.

Duration - The timeframe during which (lifetime of) the impact will be experienced:
- Temporary (less than 1 year);
- Short term (1 to 6 years);
- Medium term (6 to 15 years);
- Long term (the impact will cease after the operational life of the activity); or
- Permanent (mitigation will not occur in such a way or in such a time span that the impact can be considered transient).

Intensity - it should be established whether the impact is destructive or innocuous and should be described as either:
- High (severe alteration of natural systems, patterns or processes such that they temporarily or permanently cease);
- Medium (notable alteration of natural systems, patterns or processes; where the environment continues to function but in a modified manner); or
- Low (negligible or no alteration of natural systems, patterns or processes); can be easily avoided by

implementing appropriate mitigation measures, and will not have an influence on decision-making.

Probability - this considers the likelihood of the impact occurring and should be described as:

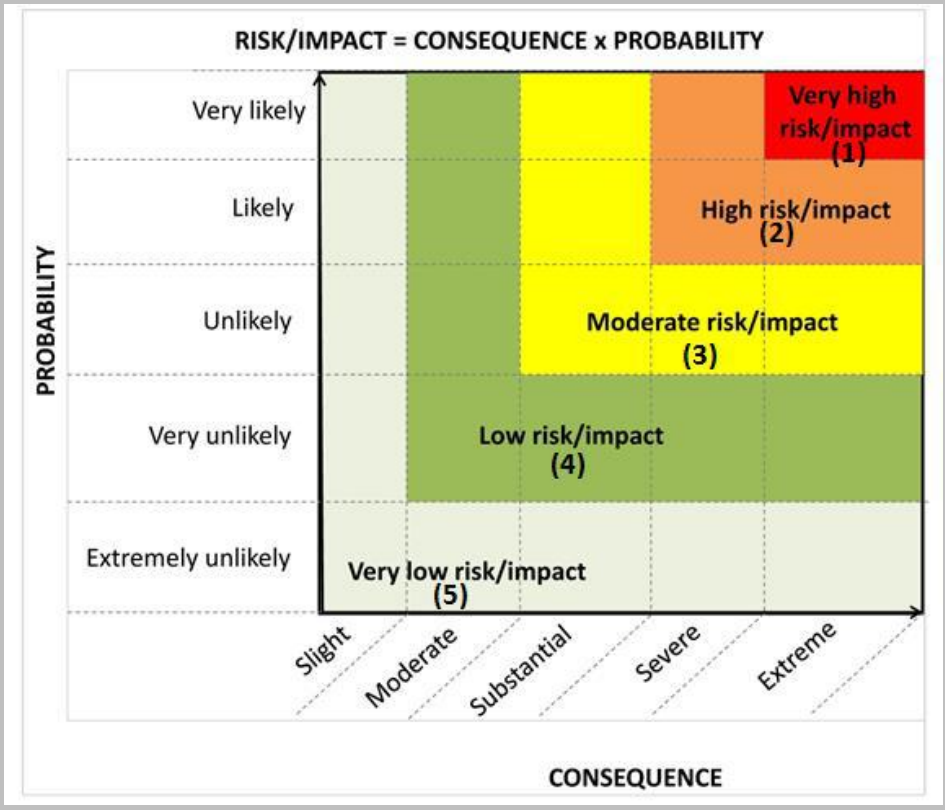
- Improbable (little or no chance of occurring);
- Probable (<50% chance of occurring);
- Highly probable (50 – 90% chance of occurring); or
- Definite (>90% chance of occurring).

Reversibility - this considers the degree to which the adverse environmental impacts are reversible or irreversible. For example, an impact will be described as low should the impact have little chance of being rectified to correct environmental impacts. On the other hand, an impact such as the nuisance factor caused by noise impacts from wind turbines can be considered to be highly reversible at the end of the project lifespan. The assessment of the reversibility of potential impacts is based on the following terms:

- High - impacts on the environment at the end of the operational life cycle are highly reversible;
- Moderate - impacts on the environment at the end of the operational life cycle are reasonably reversible;
- Low - impacts on the environment at the end of the operational life cycle are slightly reversible; or
- Non-reversible - impacts on the environment at the end of the operational life cycle are not reversible and are consequently permanent.

Irreplaceability - this reviews the extent to which an environmental resource is replaceable or irreplaceable. For example, if the proposed project will be undertaken on land that is already transformed and degraded, this will yield a low irreplaceability score; however, should a proposed development destroy unique wetland systems for example, these may be considered irreplaceable and thus be described as high. The assessment of the degree to which the impact causes irreplaceable loss of resources is based on the following terms:

- High irreplaceability of resources (this is the least favourable assessment for the environment);
- Moderate irreplaceability of resources;
- Low irreplaceability of resources; or
- Resources are replaceable (this is the most favourable assessment for the environment).



Figure…: <u>Guide to assessing risk/impact significance as a result of consequence and probability.</u>

The status of the impacts and degree of confidence with respect to the assessment of the significance is stated as follows:

Status of the impact: A description as to whether the impact will be:
- Positive (environment overall benefits from impact);
- Negative (environment overall adversely affected); or
- Neutral (environment overall not affected).

Degree of confidence in predictions: The degree of confidence in the predictions, based on the availability of information and specialist knowledge. This should be assessed as:
- High;
- Medium; or
- Low.

Based on the above considerations, the specialist provides an overall evaluation of the significance of the potential impact, which should be described as follows:
- **Low to very low:** the impact may result in minor alterations of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated;
- **Medium:** the impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated; or
- **High:** Where it could have a "no-go" implication for the project unless mitigation or re-design is practically achievable.

Furthermore, the following must be considered:
- Impacts should be described both before and after the proposed mitigation and management measures have been implemented.
- All impacts should be evaluated for the construction, operation and decommissioning phases of the project, where relevant.
- The impact evaluation should take into consideration the cumulative effects associated with this and other facilities which are either developed or in the process of being developed in the region, if relevant.

Management Actions:
- Where negative impacts are identified, mitigatory measures will be identified to avoid or reduce negative impacts. Where no mitigatory measures are possible this will be stated.
- Where positive impacts are identified, augmentation measures will be identified to potentially enhance these.
- Quantifiable standards for measuring and monitoring mitigatory measures and enhancements will be set. This will include a programme for monitoring and reviewing the recommendations to ensure their ongoing effectiveness.

Monitoring:
Specialists should recommend monitoring requirements to assess the effectiveness of mitigation actions, indicating what actions are required, by whom, and the timing and frequency thereof.

Cumulative Impact:
Consideration is given to the extent of any accumulative impact that may occur due to the proposed development. Such impacts are evaluated with an assessment of similar developments already in the environment. Such impacts will be either positive or negative, and will be graded as being of negligible, low, medium or high impact.

Mitigation:
The objective of mitigation is to firstly avoid and minimise impacts where possible and where these cannot be completely avoided, to compensate for the negative impacts of the development on the receiving environment and to maximise re-vegetation and rehabilitation of disturbed areas. For each impact identified, appropriate mitigation measures to reduce or otherwise avoid the potentially negative impacts are suggested. All impacts are assessed without mitigation and with the mitigation measures as suggested.

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

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

Kindly see Section (i) above; the advantages and disadvantages of the proposed site layout have been discussed in the reasons provided in this section, inclusive of the reasons for not considering alternatives.

(viii) The possible mitigation measures that could be applied and the level of risk.

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

CONSTRUCTION PHASE			
Potential Impact Description	**Significance Rating (Positive or Negative)**	**Proposed Mitigation**	**Significance Rating after Mitigation**
PROPOSAL (preferred alternative)			
Direct Impacts			
• Loss of vegetation and faunal habitat.	Moderate (Negative)	- Development planning must ensure loss of vegetation and disturbance is restricted to within the minimum and designated areas only. - Vegetate and irrigate open areas to limit erosion, but take care not to promote erosion by irrigating. - Removal of vegetation during construction and operation will be minimised to reduce the risk of excessive open areas occurring. - Adhere to existing roads, and if new roads are constructed, these must not cross sensitive areas such as the ridges or drainage lines. - Protected plant or animal species encountered must be managed in accordance with an accepted management plan for these species.	Low
• Loss of Conservation Important (CI) or medicinally important flora.	Moderate (Negative)	- Preconstruction walk through the facility in order to locate species of conservation concern that can be translocated as well as comply with permitting conditions. - If removing CI species such as the Protected Poison bulb or Orange/Vaal River Lily then submit permits for their removal. - Prior to construction any CI and medicinally important floral specimens that may occur within	Low

CONSTRUCTION PHASE			
Potential Impact Description	**Significance Rating (Positive or Negative)**	**Proposed Mitigation**	**Significance Rating after Mitigation**
		the site layout should be collected and replanted in the surrounding areas.	
• Soil and water resources contamination	Moderate (Negative)	- Prevent any spills from occurring; If a spill occurs it is to be cleaned up immediately and Reported to the appropriate authorities. - All vehicles are to be serviced in a correctly bunded area or at an off-site location. - Ensure that spillage control kits are available during transport and on storage sites in case of any accidental leakages of spillages, which can then be cleared immediately. - The temporary storage facilities of fuel, lubricants and explosives must be a hard park, roofed and bunded facility. This will prevent contamination of soils and the possibility of contamination of the surface water resources. - Machinery should be maintained properly. Diesel and other chemicals should be handled appropriately. Re-fuelling protocols must be followed to ensure no diesel is spilled during filling. - Clean and dirty surface water channels should be constructed to divert runoff separately to appropriate storage dams (dirty water to the PCD to avoid eroded soils entering the clean water areas).	Low
• Potential of soil erosion due to exposed soil	Low (Negative)	- Removal of topsoil should be done systematically, only clearing the necessary areas at a time. - The topsoil stockpiles should be vegetated as soon as possible to prevent erosion, which might cause siltation of the water resources. - Erosion berms are to be put in	Very low

CONSTRUCTION PHASE			
Potential Impact Description	**Significance Rating (Positive or Negative)**	**Proposed Mitigation**	**Significance Rating after Mitigation**
		place where there is a high risk of erosion.	
• Increased use of groundwater.	Moderate (Negative)	- Regular inspection and maintenance of all boreholes, tanks, reservoirs, toilets, water pipes, valves and taps should be conducted, to prevent wasting water. - Apply water saving techniques, such as re-use of water.	Low
• Groundwater dewatering	Very low (Negative)	- A groundwater monitoring network (both quality and quantity) should be established in association with the DWS and surrounding small scale diamond mines in the Carlisonia area. This is to determine and monitor any potential impacts on groundwater quantity (reduced yields and declining water levels) and quality (acidity, hydrocarbons, trace metals, microbiology etc.) from the proposed mining.	Very low
• Noise disturbances as a result of construction activities.	Very low (Negative)	- The noise created by the proposed development is not expected to be problematic. If required, noise reduction measures will have to be implemented in compliance with Noise standards and Regulations. - No sound amplification equipment to be used on site, except in emergency situations. - Limit vehicles travelling to and from the site to minimise traffic noise to the surrounding environment. - Limit construction activities to day time hours. - Mining related machines and vehicles to be serviced on a regular basis to ensure noise suppression mechanisms are effective. - Activities that will generate the most noise should be limited to during the day, where	Very low

CONSTRUCTION PHASE			
Potential Impact Description	**Significance Rating (Positive or Negative)**	**Proposed Mitigation**	**Significance Rating after Mitigation**
		viable, in order minimise disturbance. - Equipment that is not in use should be switched off. - A complaints register should be kept on site, with records of complaints received and manner in which the complaint was addressed.	
• Sensory disturbance of fauna due to noise.	Low (Negative)	- Limit construction activities to day time hours. - Minimize or eliminate security and construction lighting, to reduce the disturbance of nocturnal fauna. - All outside lighting should be directed away from sensitive areas.	Low
• Construction activities may disturb or destroy sites or features of heritage importance.	Low – Very low (Negative)	- Should any features of heritage be identified on site, these should not be disturbed. They should be safeguarded, preferably *in situ*, and immediately reported to a Heritage specialist and/or SAHRA.	Very low
• Impact on health, and safety of workers.	Moderate (Negative)	- Training of workers in the correct use of the machinery and/or equipment so as to avoid incidents. - Workers to wear Personal Protective Equipment (PPE). - Hazardous material must be correctly labelled and handled in a safe manner.	Low
• Potential deterioration of the existing gravel road due to use by heavy vehicles.	Moderate (Negative)	- Limit vehicles coming to the site and limit to a temporary minimal duration. - Maintain and/or upgrade the gravel road.	Moderate
• Potential impact of traffic.	Moderate (Negative)	- Effective signage and traffic control measures along the route.	Low
• Generation of waste.	Moderate (Negative)	- Any waste generated during construction must be stored in such a manner that it prevents pollution and amenity impacts. - Waste to be disposed of at a licenced landfill site. - Hazardous waste to be correctly stored and disposed of in terms of relevant	Low

CONSTRUCTION PHASE			
Potential Impact Description	**Significance Rating (Positive or Negative)**	**Proposed Mitigation**	**Significance Rating after Mitigation**
		legislation and guidelines.	
• Topography and visual alteration.	Moderate (Negative)	- Limit the footprint area of the construction where possible. - Topsoil stockpiles should be vegetated and positioned to reduce visual disturbance where possible.	Low
• Degradation of ambient air quality as a result of dust and other emissions generated.	Very low (Negative)	• Exposed areas should be re-vegetated with locally indigenous flora. If the soil is compacted, it should be ripped, and fertilised. • Implement effective and environmentally-friendly dust control measures, such as mulching or periodic wetting of the entrance road. • A complaints register should be kept on site, with records of complaints received and manner in which the complaint was addressed.	Very low
Indirect Impacts			
• Introduction and increase in alien vegetation.	Moderate (Negative)	- Keep the footprint of the disturbed area to the minimum and designated areas only. - Vegetate and irrigate open areas to limit erosion, but take care not to cause erosion by irrigating. Removal of vegetation during construction and operation will be minimised to reduce the risk of excessive open areas occurring. - Adhere to existing roads, and if new roads are constructed, these must not cross sensitive areas such as the ridges or drainage lines.	Low
• Potential for sinkhole development	Very low (Negative)	• Due to the risk of sinkhole development in karst dolomitic terranes, detailed geotechnical assessments should be taken prior to mining to determine any high risk zones that should be avoided during mining. • Concurrent rehabilitation of diggings and trenches once excavated zones are complete	Very low

CONSTRUCTION PHASE			
Potential Impact Description	**Significance Rating (Positive or Negative)**	**Proposed Mitigation**	**Significance Rating after Mitigation**
		through re-filling with excavated material to existing surface levels and re-vegetation at surface, in order to prevent the exposure of any mineralised zones within the dolomite to the atmosphere and reduce the potential development of Acid Mine Drainage, and subsequent infiltration into the aquifer.	
• The creation of new employment opportunities and skills development.	Moderate (Positive)	• Ensure maximisation of job creation and promote local employment and skills training.	High
NO-GO ALTERNATIVE			
DIRECT IMPACTS: • None of the impacts mentioned above will occur. • The site will remain with existing structures, no new clearance will occur which will result in no clearance of indigenous vegetation and no clearance of present alien species. **INDIRECT IMPACTS:** • There are no indirect impacts during the construction phase for the No-go Option. • If the proposed project does not proceed, increased income and economic benefits associated with the project will not be realised. • No employment opportunities will be created. • If the proposed project does not proceed, the potential to produce and supply minerals to industrial and commercial establishments and the subsequent contribution to the Gross Domestic Product (GDP) of the municipality and Province will not be realised; thus hindering economic growth potential.			

OPERATIONAL PHASE			
Potential Impact Description	**Significance Rating (Positive or Negative)**	**Proposed Mitigation**	**Significance Rating after Mitigation**
PROPOSAL (preferred alternative)			
Direct Impacts			
• Impact on aquifers and groundwater quality.	Low (Negative)	- Portable toilets must be set up correctly and emptied regularly to prevent any leaks and potential contamination of the	Low

OPERATIONAL PHASE			
Potential Impact Description	**Significance Rating (Positive or Negative)**	**Proposed Mitigation**	**Significance Rating after Mitigation**
		aquifer. - Fuel needs to be stored in a specified lined area to prevent any chance of contamination to the underlying soil/aquifer. - Waste generated from the operation of the mine to be stored in an appropriate and designated storage and be disposed of in a permitted designated waste disposal site. - Mining equipment is regularly maintained to prevent any fuel or oil leaks. - Correct lining of any tailings dam facilities, as well as ensuring correct dam wall heights, in order to prevent infiltration of potential contaminants and overflow respectively. - Tailings piles should be lined covered, to reduce exposure to the atmosphere and prevent infiltration of potential contaminants. - Funnelling of all drainage from mining operations to lined tailings dam facilities via lined channels with bund walls and swales, in order to reduce infiltration of potential Acid Mine Drainage (AMD) water into the aquifer. - Funnelling of all drainage from mining operations to lined tailings dam facilities via lined channels with bund walls and swales, in order to reduce infiltration of potential AMD water into the aquifer.	
• Impact on groundwater quantity.	Very low (Negative)	- Monitoring of water levels and abstraction volumes from the proposed BH 2 abstraction borehole at Kwa Nozici Minerals, the two	Very low

OPERATIONAL PHASE			
Potential Impact Description	**Significance Rating (Positive or Negative)**	**Proposed Mitigation**	**Significance Rating after Mitigation**
		Carlisonia village abstraction boreholes and any other nearby mine abstraction boreholes pre-, during the duration of, and post-mining, through the installation of a flow meter and water level datalogger (to be implemented by Kwa Nozici Minerals, and a requirement of any groundwater registration/WUL).	
• Impact on groundwater recharge and run-off alteration.	Very low (Negative)	- Implement measures to collect and store clean water that falls within the Project area for use on site e.g. watering of gardens, wash bays and dust suppression. Although the hard surfaces on site will increase runoff thereby reducing recharge of the aquifer, the collection of this water for use on site will reduce the need to pump water from boreholes. - Monitor changes in water levels and quality around the Project area, so as to be aware of changes in groundwater conditions.	Very low
• Impact on upstream tributaries and water in catchment.	Very low (Negative)	- No surface drainage or rivers are present within the immediate vicinity of the proposed mine, with the headwaters of the Molopo and Harts Rivers being ~15 km from the mine area (along with the closest related high yielding discharge springs). Any leaks or flow from tailings dams etc. will also likely infiltrate into the surrounding dolomite aquifer, with any contamination likely to be attenuated and diluted before reaching regional discharge springs.	Very low

OPERATIONAL PHASE			
Potential Impact Description	**Significance Rating (Positive or Negative)**	**Proposed Mitigation**	**Significance Rating after Mitigation**
		- A surface water management plan must be implemented to minimise the volume of dirty water produced thereby reducing the probability of contamination of groundwater from infiltration of dirty surface water.	
• Impact on ambient air quality and dust emissions.	Low (Negative)	- Vehicles operating on the mine must keep at minimum speed to reduce dust generation. - Vehicles that are used must be roadworthy and regularly inspected in order to prevent unwanted emissions and/or leaks. - In order to reduce emissions from stockpiles, mitigation measures such as spraying must be implemented as well as regular re-vegetation of topsoil stockpile to avoid or minimise wind erosion from exposed surfaces. - Crushing of ore should take place in an enclosed area to reduce the impact of wind. - Waste management plans must be developed and implemented to reduce negative impact on the ambient air quality.	Low
• Noise generation	Low (Negative)	- The noise created by the proposed development is not expected to be problematic. If required, noise reduction measures will have to be implemented in compliance with Noise Regulations. - No sound amplification equipment to be used on site, except in emergency situations. - Limit vehicles travelling to and from the site to minimise traffic noise to the surrounding environment.	Very low

OPERATIONAL PHASE			
Potential Impact Description	**Significance Rating (Positive or Negative)**	**Proposed Mitigation**	**Significance Rating after Mitigation**
		- Mining related machines and vehicles to be serviced on a regular basis to ensure noise suppression mechanisms are effective. - Activities that will generate the most noise should be limited to day-time hours, where viable, in order to minimise disturbance. - Equipment that is not in use should be switched off. - A complaints register should be kept on site, with records of complaints received and manner in which the complaint was addressed.	
• Construction activities may disturb or destroy sites or features of heritage importance.	Low – Very low (Negative)	- Should any features of heritage be identified on site, these should not be disturbed. They should be safeguarded, preferably *in situ*, and immediately reported to a Heritage specialist and/or SAHRA.	Very low
• Impact on health, and safety of workers.	Moderate (Negative)	- Training of workers in the correct use of the machinery and/or equipment so as to avoid incidents. - Workers to wear Personal Protective Equipment (PPE). - Hazardous material must be correctly labelled and handled in a safe manner. - Hazardous waste to be correctly disposed of.	Low
• Topography and visual alteration.	Low (Negative)	- Limit the footprint area where possible. - Roads used for hauling of ore should be regularly contoured.	Very low
• Increased water usage due to abstraction from the borehole for water requirements of the mining operations.	Moderate (Negative)	- Water saving strategies should be practiced such as re-use and raising water conservation awareness. - Create awareness on the importance of these resources and implement energy and water saving mechanisms.	Low

OPERATIONAL PHASE			
Potential Impact Description	**Significance Rating (Positive or Negative)**	**Proposed Mitigation**	**Significance Rating after Mitigation**
		- Also make use of rain water from the existing tank to minimise abstraction demands. - Prevent wasting of water such as leaving running taps. - Regular inspection of use should be conducted, including regular inspection of the borehole, water tanks, for any leaks.	
• Impact of operational activities on fauna.	Moderate (Negative)	- Minimize noise to limit its impact on sensitive fauna. - Operational areas to be demarcated and workers to stay within these areas. - Create awareness on the importance of fauna and ecosystem functioning. - Workers to stay within demarcated operational areas.	Low
• Potential for fires to occur.	Moderate (Negative)	- Ensure effective fire management plans. - Create safe storage on the premises for flammable materials. - Establish and implement a fire management plan with emergency fire procedures. - Educate workers about the plan and emergency procedures with regular training and notices.	Low
• Possible soil and water contamination from diesel storage on site.	Low (Negative)	- Appropriate storage of hazardous material such as diesel must be implemented. - The areas where hazardous substances are stored should be bunded to avoid soil and water contamination. - Fuel must be stored in a secure designated room. - The ground where refuelling takes place must be protected and refuelling to be handled in a cautious manner.	Low

OPERATIONAL PHASE			
Potential Impact Description	**Significance Rating (Positive or Negative)**	**Proposed Mitigation**	**Significance Rating after Mitigation**
		- In the event of spills, the area to be cleaned immediately using bioremediation products. - Ensure that any accidental spills do not move beyond the designated storage area. - Ensure appropriate and safe disposal of hazardous chemicals. - Ensure training of staff to handle hazardous chemicals.	
• Generation of operational waste.	Moderate (Negative)	- All waste produced to be disposed of in permitted designated waste disposal site. - Waste must be stored in designated areas for storage. - Clearly demarcate and label appropriate storage for the different types of waste. - Ensure regular removal of waste on site to prevent attraction of pests and disposal of waste in a permitted disposal site at a licenced landfill site.	Low
Indirect Impacts			
• Impact on vegetation and faunal habitat.	Moderate (Negative)	- Vegetation cover must be reinstated through rehabilitation. - Removal of vegetation during operation will be minimised to reduce the risk of excessive open areas occurring. - Adhere to existing roads, and if new roads are constructed, these must not cross sensitive areas such as the ridges or drainage lines. - Continuously manage the establishment of alien invasive species through removal. - Protected plant or animal species encountered must be managed in accordance	Low

OPERATIONAL PHASE			
Potential Impact Description	**Significance Rating (Positive or Negative)**	**Proposed Mitigation**	**Significance Rating after Mitigation**
		with an accepted management plan for these species.	
• The proposed project is a job creation initiative with the potential to create local employment and skill development.	Moderate (Positive)	- Maximise job creation and promote local employment and skills training. - Promote employment of women and youth.	High
• The proposed project will contribute to the short term growth of the local economy.	Moderate (Positive)	- Explore opportunities for mineral markets. - Development of skills in mining Small-Medium Micro Enterprises (SMMEs) as part of Municipal Local Economic Development initiatives. - Development of contractual agreements to supply local beneficiation markets.	High
NO-GO ALTERNATIVE			
Potential Impact Description	**Significance Rating (Positive or Negative)**		
Direct Impacts			
DIRECT IMPACTS: • None of the impacts mentioned above will occur. • The status quo of the site and area will remain with existing structures • No new clearance will occur which will result in no clearance of indigenous vegetation and no clearance of present alien species.			
Indirect Impacts			
• If the proposed project does not proceed, increased income and economic benefits associated with the project will not be realised. • No new employment opportunities will be created.			

DECOMMISSIONING PHASE			
Potential Impact Description	**Significance Rating (Positive or Negative)**	**Proposed Mitigation**	**Significance Rating after Mitigation**
PROPOSAL (preferred alternative)			
Direct Impacts			
• Destruction of vegetation.	Moderate (Negative)	- Special care must be taken not to destroy rehabilitated areas. - All disturbed areas must be	Low

DECOMMISSIONING PHASE			
Potential Impact Description	**Significance Rating (Positive or Negative)**	**Proposed Mitigation**	**Significance Rating after Mitigation**
		rehabilitated.	
• Soil and water resources contamination.	Low (Negative)	- Prevent any spills from occurring; If a spill occurs it is to be cleaned up immediately and Reported to the appropriate authorities. - Accredited contractors must be used for disposal and transport of demolition material.	Very low
• Impact on land capability.	Moderate (Negative)	- Topsoil replacement should be done systematically; slopes should be kept low to prevent run-off and erosion, and replaced according to the soil types. - The topsoil stockpiles should be vegetated as soon as possible to prevent erosion, which might cause siltation of the water resources. - Avoid compaction of topsoil.	Very low
• Groundwater dewatering	Very low (Negative)	- A groundwater monitoring network (both quality and quantity) should be established in association with the DWS and surrounding small scale diamond mines in the Carlisonia area. This is to determine and monitor any potential impacts on groundwater quantity (reduced yields and declining water levels) and quality (acidity, hydrocarbons, trace metals, microbiology etc.) from the proposed mining.	Very low
• Noise disturbances as a result of decommissioning activities.	Very low (Negative)	- The noise created by the proposed development is not expected to be problematic. If required, noise reduction measures will have to be implemented in compliance with Noise Regulations. - No sound amplification equipment to be used on site, except in emergency situations. - Mining related machines and vehicles to be serviced on a regular basis to ensure noise suppression mechanisms are	Very low

DECOMMISSIONING PHASE			
Potential Impact Description	**Significance Rating (Positive or Negative)**	**Proposed Mitigation**	**Significance Rating after Mitigation**
		effective. - Activities that will generate the most noise should be limited to during the day, where viable, in order minimise disturbance. - Equipment that is not in use should be switched off. - A complaints register should be kept on site, with records of complaints received and manner in which the complaint was addressed.	
• Impact on health, and safety of workers.	Moderate (Negative)	- Training of workers in the correct use of the machinery and/or equipment so as to avoid incidents. - Worker to wear Personal Protective Equipment (PPE). - Hazardous material must be correctly labelled and handled in a safe manner.	Low
• Topography and visual alteration.	Low (Negative)	- Ensure that all infrastructure installed pre-mining is removed from the site. - Roads should be regularly maintained. - Topsoil stockpiles should be vegetated and positioned to reduce visual disturbance where possible.	Very low
• Degradation of ambient air quality as a result of dust and other emissions generated.	Very low (Negative)	• Demolition and removal of structures and rubble to be done cautiously. • Exposed areas should be re-vegetated with locally indigenous flora. If the soil is compacted, it should be ripped, and fertilised. • Limit the area of exposure to minimise wind erosion. • Implement effective and environmentally-friendly dust control measures, such as mulching or periodic wetting of the entrance road. • Vehicles must keep at minimum speed to reduce dust generation. • A complaints register should be kept on site, with records of complaints received and	Very low

DECOMMISSIONING PHASE			
Potential Impact Description	**Significance Rating (Positive or Negative)**	**Proposed Mitigation**	**Significance Rating after Mitigation**
		manner in which the complaint was addressed.	
Indirect Impacts			
• Establishment and increase in alien vegetation.	Moderate (Negative)	- Reinstate vegetation cover through rehabilitation. - Keep the footprint of the disturbed area to the minimum and designated areas only. - Adhere to existing roads, and if new routes are used, these must not cross sensitive areas such as the ridges or drainage lines. - All alien plant species should be removed, preferably as juveniles, before they become established and bear seed and flowers. - Alien plant monitoring should take place for 2-3 years.	Low
• Potential for sinkhole development	Very low (Negative)	• Due to the risk of sinkhole development in karst dolomitic terranes, detailed geotechnical assessments should be taken prior to mining to determine any high risk zones that should be avoided during mining. • Concurrent rehabilitation of diggings and trenches once excavated zones are complete through re-filling with excavated material to existing surface levels and re-vegetation at surface, in order to prevent the exposure of any mineralised zones within the dolomite to the atmosphere and reduce the potential development of Acid Mine Drainage, and subsequent infiltration into the aquifer.	Very low
• Restoration of water quality and quantity	Low (Negative)	• If the site is not rehabilitated post mining operations then impacts on the water resources may occur, therefore rehabilitation will have a positive impact on the water resources. • Concurrent rehabilitation of	Low (Positive)

DECOMMISSIONING PHASE			
Potential Impact Description	**Significance Rating (Positive or Negative)**	**Proposed Mitigation**	**Significance Rating after Mitigation**
		diggings and trenches once excavated zones are complete through re-filling with excavated material to existing surface levels and re-vegetation at surface, in order to prevent the exposure of any mineralised zones within the dolomite to the atmosphere and reduce the potential development of AMD, and subsequent infiltration into the aquifer. • Disturbed areas should be vegetated and contoured to allow for good drainage. • Associated potential soil erosion post rehabilitation should be mitigated. • Regular inspection and monitoring of water quality should be implemented for a period of at least 3 years post closure of the mine, in order to determine any negative residual impacts that could occur years later.	
NO-GO ALTERNATIVE			
DIRECT IMPACTS: • None of the impacts mentioned above will occur. **INDIRECT IMPACTS:** • There are no indirect impacts during the decommissioning phase for the No-go Option.			

(ix) Motivation where no alternatives sites were considered.

No property alternatives have been considered as the envisaged mining operations will occur in an area of existing mining operations, and also in close proximity to the access road and community in need of such a development.

(x) Statement motivating the alternative development location within the overall site (Provide a statement motivating the final site layout that is proposed)

The site layout was determined by considering both spatial and practical mining operation aspects. The proposed layout is more of a security measure, allowing for more effective management of

mined ores. The site layout within the overall site is also supported by the specialist studies undertaken, in accordance with the recommended management measures.

i) Full description of the process undertaken to identify, assess and rank the impacts and risks the activity will impose on the preferred site (In respect of the final site layout plan) through the life of the activity. (Including (i) a description of all environmental issues and risks that erer identified during the environmental impact assessment process and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.)

The identified risks and impacts for this study, specifically the proposed site layout, were informed by the environmental studies undertaken for this site, the socio-economic need of the surrounding area, as well as the evidence of historical diamond exploration on site and the landscape.

j) Assessment of each identified potentially significant impact and risk

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

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.)	**POTENTIAL IMPACT** (Including the potential impacts for cumulative impacts) (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)	**SIGNIFICANCE** if not mitigated	**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 through rehabilitation..	**SIGNIFICANCE** if mitigated
Vehicular activities.	Dust emissions.	Air Quality	Construction Phase Operation Phase Decommissioning Phase	Very low (Negative)	Monitor and manage through Dust Management Plan and Measures.	Very low (Negative)
	Soil and water resources contamination.	Surface and Groundwater	Construction Phase Operation Phase Decommissioning Phase	Very low (Negative)	Monitor and remedy through Emergency Response Plan.	Very low (Negative)
	Noise generation.	Noise Receptors	Construction Phase Operation Phase Decommissioning Phase	Very low (Negative)	Manage through Noise Reduction Measures and Regular Vehicle Inspections.	Very low (Negative)
Site clearing and topsoil removal for mining operation, and construction of a mining pit.	Soil erosion due to exposed soil.	Soils	Construction Phase Operation Phase	Low (Negative)	Manage and control through Soil Rehabilitation Plan and Stormwater Management Plan.	Very low (Negative)
	Loss of vegetation and faunal habitat.	Fauna and Flora	Construction Phase	Moderate (Negative)	Remedy through Rehabilitation Plan, Conservation Management Plan and Alien Invasive Management Plan.	Low (Negative)
	Dust emissions.	Air Quality	Construction Phase Operation Phase Decommissioning Phase	Very low (Negative)	Monitor and manage through Dust Management Plan and Measures.	Very low (Negative)
	Noise generation.	Noise Receptors	Construction Phase Operation Phase Decommissioning Phase	Very low (Negative)	Manage through Noise Reduction Measures and Regular Vehicle Inspections.	Very low (Negative)
	Soil and water resources contamination.	Surface and Groundwater	Construction Phase Operation Phase Decommissioning Phase	Moderate (Negative)	Monitor and remedy through Emergency Response Plan and Stormwater Management Plan.	Low (Negative)
	Topography and visual alteration.	Topography and Visual Environment	Construction Phase Operation Phase	Moderate (Negative)	Minimise through Mine Design and Management Plan.	Low (Negative)
	Destruction of features of heritage importance.	Heritage	Construction Phase	Low – Very low (Negative	Manage and avoid through Environmental Conservation Management Plan.	Very low (Negative)
Construction of infrastructure (PCD, trenches, water pipes, storm water management facilities).	Topography and visual alteration.	Topography and Visual Environment	Construction Phase Operation Phase	Moderate (Negative)	N/A	N/A
	Soil and water resources contamination.	Surface and Groundwater	Construction Phase Operation Phase	Low (Negative)	Manage through Stormwater Management Plan and Groundwater Monitoring Plan.	Very low (Negative)
	Soil erosion due to exposed soil.	Soils	Construction Phase	Low (Negative)	Manage and control through Soil Rehabilitation Plan and Stormwater Management Plan.	Very low (Negative)
	Dust emissions.	Air quality	Construction Phase	Very low (Negative)	Monitor and manage through Dust Management Plan and Measures.	Very low (Negative)
Preparing an area of 900 m2 for a portable	Loss of vegetation and	Flora and Fauna	Construction Phase	Moderate	Remedy through Rehabilitation Plan, Conservation	Low

camp site to accommodate infrastructure associated with stockpiling, crushing, washing, sorting and offices).	faunal habitat.			(Negative)	Management Plan and Alien Invasive Management Plan.	(Negative)
	Exposed soil susceptible to erosion.	Soils	Construction Phase Operation Phase	Low (Negative)	Manage and control through Soil Rehabilitation Plan and Stormwater Management Plan.	Very low (Negative)
	Dust emissions.	Air quality	Construction Phase	Very low (Negative)	Monitor and manage through Dust Management Plan and Measures.	Very low (Negative)
	Noise generation.	Noise receptors	Construction Phase Operation Phase Decommissioning Phase	Very low (Negative)	Manage through Noise Reduction Measures.	Very low (Negative)
	Soil and water resources contamination and siltation.	Surface water and Groundwater	Construction Phase	Low (Negative)	Monitor and manage through Stormwater Management Plan and Groundwater Monitoring Plan.	Very low (Negative)
	Topography and visual alteration.	Topography and Visual Environment	Construction Phase	Moderate (Negative)	Minimise through Mine Design and Management Plan.	Low (Negative)
	Soil disturbance resulting in the spread of alien plant species.	Fauna and Flora	Construction Phase	Low (Negative)	Monitor and manage through Rehabilitation Plan, Conservation Management Plan and Alien Invasive Management Plan.	Very low (Negative)
	Destruction of features of heritage importance.	Heritage	Construction Phase	Very low (Negative)	Manage and avoid through Environmental Conservation Management Plan.	Very low (Negative)
Extraction and transportation of ore. TLB activity and operation of mining equipment. Crushing, washing and sorting of ore in mobile plant.	Impact on groundwater and aquifer.	Groundwater	Operation Phase	Very low (Negative)	Monitor and manage through Stormwater Management Plan and Groundwater Monitoring Plan. Monitor and remedy through Emergency Response Plan.	Very low (Negative)
	Impact on upstream tributaries and water in the catchment.	Surface water	Operation Phase	Very low (Negative)	Control through Stormwater Management Plan.	Very low (Negative)
	Noise generation.	Noise receptors	Operation Phase	Low (Negative)	Manage through Noise Reduction Measures and Regular Vehicle Inspections.	Very low (Negative)
	Air quality and dust emissions.	Air quality	Operation Phase	Low (Negative)	Monitor and manage through Dust Management Plan and Measures.	Low (Negative)
	Soil and water resources contamination	Surface water and Groundwater	Operation Phase	Moderate (Negative)	Monitor and remedy through Emergency Response Plan.	Low (Negative)
	Destruction of features of heritage importance.	Heritage	Operation Phase	Low (Negative)	Manage and avoid through Environmental Conservation Management Plan.	Very low (Negative)
	Topography and visual alteration.	Topography and Visual Environment	Operation Phase	Moderate (Negative)	N/A	N/A
Water extraction from borehole and/or tank.	Noise generation.	Noise receptors	Operation Phase	Very low (Negative)	N/A	N/A
	Dust emissions.	Air quality	Operation Phase	Very low (Negative)	Monitor and manage through Dust Management Plan and Measures.	Very low (Negative)
	Topography and visual alteration.	Topography and Visual Environment	Operation Phase	Low (Negative)	Minimise through Mine Design and Management Plan.	Very low (Negative)
	Groundwater quantity.	Groundwater	Construction Phase Operation Phase	Very low (Negative)	Manage through Water Conservation Plan and Regular Inspection of Water Facilities.	Very low (Negative)
Storage of diesel and vehicle/machinery maintenance equipment. Waste generation and disposal.	Impact on ambient air quality.	Air quality	Construction Phase Operation Phase Decommissioning Phase	Very low (Negative)	Manage through Regular Inspection and Management Plan.	Low (Negative)
	Surface water contamination.	Surface water	Construction Phase Operation Phase Decommissioning Phase	Very low (Negative)	Monitor and remedy through Emergency Response Plan.	Very low (Negative)
	Hydrogeology and soil contamination.	Hydrogeology Soils	Construction Phase Operation Phase Decommissioning Phase	Low (Negative)	Monitor and remedy through Emergency Response Plan.	Very low (Negative)
	Visual impact.	Visual Environment	Construction Phase	Moderate	Manage and Minimise through Management Plan	Low

			Operation Phase Decommissioning Phase	(Negative)	and Rehabilitation Plan.	(Negative)
Demolition and/or removal of mobile camp site infrastructure/equipment	Establishment and spread of alien plant species.	Fauna and Flora	Decommissioning Phase Post Closure	Moderate (Negative)	Manage and control through Alien Invasive Management Plan.	Low (Negative)
	Destruction of vegetation.	Fauna and Flora	Decommissioning Phase	Moderate (Negative)	Manage and Minimise through Management Plan and Rehabilitation Plan	Low (Negative)
	Soil and water resources contamination.	Soils Groundwater	Decommissioning Phase	Low (Negative)	Monitor and remedy through Emergency Response Plan.	Very low (Negative)
	Impact on upstream tributaries and water in the catchment.	Surface water	Decommissioning Phase	Moderate (Negative)	Manage and Minimise through Management Plan and Rehabilitation Plan.	Low (Negative)
	Topography and visual alteration.	Topography and Visual Environment	Decommissioning Phase	Low (Negative)	Remedy through Rehabilitation and Closure Plan.	Very low (Negative)
	Noise generation.	Noise receptors	Decommissioning Phase	Very low (Negative)	Manage through Noise Reduction Measures and Regular Vehicle Inspections.	Very low (Negative)
	Air quality and dust emissions.	Air quality	Decommissioning Phase	Very low (Negative)	Monitor and manage through Dust Management Plan and Measures.	Very low (Negative)
Rehabilitation and restoration of disturbed areas	Land capability reduction.	Soils Vegetation	Decommissioning Phase Post Closure	Moderate (Negative)	Manage, minimise through Post-closure Management Plan and Rehabilitation Plan.	
Employment of workers, and acquiring mining vehicles, machinery, equipment and materials.	Creation of local employment and skills development.	Socio-economic	Construction Phase Operation Phase	Moderate (Positive)	Promote through Local Based Employment Strategy, and Women and Youth Employment Initiatives.	High (Positive)
	Contribution to the short term growth of the local economy.	Socio-economic	Construction Phase Operation Phase	Moderate (Positive)	Promote through Local Beneficiation Markets Support to SMME Initiatives.	High (Positive)
	Impact on health and safety of workers.	Socio-economic	Construction Phase Operation Phase	Moderate (Negative)	Prevent through Awareness Campaigns and Training.	Low (Negative)

CSIR: Please refer to the detailed specialist Reports appended to this Report, for the impact assessments conducted as part of this Study as well as Sections (v) and (viii) of this report :

k) Summary of specialist reports

(This summary must be completed if any specialist reports informed the impact assessment and final site layout process and must be in the following tabular form):-

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
Fauna and Flora Impact Assessment	The proposed development will result in the loss of moderate ecologically sensitive habitat in the form of disturbed grasslands. It is recommended that species of special concern be managed and specific mitigation measures described in this assessment are adhered to. The overall impact of the proposed small scale mining facility will be moderate to low. Since the majority of the site is of moderate ecological sensitivity, it is the specialist's opinion that should the project proceed then the ecological aspects related to the impact assessment can be managed accordingly. Mitigation and management measures described in this report should be followed.	X	The mitigation measures, as well as the environmental management programme included in this report is informed by the Flora and Fauna Specialist study undertaken, including the recommendations provided therein. The Report produced as part of the study is included in Appendix D.
Hydrogeological Impact Assessment	If the proposed mining development is authorised then the mitigation measures and recommendations associated with groundwater monitoring, groundwater registration and water use licensing and mining management plans captured in this report should be followed; in order to ensure groundwater quality and quantity of the underlying Monte Christo Formation dolomitic aquifer is not impacted severely, and the surrounding community of Carlisonia and local farmers who make use of groundwater are not adversely affected.	X	The mitigation measures, as well as the environmental management programme included in this report is informed by the Hydrogeological Specialist Study undertaken, including the recommendations provided therein. The Report produced as part of the study is included in Appendix D.
Heritage Impact Assessment	Because there will be no significant impacts to heritage resources, it is recommended that the proposed mining project should be authorised but subject to the following condition (which should be included in the environmental authorisation): • If any archaeological or palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist or palaeontologist as appropriate. Such heritage is the property of the state and may require excavation and curation in an approved institution. The project EMPr should make reference to this possibility so that appropriate action can be taken as and when necessary.	X	The mitigation measures, as well as the environmental management programme included in this report is informed by the Heritage Impact Study undertaken, including the recommendations provided therein. The Report produced as part of the study is included in Appendix D.

l) Environmental impact statement.

(i) Summary of the key findings of the environmental impact assessment

The proposed mining area can be divided into two main areas, which is transformed and degraded land, mostly as a result of alien plant species, grazing activities and possible past clearing activities that have occurred in the area. The transformed areas contain few or no indigenous species, whereas the degraded areas are mainly made up of indigenous species with some invasive species in disturbed areas. The main potential environmental impacts associated with the proposed project include:

Noise generation

Noise generation as a result of machinery and vehicles operated on site is likely to impact on the surrounding receptors in the nearby village. All reasonable measures need to be implemented to minimise noise levels to the nearby residents throughout the life cycle of the proposed mine. Due to the small-scale nature and size of the proposed mining activity, and therefore basic machinery and equipment, this impact is expected to be of very low significance.

Air quality and dust emission

Vehicles transporting mining material to and from the site, as well site preparation activities, excavation, processing and decommissioning activities will result in the generation of fugitive dust. Air quality emissions will also include the evaporation of fuels stored on site. Air quality emissions will be of low to very low significance. The recommended mitigation measures in this report should reduce the potential for these impacts on the ambient air quality.

Topography and Visual Alteration

Storage of material and equipment on site, vehicular activities, stockpiling of topsoil and excavation to extract minerals will alter the visual environment in the area. The impacts will be of moderate to low significance at the different phases and activities of the project. All reasonable measures need to be implemented to minimise and limit these impacts where possible, incorporating the recommended mitigation measures of the specialists included in this report. Rehabilitation of the disturbed areas to return the site to its similar visual state prior mining will have a neutral visual impact on the area.

Soil erosion

Mining activities on site will result in exposed soil, which could result in soil erosion. Erosion can lead to destruction of natural habitats and sedimentation of nearby watercourses. This impact will have a low probability of occurrence with implemented mitigation measures and ultimately low impact.

Soil and water resources contamination

The potential impact of contamination will arise throughout the life cycle of the proposed mine as a result of contaminants such as fuels, waste material on site, seepage of waste water, spills etc. These possible contaminants need to be managed and prevented through an effective Emergency Response Plan and Stormwater Management Plan, as well as the development of an appropriate Groundwater Monitoring Plan in order to reduce the significance of these impacts.

Loss of vegetation and faunal habitat

Vegetation loss is unavoidable during the activities of the proposed mining project. The majority of the site has been transformed and is degraded; however these degraded areas contain some indigenous vegetation thus necessitating high consideration of the vegetation on site. The developmental footprint of the proposed small-scale mining will impact on the natural vegetation and faunal habitats. Recommended mitigation measures described in the assessment must be adhered to in order to reduce the impacts from moderate to low and special care must be taken to manage any species of special concern.

Destruction of features of heritage importance

It is of the opinion of the heritage study undertaken that any heritage resources (palaeontology, possible archaeology and the cultural landscape) that are affected by the proposed development would be impacted during the construction and operation phases when the site is cleared and then excavated. The impacts would be direct but because of their very low significance would not require any further studies or mitigation work prior to the commencement of development. It is recommended that the Environmental Control Officer (ECO) and mine staff should be made aware of the possibility of uncovering fossils such as wood in the gravels and large stromatolites in the dolomite bedrock. With this plan in place the significance of impacts would be reduced from low to very low.

Groundwater quantity and quality

It is expected that environmental impacts on groundwater will occur as result of potential contaminants being on site. The significance is expected to be of low significance and thus low risk of groundwater contamination on a local scale; however this impact may increase to moderate at a regional scale. Mining operations may also influence groundwater recharge as a result of excavations. Ground water dewatering is expected to be of very low risk, due to the fact that the proposed mining activities will occur above the highest encountered groundwater levels in the area. Monitoring and the implementation of the recommended mitigation measures can reduce the potential hydrogeological impacts to the environment.

Surface water

No surface drainage or rivers are present within the immediate vicinity of the proposed mine, the closest surface water systems are approximately 15km away and therefore any contamination will likely to be attenuated and diluted before reaching regional discharge springs. Surface water impacts are therefore considered very low risk.

Land capability reduction

Removal of soil for excavation and site preparation during the construction and operation phase will impact the land capability in that it will prevent the support of vegetation growth thereof. The removed soil should be stockpiled and managed correctly to minimise this impact. Soil replacement during rehabilitation has the potential to impact on the land capability as it will support the growth of vegetation, potentially returning land capability to its pre-mining state such as arable and/or grazing land.

Establishment and spread of alien plant species

Alien plant invasion is expected to occur in disturbed areas, however with the implementation of mitigation measures this impact can be reduced from moderate to low. This should be mitigated through the establishment of an alien invasive management plan to ensure the establishment of indigenous vegetation.

Socio-economic

Based on the environmental assessment presented in this report and the specialists' reports, it is the conclusion of this Basic Assessment that the proposed project will have relatively low impacts on the environment. With effective implementation management and mitigation measures, as well as recommended monitoring plans suggested in this report and those of the specialists', the significance of most potential environmental impacts on site from an environmental perspective will be reduced to low-very low. There will be potential impacts on vegetation and habitat, groundwater, soil, dust, air quality and visual environment as a result of earthworks associated with the activity, influx and movement of vehicles, infrastructure, waste and waste water generated by the project as a whole. The Environmental Management Programme supporting this BA outlines adequate methods and mitigation measures that need to be implemented in order for the identified impacts to not pose

any environmental flaws associated with the proposed establishment of a small-scale mining operation.

(ii) Final Site Map

Provide a map at an appropriate scale which superimposes the proposed overall activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers .Attach as **Appendix B**

Note from CSIR: **A Site map depicting the proposed mining area layout on the farm has been included as Map 2 in Appendix B Based on the specialists' reports; no sensitive landscapes were encountered within the project boundary.**

(iii) Summary of the positive and negative implications and risks of the proposed activity and identified alternatives;

A summary of the positive and negative potential impacts associated with the project has been outlined in Section **I(i)** above.

m) Proposed impact management objectives and the impact management outcomes for inclusion in the EMPR;

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

The EMPr addresses the environmental impacts associated with the project during Construction, Operation, Decommissioning and Post Closure Phases of the proposed project. The objectives of the EMPr will be to provide detailed information that will advise the planning design of Kwa Nozici Minerals mining activities in order to avoid and/or reduce impacts that may be detrimental to the environment. The following environmental management objectives are recommended for the proposed mining development and associated infrastructure:

- Alien plant monitoring should take place after construction, throughout the lifecycle of the mine, as well as post closure of the mine.
- Development planning must restrict the area of impact to a minimum and designated areas only.
- Monitor and prevent contamination, and undertake appropriate remedial actions.
- Limit the visual and noise impact on receptors.
- Avoid impact on possible heritage finds.
- Promote health and safety of workers.
- Limit dust and other emissions to within allowable limits.
- Manage soils to prevent erosion.

n) Aspects for inclusion as conditions of Authorisation.

Any aspects which must be made conditions of the Environmental Authorisation

The following aspects as recommended by the specialist studies are emphasised to be included as conditions in the Environmental Authorisation:

- Since the majority of the site is of moderate ecological sensitivity, it is of the specialist's opinion should the project proceed then the ecological aspects related to the impact assessment can be managed accordingly.
- Mitigation and management measures described in the flora and fauna report should be followed.
- If the proposed mining development is authorised then the mitigation measures and recommendations as captured in the geohydrology report should be followed, in order to ensure groundwater quality and quantity of the underlying Monte Christo Formation

dolomitic aquifer is not impacted severely, and the surrounding community of Carlisonia and local farmers who make use of groundwater are not adversely affected.

- If any archaeological or palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist or palaeontologist as appropriate. Such heritage is the property of the state and may require excavation and curation in an approved institution. The project EMPr should make reference to this possibility so that appropriate action can be taken as and when necessary.
- Workers should be educated about the importance of wildlife and the environment.

o) Description of any assumptions, uncertainties and gaps in knowledge.
(Which relate to the assessment and mitigation measures proposed)

Uncertainties form part of any proposed development with regards to the actual degree of impact that the development will have on the immediate environment. Any actual and/or site specific results will only be determined once development has commenced and throughout the life cycle of the proposed project. Gaps in knowledge were also identified in terms of the site-specific metereological data that is unavailable.

The following assumptions have been made for this study in terms of the specialists' reports:

- The flora and fauna field investigation took place after drought conditions, although this was during the expected rainy season. As not all plant species on site were identifiable during the flora survey, it is possible that Red Data species could have been missed. It is strongly recommended that an additional flora Red Data survey is conducted prior to the clearing of any habitat associated with the site.

- The faunal sampling assessment was intended to document any faunal activity or evidence thereof on site. It is likely that some elusive, shy, nocturnal or migrant species may not have been recorded during the faunal survey;

- The project was assessed according to the project activities listed herein (that were made available to Digby Wells by the client). Any changes to these after the assessments were done would not be captured in this report. Should any changes be made, additional studies may be required; and

- Cumulative impacts are assessed by adding expected impacts from this proposed development to existing and proposed developments with similar impacts in a 20km radius.

- The heritage study was carried out at the surface only and hence any completely buried archaeological sites or palaeontological material was not readily located. Similarly, it is not always possible to determine the depth of such material visible at the surface.

- Assumptions in the geohydrology study include that there are no unidentified aquifers present, with all analysis based on available data, information and specialist knowledge.

Limitations to the specialist study include that no invasive in-situ site investigations (i.e. trial pitting, drilling, testing, detailed hydrochemical sampling, hydrogeological modelling etc.) were undertaken, and that no mine works programme is currently available (indicating the exact mining methodology to be used on site, potential equipment and materials to be used, infrastructure layout, areas and depth to be excavated, and the exact amount and quality of water required for any mining processes).

p) Reasoned opinion as to whether the proposed activity should or should not be authorised

i) Reasons why the activity should be authorized or not.

Mining is the most important economic sector in the North West and the area proposed for the project is an area of existing diamond mining activities. The project site is located in Ward 14 of the Ditsobotla Local Municipality, and according to the municipality's 2016 Local Economic Development Strategy, the identified flagship projects of this ward are diamond, manganese mining and services. The proposed project is thus an initiative in meeting and/or addressing this socio-economic need.

Specialists' studies were conducted as part of this BA, providing mitigation measures and recommendations to ensure that environmental aspects of the site and surrounding area are not impacted severely. The site is composed of degraded and disturbed areas, and the undertaken ecological study did not identify any areas of high significance that could pose a fatal flaw prohibiting the proposed development. It is the opinion of the EAP that the proposed project will comply with current relevant legislation, and that with the implementation of the mitigation measures suggested in this BAR, there are no environmental impacts identified as highly detrimental to the environment. It is therefore recommended that following the above, the proposed development be granted Environmental Authorisation.

ii) Conditions that must be included in the authorisation

The EMPr of this proposed project must form part of the contractual agreement and be adhered to by both the contractors and the applicant. The applicant must also ascertain that there is representation of the applicant on site, at all times of the project, ensuring compliance with the conditions of the EMPr and specialist reports, and Environmental Authorisation thereof.

q) Period for which the Environmental Authorisation is required.

The proposed Kwa Nozici Minerals mining project will have a Life of Mine of approximately 3 years upon commencement of operation.

r) Undertaking

Confirm that the undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to both the Basic assessment report and the Environmental Management Programme report.

The undertaking is provided at the end of the EMPr.

s) Financial Provision

State the amount that is required to both manage and rehabilitate the environment in respect of rehabilitation.

The rehabilitation fee guarantee was calculated at R 1 738 78.

i) Explain how the aforesaid amount was derived.

This amount was calculated according to the guideline for the Calculation of the Quantum for rehabilitation as provided by DMR. . The mining operation will entail the excavation of pits in sections, where after processing each pit will be closed/rehabilitated and a different/new pit will be excavated, within the 5 hectares area. The open cast rehabilitation fee is thus calculated on a pit size of 2500 m^2 rehabilitated concurrently, trench dam, camp site area

ii) Confirm that this amount can be provided for from operating expenditure. (Confirm that the amount, is anticipated to be an operating cost and is provided for as such in the Mining work programme, Financial and Technical Competence Report or Prospecting Work Programme as the case may be).

Mrs Lily Phillips (the Project Applicant), has confirmed that this amount can be provided for from operating expenditure.

t) Specific Information required by the competent Authority

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

(1) Impact on the socio-economic conditions of any directly affected person. (Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any directly affected person including the landowner, lawful occupier, or, where applicable, potential beneficiaries of any land restitution claim, attach the investigation report as an **Appendix** .

The proposed Kwa Nozici Minerals mining operation is proposed on property under the jurisdiction of the Community Leader in the neighbouring Welverdiend village, who has been informed and is in agreement with the proposed project.

(2) Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act. (Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any national estate referred to in section 3(2) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) with the exception of the national estate contemplated in section 3(2)(*i*)(vi) and (vii) of that Act, attach the investigation report as **Appendix 2.19.2** and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6.and 2.12.herein).

There are no significant heritage resources present on the site and significant impacts are thus not expected. The only minor concern is palaeontology, but the only fossil material seen were small stromatolites that have very little scientific value because they are very common. A Heritage Impact Assessment stud was carried out in this regard, and the applicable mitigation measures are included in this report and the supporting HIA report attached as **Appendix 2.19.2.**

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

(the EAP managing the application must provide the competent authority with detailed, written proof of an investigation as required by section 24(4)(b)(i) of the Act and motivation if no reasonable or feasible alternatives, as contemplated in sub-regulation 22(2)(h), exist. The EAP must attach such motivation as **Appendix 4)**.

Note from CSIR: **Information on the preferred proposed alternative, as well the motivation has been included in Section g) and h), kindly refer to these sections above.**

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1) Draft environmental management programme.

a) **Details of the EAP,** (Confirm that the requirement for the provision of the details and expertise of the EAP are already included in PART A, section 1(a) herein as required).

The requirements for the provision of the details and expertise of the EAP are included in Part A, **Section a)** and as **Appendix A.**

b) **Description of the Aspects of the Activity** (Confirm that the requirement to describe the aspects of the activity that are covered by the draft environmental management programme is already included in PART A, section (1)(h) herein as required).

The requirement to describe the aspects of the activity that are covered by the draft environmental management programme is included in PART A, **Section d)**.

c) Composite Map

(Provide a map **(Attached as an Appendix**) at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers)

The composite plan is included in **Appendix B**.

d) **Description of Impact management objectives including management statements**

The proposed impact management objectives and management statements are informed by the environmental setting of the proposed mining site, as well as the desired state during closure and post closure of the mine.

i) **Determination of closure objectives.** (ensure that the closure objectives are informed by the type of environment described)

The proposed mining area can be divided into two main areas, which is transformed and degraded land, mostly as a result of alien plant species, grazing activities and possible past clearing activities that have occurred in the area. The transformed areas contain few or no indigenous species, whereas the degraded areas are mainly made up of indigenous species with some invasive species in disturbed areas. The main potential environmental impacts associated with the proposed project include:

- loss of vegetation and faunal habitat;
- Topography and visual alteration;
- Soil erosion;
- Soil and water resources contamination;
- Impact on water quantity and quality;
- Land capability reduction;
- Spread of alien plant species.

Therefore, effective and practical measures need to be implemented to prevent, reduce or control and remedy any impacts that may be detrimental to the environment, as well as to

rehabilitate the site to a desired state similar to that of the pre-mining state. These measures include:

- Rehabilitate the site in accordance with a detailed closure plan, and implement an alien invasive management plan to ensure the establishment of indigenous vegetation.
- Rehabilitation of the disturbed areas to return the site to its similar visual state prior mining.
- Identify and attend to possible areas of erosion.
- Implement an effective waste management plan to contain waste on site, as well as any spills that may occur.

ii) **Volumes and rate of water use required for the operation.**

The proposed mine plans to use groundwater of up to 10 000 litres per day, pumped from a nearby borehole.

iii) **Has a water use licence has been applied for?**

No application for a water use licence has been made. The required mine operation volume falls within the General Authorisation, in terms of water use, of the farm portion, and therefore a Section 21 (a) water use licence will not be required by the mine. The General Authorisation for water use has however been applied for with the Department of Water and Sanitation. See **Appendix E** for proof of application received by the Department.

iv) Impacts to be mitigated in their respective phases

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

ACTIVITIES **(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.)	**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 m^2)	**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 prospecting as the case may be.
Vehicular activities.	Construction Operational Decommissioning	Local	• Adhere to existing roads, and if new roads are constructed, these must not cross sensitive areas such as the ridges or drainage lines. • Limit vehicles travelling to and from the site to minimise traffic noise to the surrounding environment. • Effective signage and traffic control measures along the route. • Implement effective and environmentally-friendly dust control measures, such as mulching or periodic wetting of the entrance road. • Vehicles operating on the mine	• Manage and avoid through Environmental Conservation Management Plan. • Minimise through Mine Design and Management Plan. • Monitor and manage through Dust Management Plan and Measures. • Implement noise reduction measures in compliance with Noise standards and Regulations.	Daily and on-going during the Life of Mine.

			must keep at minimum speed to reduce dust generation.		
Site clearing and topsoil removal for mining operation, and construction of a mining pit.	Construction	Local	• Development planning must ensure loss of vegetation and disturbance is restricted to within the minimum and designated areas only. • Revegetate exposed areas to prevent soil erosion and the establishment of alien invasive species. • Manage any encountered protected plant or animal species. • Implement dust suppression measures. • Prevent any spillages from hauling vehicles. • Report any identified features of heritage.	• Manage and avoid through Environmental Conservation Management Plan. • Implement in accordance with the rehabilitation plan and standards. • Comply with the Alien invasive Management Plan in accordance with NEM:BA. • Monitor and manage through Dust Management Plan and Measures to ensure that the acceptable standards as set out in Regulation 3 of NEMAQA National Dust Control Regulations. • Manage through Emergency Response Plan. • Manage through Best Practice Guidelines.	On-going during the construction and operational phase.
Construction of infrastructure (PCD, trenches, water pipes, storm water management facilities).	Construction	Local	• Implement effective Stormwater Management measures. • Vegetate soil stockpiles and prevent soil erosion. • Avoid contamination and divert any dirty water to suitable storage facility.	• Manage through Stormwater Management Plan. • Manage in accordance with the rehabilitation plan. • Manage through Stormwater Management Plan and Groundwater Monitoring Plan.	On-going during the construction phase.
Preparing an area of 900 m2 for a portable camp site to accommodate infrastructure associated with stockpiling, crushing, washing, sorting and offices).	Construction	Local	• Development planning must ensure loss of vegetation and disturbance is restricted to within the minimum and designated areas only. • All disturbed areas must be rehabilitated. • Vegetation cover must be	• Minimise through Mine Design and Management Plan. • Manage in accordance with the Rehabilitation Plan. • Dust Monitoring Measures to ensure that the acceptable standards as set out in	Daily during construction in accordance with the Management Plan.

			reinstated through rehabilitation. • Implement effective and environmentally-friendly dust control measures.	Regulation 3 of NEMAQA National Dust Control Regulations.	
Extraction and transportation of ore. TLB activity and operation of mining equipment. Crushing, washing and sorting of ore in mobile plant.	Operational	Local	• Avoid contamination and divert any dirty water to suitable storage facility. • Implement noise minimisation measures. • Implement effective and environmentally-friendly dust control measures. • Undertake closure and rehabilitation of pits when activities are completed in those pits.	• Control through Stormwater Management Plan. • Regular vehicle and machinery inspection. • Implement in accordance with the rehabilitation plan and standards. • Monitor and manage through Dust Management Plan and Measures to ensure that the acceptable standards as set out in Regulation 3 of NEMAQA National Dust Control Regulations.	Ongoing during the Life of Mine.
Water extraction from borehole and/or tank.	Construction Operational	Local	• Apply water saving techniques, such as re-use of water.	• Manage through Water Conservation Plan and Regular Inspection of Water Facilities.	Daily during Life of Mine
Waste generation and disposal.	Construction Operational Decommissioning	Municipal	• Waste must be stored in demarcated storage facilities and disposed of in terms of relevant legislation and guidelines.	• Manage in accordance with Best Practice Guidelines, NWA, NEMWA.	Weekly during Life of Mine.
Demolition and/or removal of mobile camp site infrastructure/equipment. Rehabilitation and restoration of disturbed areas.	Decommissioning Post Closure	Local Site	• All disturbed areas must be rehabilitated. • Limit activity footprint and avoid disturbance of rehabilitated areas. • Implement an effective Alien Invasive Management Plan. • Demolition and removal of	• Manage in accordance with the Rehabilitation Plan, Environmental Conservation Plan, Alien Invasive Management Plan, NEM:BA and Best Practice Guidelines.	Ongoing during Decommissioning and Post Closure Phase.

			structures and rubble to be done cautiously. • Monitoring to be undertaken for a long enough period post closure, eg, 2-3 years.		

e) Impact Management Outcomes

(A description of impact management outcomes, identifying the standard of impact management required for the aspects contemplated in paragraph ();

ACTIVITY (whether listed or not listed). **(E.g. 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.).**	**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.**
Please see **section d (ii)** of **Part A** for a list of activities to be undertaken.	Please see **section (v)** and **(viii)** of **Part A** for the description of potential impacts associated with the project.	Please see **section j)** of **Part A**.	Please see **section j)** of **Part A**.	Please see **section j)** of **Part A** for mitigation type.	Please see **section iv)** above in terms of compliance, as well as **section e)** of **Part A** for compliance with legislation and policy.

f) Impact Management Actions

(A description of impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (c) and (d) will be achieved).

ACTIVITY whether listed or not listed. **(E.g. 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.).**	**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 prospecting 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)
Please see **section d (ii)** of **Part A** for a list of activities to be undertaken.	Please see **section (v)** and **(viii)** of **Part A** for the description of potential impacts associated with the project.	Please see **section j)** of **Part A** for mitigation type.	Please see **section iv)** above.	Please see **section iv)** above in terms of compliance, as well as **section e)** of **Part A** for compliance with legislation and policy.

i) Financial Provision

(1) Determination of the amount of Financial Provision.

(a) Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under the Regulation.

Kwa Nozici Minerals will be using a mobile camp site for its processing activities, and therefore no infrastructure associated with the camp site will require breaking down or demolishing at closure. The areas disturbed as a result of the mining operation will be rehabilitated by maintaining the general topography of the surrounding area, ensuring that there are no remnants of the structures. The closure objectives aim to return the affected area to a land use condition or desired state similar to that of the pre-mining state. Closure and rehabilitation of pits will be undertaken during the operational phase when the activities are completed in those pits, to achieve a desired land condition as early as possible. The pollution control dams (PCD) will be removed at closure and the plastic lining will be removed and recycled. At the end of the project life cycle, a thick soil layer of approximately 333 mm will be spread across the disturbed areas; thereafter the soil will be ripped, fertilised and re-vegetated. Post-closure monitoring will assist in determining the success of the rehabilitation and also identify whether any additional measures need to be taken to ensure the area is restored to a reasonable and acceptable condition.

Rehabilitation measures and objectives will be undertaken in compliance with legislation and policy governing the requirements for rehabilitation such as the National Environmental Management Act 107 of 1998 and the Mineral and Petroleum Resources Development Act 28 of 2002.

(b) Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties.

This Report highlights the rehabilitation and management objectives with regards to mitigating negative environmental impacts associated with the proposed mining operation. These environmental objectives related to the closure of the mining operation contained in this report will be subjected to a 30-day review period by Interested and Affected Parties.

(c) 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 rehabilitation plan for the proposed Kwa Nozici Minerals mining operation aims to mitigate the negative impacts associated with the mining activities, and ultimately to return the affected land to its desired land use standard. The objectives of the plan are to ensure that the condition of the site post mining operation are suitable to and in agreement with the affected neighbouring community and the competent authority, that there is minimal loss to the biodiversity of the area, and that rehabilitation restores the land use and capability of the area/site.

The rehabilitation process will commence during the mining operation throughout the life of mine; involving concurrent rehabilitation of pits when activities are completed in those pits and thereafter the final rehabilitation will be undertaken during the mine closure phase. A more detailed closure plan will be developed during the life of mine, prior to the cessation of mining activities; adapted to the developed information and environmental impact status of the project in order to achieve a site-specific closure plan.

A map showing the site layout and aerial extent of the proposed mining activities, depicting the anticipated mining permit area at the time of closure is included as Map 2 in **Appendix B**.

(d) Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives.

The closure plan will assist the proposed mining operation to achieve the following objectives:

- Comply with relevant legislation and policy requirements with regards to mine rehabilitation.
- Avoid or mitigate impacts associated with the project which may be detrimental to the environment.
- Land rehabilitation to a predetermined and agreed upon state that allows sustainable land use and capability of the site, that is to return the site to the condition that existed prior to mining or an agreed upon state.
- Cost effective and efficient closure of mining operations.
- Management and monitoring of the area post-closure.

The rehabilitation plan will thus be aligned to the closure objectives and tailored to the project to achieve these objectives. It will include information about the site prior to the mining operation and provide information on the maintenance of resources required for the rehabilitation process, as well detail how rehabilitation will be undertaken. It will also provide information on the management and monitoring of disturbance to avoid or minimise detrimental impacts, as well as an estimate of the financial closure provision. It will also include information associated with post-closure environmental monitoring of the

site to ensure that the rehabilitation plan is followed and its objectives are achieved.

(e) Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline.

This amount was calculated according to the guideline for the Calculation of the Quantum for rehabilitation as provided by DMR. The mining operation will entail the excavation of pits in sections, where after processing each pit will be closed/rehabilitated and a different/new pit will be excavated, within the 5 hectares area. The open cast rehabilitation fee is thus calculated on a pit size of 2500 m2, rehabilitated concurrently, trench dam and camp site area to a fee of **R 1 738 78.**

Refer to the table below for the Calculated Quantum Rehabilitation Financial Provision.

Table 1: Calculation of the financial provision required for the proposed Kwa Nozici Minerals Mining Project

CALCULATION OF THE QUANTUM

Applicant: **Kwa Nozici Minerals (Pty) Ltd** **Ref No.:** **NW30/5/1/3/2/10449MP**
Evaluator: **Date:** **03-Nov-16**

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	0	12.84	1	1	0
2 (A)	Demolition of steel buildings and structures	m2	0	178.87	1	1	0
2(B)	Demolition of reinforced concrete buildings and structures	m2	0	263.59	1	1	0
3	Rehabilitation of access roads	m2	0	32	1	1	0
4 (A)	Demolition and rehabilitation of electrified railway lines	m	0	310.66	1	1	0
4 (A)	Demolition and rehabilitation of non-electrified railway lines	m	0	169.45	1	1	0
5	Demolition of housing and/or administration facilities	m2	0	357.73	1	1	0
6	Opencast rehabilitation including final voids and ramps	ha	0.25	182 063.65	1	1	45515.9125
7	Sealing of shafts adits and inclines	m3	0	96.02	1	1	0
8 (A)	Rehabilitation of overburden and spoils	ha	0	125 016.15	1	1	0
8 (B)	Rehabilitation of processing waste deposits and evaporation ponds (non-polluting potential)	ha	0.000325	155 705.36	1	1	50.604242
8 (C)	Rehabilitation of processing waste deposits and evaporation ponds (polluting potential)	ha	0	452 242.17	1	1	0
9	Rehabilitation of subsided areas	ha	0	104 682.20	1	1	0
10	General surface rehabilitation	ha	0	99 033.88	1	1	0
11	River diversions	ha	0	99 033.88	1	1	0
12	Fencing	m	120	112.97	1	1	13556.4
13	Water management	ha	0	37 655.47	1	1	0
14	2 to 3 years of maintenance and aftercare	ha	5	13 179.41	1	1	65897.05
15 (A)	Specialist study	Sum	0			1	0
15 (B)	Specialist study	Sum				1	0
					Sub Total 1		125019.9667

1	Preliminary and General	15002.39601	**weighting factor 2** 1	15002.39601
2	Contingencies	12501.99667		12501.99667
			Subtotal 2	152524.36
			VAT (14%)	21353.41
			Grand Total	**173878**

(f) Confirm that the financial provision will be provided as determined.

Kwa Nozici Minerals confirms that the financial provision will be provided as determined.

Mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon, including

g) Monitoring of Impact Management Actions
h) Monitoring and reporting frequency
i) Responsible persons
j) Time period for implementing impact management actions
k) Mechanism for monitoring compliance

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
Site clearing and topsoil removal. Construction of infrastructure (PCD, trenches, water pipes, storm water management facilities). TLB activity and operation of mining equipment. Crushing, washing and sorting of ore in mobile plant. Water extraction from borehole and/or tank. Waste generation and disposal.	Air quality.	Set up PM^{10} Monitoring sites in the area to monitor dustfall, using method ASTM D1739: 1970 (or equivalent).	Environmental Control Officer	Ongoing during the Life of Mine. Compile monthly reports.
	Soil	Management and monitoring of soil stockpiles. Soils must be stored properly and revegetated to prevent erosion and to enable re-use during rehabilitation.	Environmental Control Officer Kwa Nozici Management	Monitor and inspect on a daily basis. Compile monthly reports.
	Groundwater and aquifer.	Manage through Groundwater Monitoring Plan. Monitoring water levels of the boreholes found in close proximity to the proposed mining site, through a flow meter and water level datalogger. Collection of baseline hydrochemistry samples for analysis.	Kwa Nozici Minerals Other mine owners in the area Department of Water and Sanitation	Ongoing during the Life of Mine and post mine closure. Collect at least bi-annually during Life of Mine, and annually post mine closure.

Demolition and/or removal of mobile camp site infrastructure/equipment. Rehabilitation and restoration of disturbed areas.	Surface water.	Monitor and manage through Stormwater Management Plan	Environmental Control Officer Kwa Nozici Management	Ongoing during the Life of Mine, as well as for at least a year post mine closure.
	Establishment and spread of alien plant species	Alien invasive vegetation monitoring and control through Alien Invasive Management Plan	Environmental Control Officer	Ongoing during the Life of Mine. Monitor and control on a monthly basis.

l) Indicate the frequency of the submission of the performance assessment/ environmental audit report.

The Environmental Control Officer will undertake audits in compliance with the provided EMP contents and guidelines and will compile audit reports, which will ultimately be submitted to the DMR every two years.

m) Environmental Awareness Plan

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

Kwa Nozici Minerals Management has to appoint an independent Environmental Control Officer whose duty is to also implement an effective environmental awareness plan aimed to educate workers and contractors in terms of the biodiversity on site, environmental risks associated with the proposed development and land management of the site. Training and/or awareness should be raised and effectively communicated prior to the commencement of the construction phase. Training sessions should incorporate the management plans addressed in this EMPr as well as any new information and documentation provided by the ECO, as well as that of the Environmental Health & Safety Officer. The ECO would be the most suitable person to conduct these training sessions, identifying sensitive environments as well as all the risks and impacts associated with the mining operation and the methods in which to deal with the impacts in order to avoid environmental degradation. Training sessions can be monitored by providing an attendance register indicating the workers that received training as well as evidence of the training and/or awareness received. These sessions would also need to be carried out throughout the Life of Mine, at least once a year, or as new information becomes available.

(2) Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment.

Kindly refer to the table of possible mitigation measures that could be applied in **section (viii)** of Part A for an indication of the manner in which risks will be dealt with

n) Specific information required by the Competent Authority
(Among others, confirm that the financial provision will be reviewed annually).

No specific information requirements have been made by the competent authority at this stage

2) 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:

Council for Scientific and Industrial Research

Name of company:

24/01/2017

Date:

-END-

Draft Basic Assessment Report – Proposed Establishment of a Small-Scale Alluvial Diamond and Manganese Mining Project for Kwa Nozici Minerals (Pty) Ltd

Farm 361 JP, Welverdiend, North West

APPENDICES

Appendix A	CVs of the EAPs
Appendix B	Locality map, Site Layout Plan, Land Use Map
Appendix C	Public participation information: including a copy of the register of interested and affected parties, the comments and responses report, proof of notices, advertisements and any other public participation information as required.
Appendix D	Specialist Reports
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	• Heritage Impact Assessment Study (2.19.2)
	• Hydrogeological Specialist Study
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	• Water Use General Authorisation Registration Letter

APPENDIX A

CVs of the EAPs

Contents

Annexure A.1: Minnelise Levendal (Project Leader)

CSIR
Jan Cilliers Street
PO Box 320 Stellenbosch 7600
South Africa

Phone: +27 21 888 2400
Fax: +27 21 888 2693
Email: mlevendal@csir.co.za

CURRICULUM VITAE OF MINNELISE LEVENDAL – PROJECT LEADER

Name of firm	CSIR
Name of staff	Minnelise Levendal
Profession	Environmental Assessment and Management
Position in firm	Project Manager
Years' experience	8 years
Nationality	South African
Languages	Afrikaans and English

CONTACT DETAILS:

Postal Address: P O Box 320, Stellenbosch, 7599
Telephone Number: 021-888 2495/2661
Cell: 0833098159
Fax: 0865051341
e-mail: mlevendal@csir.co.za

BIOSKETCH:

Minnelise joined the CSIR Environmental Management Services group (EMS) in 2008. She is focussing primarily on managing Environmental Impact Assessments (EIAs), Basic Assessments (BAs) and Environmental Screening studies for renewable energy projects including wind and solar projects. These include an EIA for a wind energy facility near Swellendam, Western Cape South Africa for BioTherm (Authorisation granted in September 2011) and a similar EIA for BioTherm in Laingsburg, Western Cape (in progress). She is also managing two wind farm EIAs and a solar Photovoltaic BA for WKN-Windcurrent SA in the Eastern Cape. Minnelise was the project manager for the Basic Assessment for the erection of ten wind monitoring masts at different sites in South Africa as part of the national wind atlas project of the Department of Energy in 2009 and 2010..She was also a member of the Project Implementation Team who managed the drafting of South Africa's Second National Communication under the United Nations Framework Convention on Climate Change. The national Department of Environmental Affairs appointed the South African Botanical Institute (SANBI) to undertake this project. SANBI subsequently appointed the CSIR to manage this project.

EDUCATION:

- M.Sc. (Botany) Stellenbosch University 1998
- B.Sc. (Hons.) (Botany) University of the Western Cape 1994
- B.Sc. (Education) University of the Western Cape 1993

MEMBERSHIPS:

- International Association for Impact Assessment (IAIA), Western Cape (member of their steering committee from 2001-2003)
- IUCN Commission on Education and Communication (CEC); World Conservation Learning Network (WCLN)
- American Association for the Advancement of Science (AAAS)
- Society of Conservation Biology (SCB)

EMPLOYMENT RECORD:

- **1995:** Peninsula Technicon. Lecturer in the Horticulture Department.
- **1996:** University of the Western Cape. Lecturer in the Botany Department.
- **1999:** University of Stellenbosch. Research assistant in the Botany Department (3 months)
- **1999:** Bengurion University (Israel). Research assistant (Working in the Arava valley, Negev – Israel; 2 months). Research undertaken was published (see first publication in publication list)
- **1999-2004:** Assistant Director at the Department of Environmental Affairs and Development Planning (DEA&DP). Work involved assessing Environmental Impact Assessments and Environmental Management Plans; promoting environmental management and sustainable development.
- **2004 to present:** Employed by the CSIR in Stellenbosch:
- September 2004 – May 2008: Biodiversity and Ecosystems Services Group (NRE)
- May 2008 to present: Environmental Management Services Group (EMS)

PROJECT EXPERIENCE RECORD:

The following table presents a list of projects undertaken at the CSIR as well as the role played in each project:

Completion Date	Project description	Role	Client
2011 *(in progress)*	EIA for the proposed Electrawinds Swartberg wind energy project near Moorreesburg in the Western Cape	Project Manager	Electrawinds
2010-2011 *(in progress)*	EIA for the proposed Ubuntu wind energy project, Eastern Cape	Project Manager	WKN Windkraft SA
2010-2011 *(in progress)*	EIA for the proposed Banna ba pifhu wind energy project, Eastern Cape	Project Manager	WKN Windkraft SA
2010-2011	BA for a powerline near Swellendam in the Western Cape	Project Manager	BioTherm Energy (Pty Ltd
2010-2011 *(Environmental Authorisation granted in September 2011)*	EIA for a proposed wind farm near Swellendam in the Western Cape	Project Manager	BioTherm Energy (Pty Ltd
2010 (complete)	Basic Assessment for the erection of two wind monitoring masts near Swellendam and Bredasdorp in the Western Cape	Project Manager	BioTherm Energy (Pty Ltd
2010 (complete)	Basic Assessment for the erection of two wind monitoring masts near Jeffrey's Bay in the Eastern Cape	Project Manager	Windcurrent (Pty Ltd
2009-2010 (*(Environmental Authorisations granted during 2010)*	Basic Assessment Process for the proposed erection of 10 wind monitoring masts in SA as part of the national wind atlas project	Project Manager	Department of Energy through SANERI; GEF
2010	South Africa's Second National	Project	SANBI

Completion Date	Project description	Role	Client
	Communication under the United Nations Framework Convention on Climate Change	Manager	
2009 *(Environmental Authorisation granted in 2009)*	Basic Assessment Report for a proposed boundary wall at the Port of Port Elizabeth, Eastern Cape	Project Manager	Transnet Ltd
2008	Developing an Invasive Alien Plant Strategy for the Wild Coast, Eastern Cape	Co-author	Eastern Cape Parks Board
2006-2008	Monitoring and Evaluation of aspects of Biodiversity	Project Leader	Internal project awarded through the Young Researchers Fund
2006	Integrated veldfire management in South Africa. An assessment of current conditions and future approaches.	Co- author	Working on Fire
2004-2005	Biodiversity Strategy and Action Plan Wild Coast, Eastern Cape, SA	Co-author	Wilderness Foundation
2005	Western Cape State of the Environment Report: Biodiversity section. (Year One).	Co- author and Project Manager	Department of Environmental Affairs and Development Planning

PUBLICATIONS:

Bowie, M. (néé Levendal) and Ward, D. (2004). Water status of the mistletoe *Plicosepalus acaciae* parasitic on isolated Negev Desert populations of *Acacia raddiana* differing in level of mortality. Journal of Arid Environments 56: 487-508.

Wand, S.J.E., Esler, K.J. and **Bowie, M.R** (2001). Seasonal photosynthetic temperature responses and changes in ^{13}C under varying temperature regimes in leaf-succulent and drought-deciduous shrubs from the Succulent Karoo, South Africa. South African Journal of Botany 67:235-243.

Bowie, M.R., Wand, S.J.E. and Esler, K.J. (2000). Seasonal gas exchange responses under three different temperature treatments in a leaf-succulent and a drought-deciduous shrub from the Succulent Karoo. South African Journal of Botany 66:118-123.

LANGUAGES

Language	***Speaking***	***Reading***	***Writing***
English	*Excellent*	*Excellent*	*Excellent*
Afrikaans	*Excellent*	*Excellent*	*Excellent*

Minnelise Levendal

20 January 2017

Annexure A.2: Babalwa Mqokeli (Project Manager)

CSIR
Jan Cilliers Street
PO Box 320 Stellenbosch 7600
South Africa

Phone: +27 21 888 2432
Fax: +27 21 888 2693
Email: bmqokeli@csir.co.za

CURRICULUM VITAE OF BABALWA MQOKELI – PROJECT MANAGER

Surname:	Mqokeli
First names:	Babalwa Ruth
ID No.	8804040578087
Gender:	Female
Languages:	IsiXhosa, English and IsiZulu
Nationality:	South African
Driver's licence:	Code C1
Membership:	SACNASP Membership, IAIAsa

CONTACT DETAILS:

Postal Address:	P O Box 320, Stellenbosch, 7599
Telephone Number:	021 888 2432
Fax:	021 888 2693
E-mail:	bmqokeli@csir.co.za

EDUCATIONAL QUALIFICATIONS:

TERTIARY	
Institute:	University of KwaZulu-Natal
Duration:	2011-2012
Qualification:	MSc Ecological Science
Institute:	University of KwaZulu-Natal
Duration:	2010
Qualification:	BSc Honours Ecological Science
Institute:	University of Zululand
Duration:	2006-2009
Qualification:	BSc Biological Science
COURSES	
Institute:	Council for Scientific and Industrial Research (CSIR)
Duration:	01-02 August 2016
Qualification:	Presentation Skills

Institute:	Council for Scientific and Industrial Research (CSIR)
Duration:	10-11 November 2015
Qualification:	Project Management I
Institute:	Business Success Solutions
Duration:	29-30 October 2015
Qualification:	Environmental Law (Short Course)
SECONDARY	
School:	Durban Girls' Secondary School
Year:	2004
Qualification:	Matric
Subjects passed:	Mathematics, Biology, Business Economics, History, English and Afrikaans
SKILLS	
Computer skills:	Microsoft Office, Email Internet and Databases search
GIS skills:	ArcGIS 10

EMPLOYMENT INCLUDING VOLUNTEER WORK:

Company:	Council for Scientific and Industrial Research (CSIR)
Duration:	August 2015- Currently
Job title:	Environmental Assessment Practitioner Intern
Responsibilities:	Project manager for Basic Assessment Reports, Conduct Public Participation, GIS Mapping, Conduct site visits, Project assistant for EMF development and Report Compilation
Company:	University of KwaZulu-Natal
Duration:	February 2015-May 2015
Job title:	Teaching Assistant
Responsibilities:	Leading a 1st year laboratory in conducting and guiding biology practicals, liaising with other demonstrators in running the laboratory, interacting and assisting learners with biology practicals, assessing learners and compiling a marks list to provide to the Schools' administrator
Company:	Nature's Valley Trust (WWF-SA Environmental Leaders Programme)
Duration:	April 2013- September 2014
Job title:	Conservation Research Intern
Responsibilities:	Coordinating the Groot River monitoring research project, coordinating the Invasive alien Mosquito fish research project and the Groot Estuary fish research project, assisting with administrative tasks and field work for the Fynbos research project as well as that of the conservation forums, assisting in NVT's public events and social media management, Involved in environmental education activities with local schools and community outreach programmes
Company:	University of KwaZulu-Natal
Duration:	2010-2012 (when needed)
Job title:	Voluntary Research Assistant
Responsibilities:	• Conducting field work • Compiling data
Company:	University of KwaZulu-Natal
Duration:	2010-2012
Job title:	Undergraduate Biology Tutor
Responsibilities:	• Assisting students with the module

	• Assisting learners with biology practicals • Marking of learners work
Company:	University of Zululand
Duration:	2009
Job title:	Tutor
Responsibilities:	• Assisting students with the module and practicals • Assisting the lecturer in class • Marking of learners work
Company:	Durban Botanical Gardens
Duration:	2009 (June Vacation)
Job title:	Herbarium Volunteer
Responsibilities:	• Plant pressing and classification

CONFERENCE PAPERS

International Association for Impact Assessors South Africa (IAIAsa) 2016 Annual Conference - Overlap between biodiversity conservation & economic development: a case study of a proposed piggery near Cedarville, Eastern Cape, A project under the DEA Special Needs and Skills Development Programme.

Microscopy Society of Southern African Annual Conference (MSSA) 2011 - Palatal and lingual adaptations for frugivory and nectarivory in the Wahlberg's epauletted fruit bat (Epomophorus wahlbergi).

WORKSHOPS:

2015 Practical Adaptation for vulnerable communities by Adaptation Network, Kirstenbosch Botanical Gardens, Cape Town, August 2016.

2013 African Marine Debris Summit, Kirstenbosch Botanical Gardens, Cape Town, June 2013.

PROFESSIONAL REGISTRATION

South African Council for Natural Scientific Professions: Candidate Natural Scientist (100215/15)

RESEARCH PUBLICATIONS

1. DOWNS, C.T., MQOKELI, B.R.& SINGH, P. 2012. Sugar assimilation and digestive efficiency in Wahlberg's epauletted fruit bat (Epomophorus wahlbergi). Comparative Biochemistry and Physiology A 161: 344-348.

2. MQOKELI, B.R. & DOWNS, C.T. 2012. Blood plasma glucose regulation in Wahlberg's epauletted fruit bat. African Zoology 47:348-352.

3. MQOKELI, B.R. & DOWNS, C.T. 2013. Palatal and lingual adaptations for frugivory and nectarivory in the Wahlberg's epauletted fruit bat (Epomophorus wahlbergi). Zoomorphology 132: 111-119.

4. MQOKELI, B.R. & DOWNS, C.T. 2014. Is protein content in the diet of Wahlberg's epauletted fruit bats, Epomophorus wahlbergi, important? African Zoology 49: 161-166.

REFEREES

Name:	Minnelise Levendal
Title:	Senior Environmental Assessment Practitioner
Organisation:	Council for Scientific and Industrial Research
Contact:	021 888 2495
Name:	Dr Mark Brown
Title:	Program Director
Organisation:	Nature's Valley Trust
Contact:	044 531 6820
Name:	Prof Colleen Downs
Title:	Associate Professor/ Lecturer/ SARCHI Research Chair
Organisation:	Council for Scientific and Industrial Research
Contact:	033 260 5127

LANGUAGES

Language	***Speaking***	***Reading***	***Writing***
English	*Excellent*	*Excellent*	*Excellent*
IsiXhosa	*Excellent*	*Excellent*	*Excellent*
IsiZulu	*Excellent*	*Excellent*	*Excellent*
Afrikaans	*Fair*	*Good*	*Good*

Babalwa Mqokeli

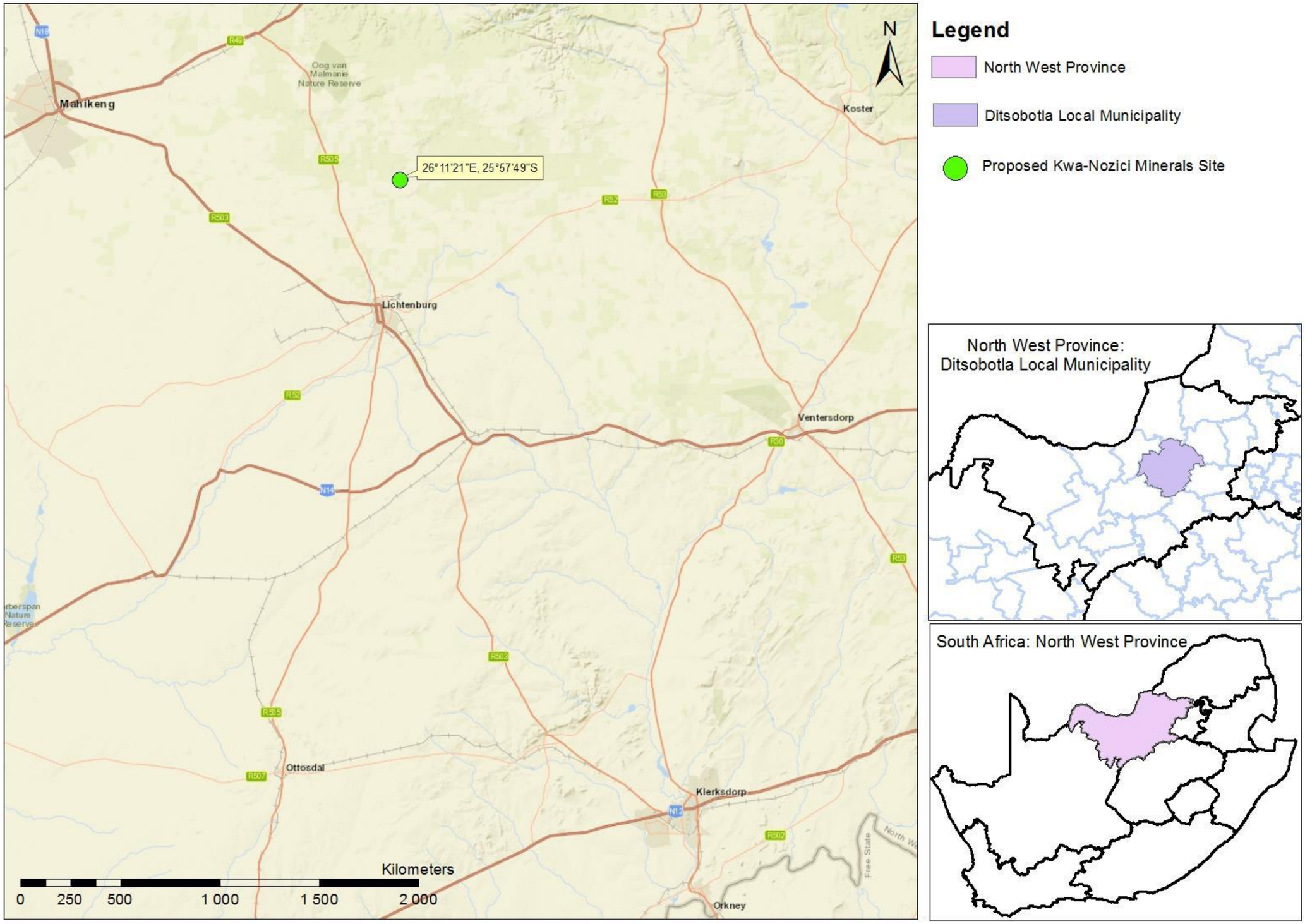
20 January 2017

APPENDIX B

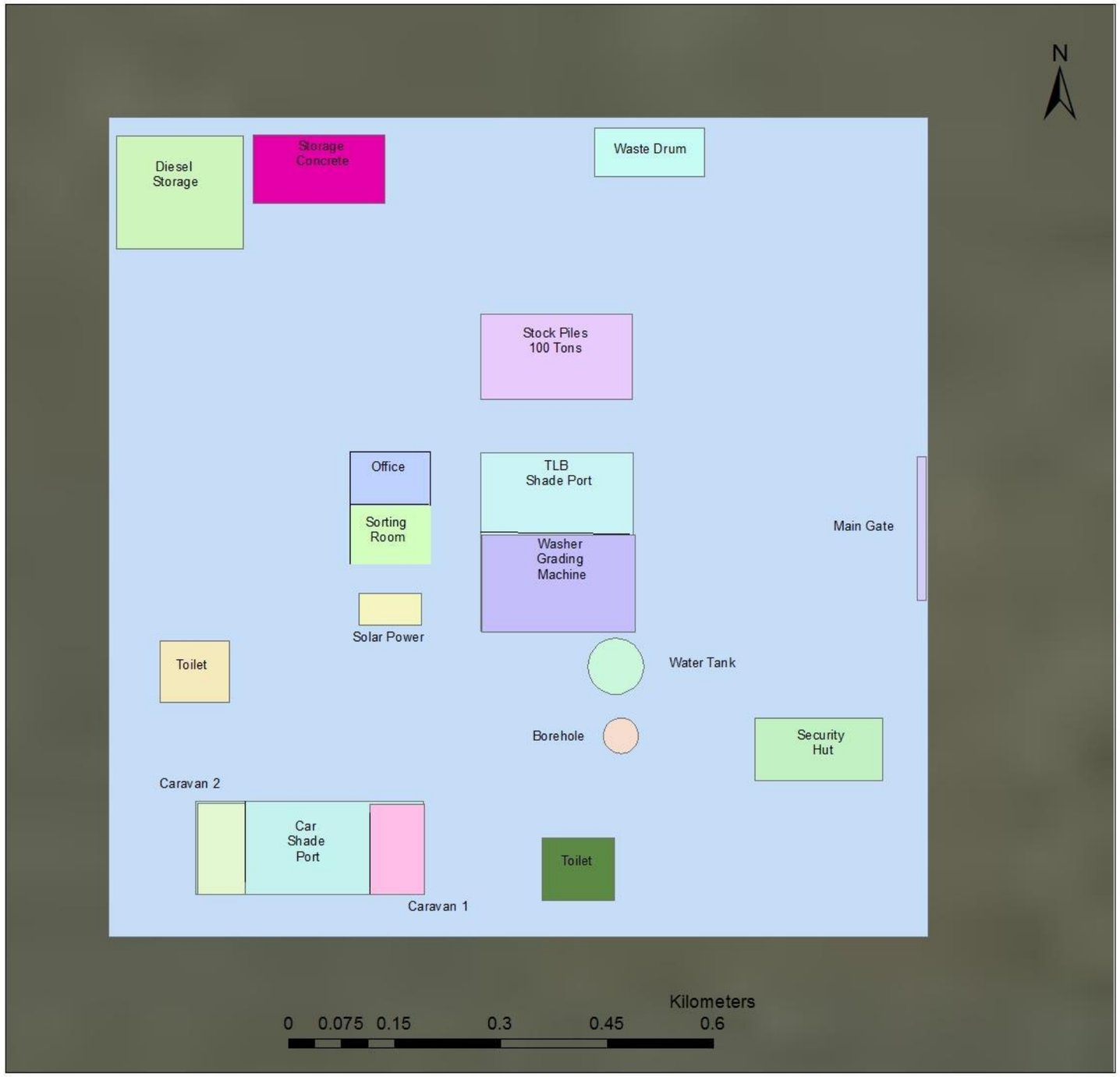
Locality & Layout Maps

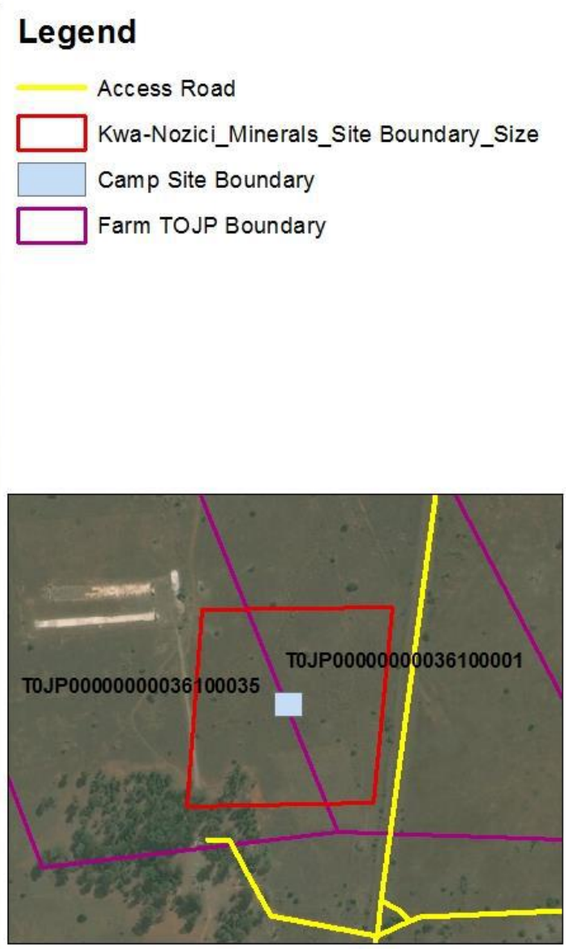
Contents

Map B1: Kwa Nozici Minerals (Pty) Ltd's Proposed Site Location on Farm 361 JP, Welverdiend, North West.

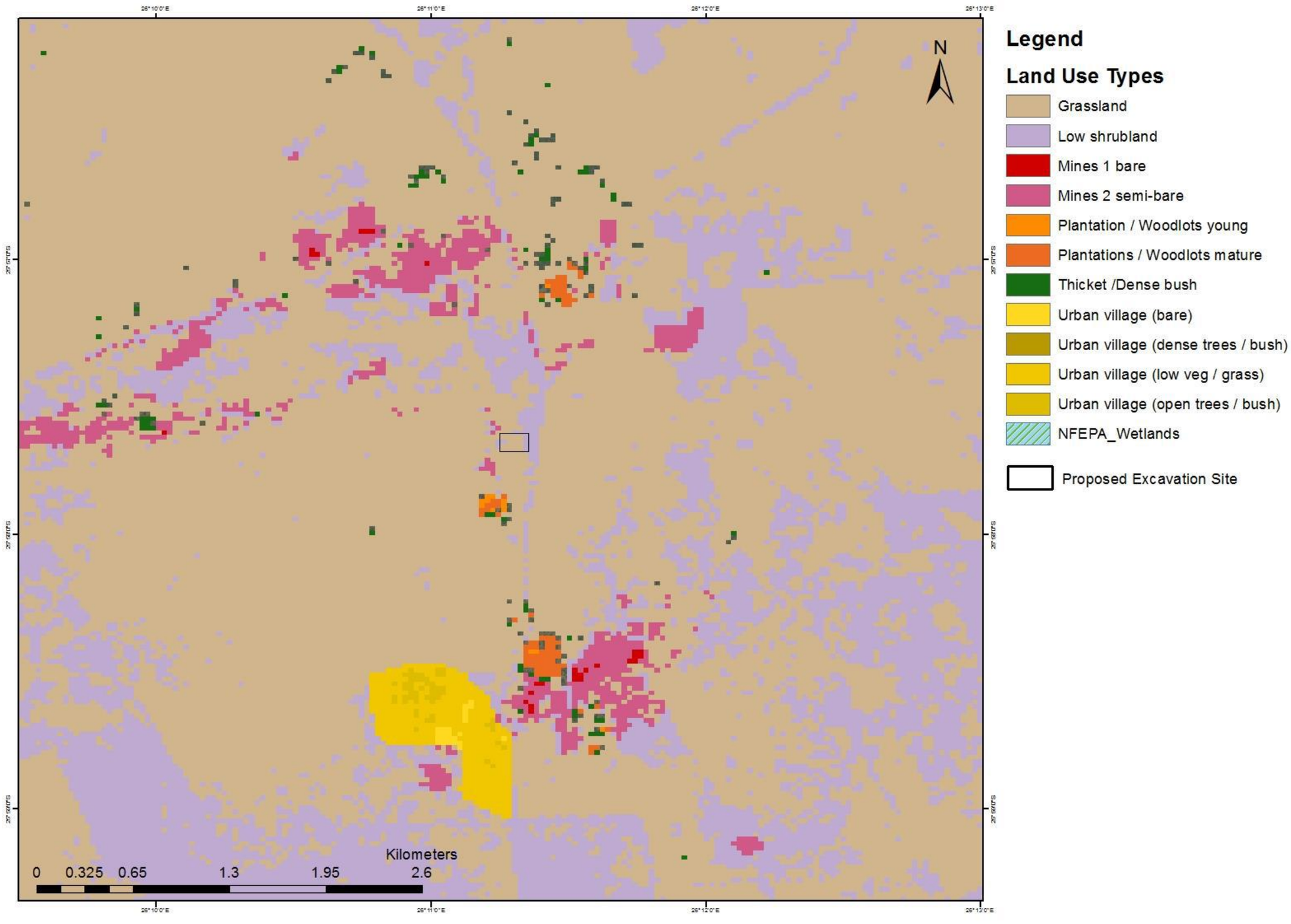


Map B2: Kwa Nozici Minerals (Pty) Ltd's proposed Site Layout Plan, locating the camp site with associated infrastructure.





Map B3: Environmental and Current Land Use Features found in the area of the proposed Kwa Nozici Minerals (Pty) Ltd Site.



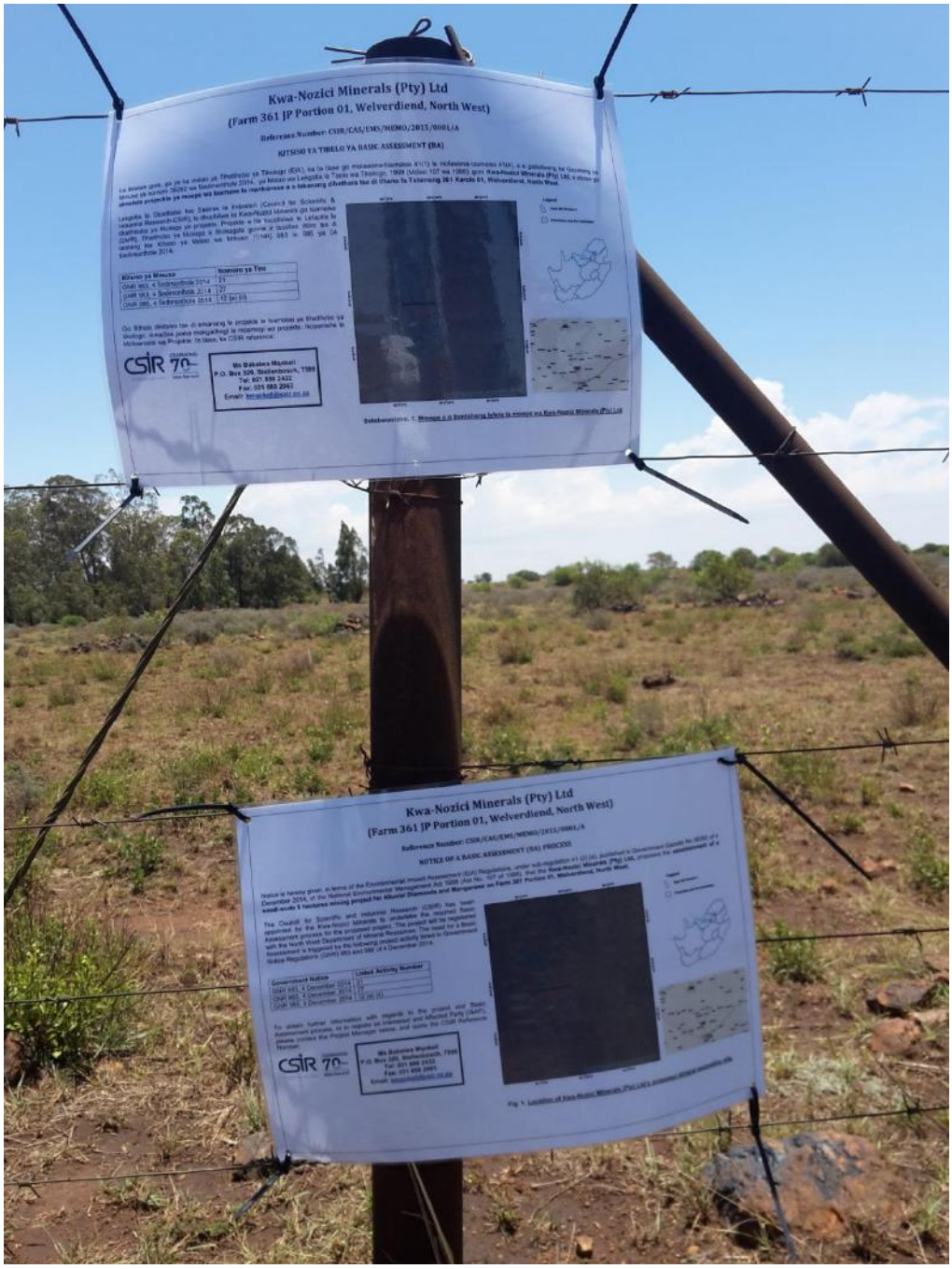
APPENDIX C

Public Participation Information

Contents

Appendix C1: Proof of Site Notice

English and SeTswana Site notices placed at the entrance of the site (Site Notice GPS location: 25°57'51.6"S 26°11'21.4"E)



Contents of the English Site notice

Kwa-Nozici Minerals (Pty) Ltd

(Farm 361 JP Portion 01, Welverdiend, North West)

Reference Number: CSIR/CAS/EMS/MEMO/2015/0001/A

NOTICE OF A BASIC ASSESSMENT (BA) PROCESS

Notice is hereby given, in terms of the Environmental Impact Assessment (EIA) Regulations, under sub-regulation 41 (2) (a), published in Government Gazette No 38282 of 4 December 2014, of the National Environmental Management Act 1998 (Act No. 107 of 1998), that the **Kwa-Nozici Minerals (Pty) Ltd,** proposes the **establishment of a small-scale 5 hectares mining project for Alluvial Diamonds and Manganese on Farm 361 Portion 01, Welverdiend, North West.**

The Council for Scientific and Industrial Research (CSIR) has been appointed by the Kwa-Nozici Minerals to undertake the required Basic Assessment process for the proposed project. The project will be registered with the North West Department of Mineral Resources. The need for a Basic Assessment is triggered by the following project activity listed in Government Notice Regulations (GNR) 983 and 985 of 4 December 2014.

Government Notice	Listed Activity Number
GNR 983, 4 December 2014	21
GNR 983, 4 December 2014	27
GNR 985, 4 December 2014	12 (a) (ii)

To obtain further information with regards to the project and Basic Assessment process, or to register as Interested and Affected Party (I&AP), please contact the Project Manager below, and quote the CSIR Reference Number:

CSIR CELEBRATING 70 years Ideas that work

Ms Babalwa Mqokeli
P.O. Box 320, Stellenbosch, 7599
Tel: 021 888 2432
Fax: 021 888 2963
Email: bmqokeli@csir.co.za

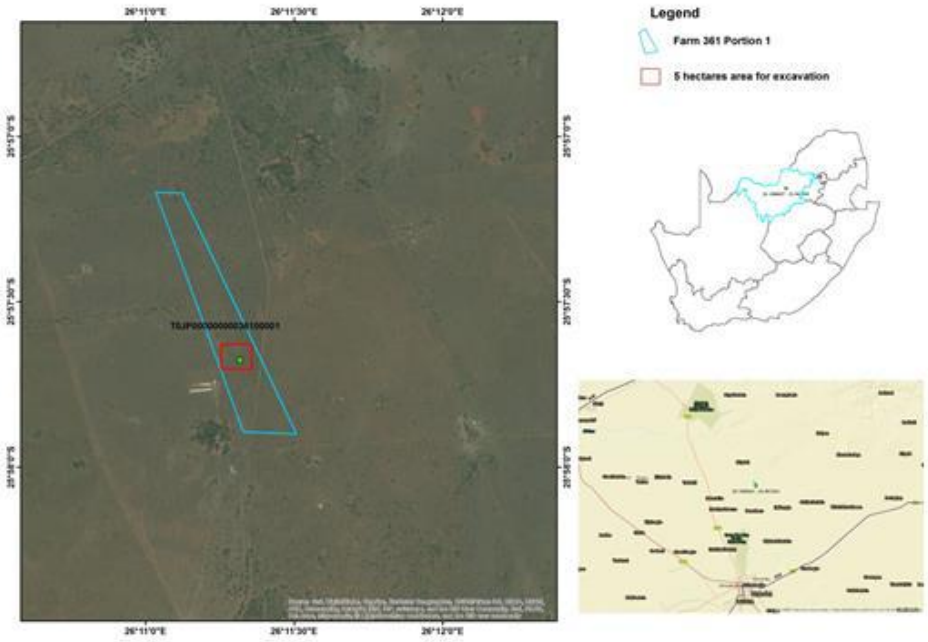


Fig. 1. Location of Kwa-Nozici Minerals (Pty) Ltd's proposed mineral excavation site.

Contents of the SeTswana Site notice

Kwa-Nozici Minerals (Pty) Ltd
(Farm 361 JP Portion 01, Welverdiend, North West)

Reference Number: CSIR/CAS/EMS/MEMO/2015/0001/A

KITSISO YA TIRELO YA BASIC ASSESSMENT (BA)

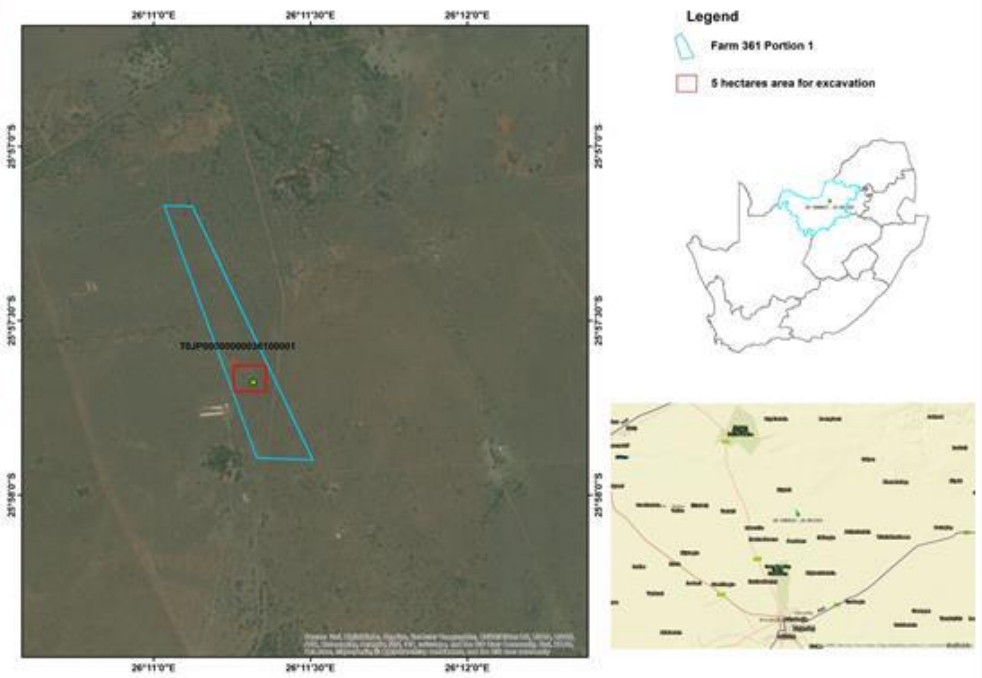
Le itsisiwe gore, go ya ka melao ya Tlhatlhobo ya Tikologo (EIA), ka fa tlase ga molawana-tsamaiso 41(1) le molawana-tsamaiso 41(4), e e gatisitweng ka Gazeteng ya Mmuso ya nomoro 38282 wa Sedimonthole 2014, ya Molao wa Lekgotla la Taolo wa Tikologo, 1998 (Molao 107 wa 1998), gore **Kwa-Nozici Minerals (Pty) Ltd,** e eletsa go **simolola projeckte ya moepo wa taemane le mankanese o o lekanang dihethara tse di tlhano fa Tshimung 361 Karolo 01, Welverdiend, North West.**

Lekgotla la Dipatlisiso tsa Saense le Indasteri (Council for Scientific & Industrial Research-CSIR), le tlhophilwe ke Kwa-Nozici Minerals go tsamaisa tlhatlhobo ya tikologo ya projekte. Projekte e tla kwadisiwa le Lefapha la (DMR). Tlhatlhobo ya tikologo e tlhokagala gonne e tsositse ditiro tse di latelang tsa Kitsiso ya Melao wa Mmuso (GNR) 983 le 985 ya 04 Sedimonthole 2014.

Kitsiso ya Mmuso	Nomoro ya Tiro
GNR 983, 4 Sedimonthole 2014	21
GNR 983, 4 Sedimonthole 2014	27
GNR 985, 4 Sedimonthole 2014	12 (a) (ii)

Go fitlhela dikitsiso tse di amanang le projekte le tsamaiso ya tlhatlhobo ya tikologo, ikwadise jaaka mokgatlhegi le moamegi wa projekte. Ikopantshe le Motsamaisi wa Projekte, fa tlase, ka CSIR reference:

Ms Babalwa Mqokeli
P.O. Box 320, Stellenbosch, 7599
Tel: 021 888 2432
Fax: 021 888 2963
Email: bmqokeli@csir.co.za



Setshwantsho. 1. Mmepe o o bontshang lefelo la moepo wa Kwa-Nozici Minerals (Pty) Ltd

Appendix C2: Written notices issued as required in terms of the regulations

Letter sent (10/03/16) to I&APs as part of Project Announcement

CSIR Specialist Services
PO Box 320
Stellenbosch
7599
South Africa
Tel: +27 21 888 2432
Fax: +27 21 888 2693
Email: bmqokeli@csir.co.za

09 March 2016

Dear Interested and/or Affected Party,

PROJECT ANNOUNCEMENT

BASIC ASSESSMENT FOR KWA-NOZICI MINERALS (PTY) LTDS' PROPOSED ALLUVIAL DIAMOND AND MANGANESE MINING PROJECT ON FARM 361 JP, WELVERDIEND, NORTH WEST

CSIR REFERENCE NO: CSIR/CAS/EMS/MEMO/2015/0001/A

The National Department of Environmental Affairs (DEA) and the Council for Scientific and Industrial Research (CSIR) have initiated the Special Needs and Skills Development Programme, whereby small-medium micro-enterprises and community trusts who are lacking financial means are provided with *pro-bono* environmental services to decrease the burden of the cost associated with starting a business. Kwa-Nozici Minerals (Pty) Ltd has been identified as an eligible client for this service and is proposing to establish a small-scale Alluvial Diamond and Manganese mining project on on portion 1 and 35 of Farm No. 361 JP, approximately 3km from the Welverdiend village, North West Province.

In terms of Government Notice Regulations (GNR) 983, 984 and 985 of the National Environmental Management Act (Act 107 of 1998) published in Government Gazette 38282 on 4 December 2014, Environmental Authorisation from the Competent Authority, in this case the the North West Department of Mineral Resources (DMR), is required prior to the undertaking of any activity triggered within GNR 983, 984 and/or 985. The CSIR, as the independent Environmental Assessment Practitioner (EAP), will be managing the Basic Assessment and Public Participation Process for this proposed project.

In line with the Environmental Impact Assessment requirements of 4 December 2014, Interested and Affected Parties (I&APs) must be notified and are requested to register for this project in order to receive future correspondence on this project and/or provide comments on issues of concern that will be considered during the Basic Assessment process. Please find enclosed with this letter a Background Information Document (BID) and a Comment and Registration form. You have until on or before **12 April 2016** to register and submit your comments for this project. To register and submit comments for the project please complete the Registration Form. Use the CSIR Reference Number above together with your full name, contact details (preferred method of notification, e.g., full postal or email address), fax/phone number(s) and an indication of any direct business, financial, personal or other interest you have in the application to the contact person listed below.

From this point onwards, all communication and documents will be in English. Should you require further information in another language, please do not hesitate to contact the CSIR and we will assist.

Yours sincerely,

Ms. Babalwa Mqokeli (Project Manager)
Postal address: PO Box 320, Stellenbosch, 7599, South Africa
Tel: 021 888 2432
Fax: 021 888 2693
E-mail: bmqokeli@csir.co.za
Website: http://www.csir.co.za/ems/specialneeds/

Letter sent (10/03/16) to I&APs as part of Project Announcement

From: Babalwa Mqokeli
To:
BC mrabothata@environment.gov.za; SHlela@environment.gov.za; tnemarude@environment.gov.za; bonginkosi.zulu@drdlr.gov.za; mashuduma@daff.gov.za; kgauta.mokoena@dmr.gov.za; MohapiN@dwa.gov.za; MuthraparsadN@dwa.gov.za; khayalethu.matrose@dmr.gov.za; mmolefane@thedti.gov.za; lfourie@nwpg.gov.za; pieter.swart@dmr.gov.za; ipeleng.wesi@dmr.gov.za; aaron.kharive@dmr.gov.za; tshilidzi.phalala@dmr.gov.za; pmokaila@nwpg.gov.za; amafole@nwpg.gov.za; lobakengc@dwa.gov.za; bogopal@dwa.gov.za; tmakhona@salga.org.za; mbila@nwpg.gov.za; smukhola@nwpg.gov.za; tboshoff@nwpg.gov.za; ntnango@nwpg.gov.za; cmmutle@nwpg.gov.za; mtumane@nwpg.gov.za; okgathea@nwpg.gov.za; lmotlhanke@nwpg.gov.za; rmathebula@nwpg.gov.za; mosadim@nwpg.gov.za; pkhrisjan@nwpg.gov.za; avanstraaten@nwpg.gov.za; leroivanniekerk@gmail.com; snnete@gmail.com; lesego.molotwane@gmail.com; goitsetau123@gmail.com; gontsanat@nmmmdm.gov.za; andrew.mvundle@gmail.com; barbersp@lantic.net; howard.hendricks@sanparks.org; Sfoya@geoscience.org.za; makoam@nra.co.za; stephanie@ewt.org.za; philli_l1955@yahoo.com
Date: 10/03/2016 08:57
Subject: Notification of Release of BID for Basic Assessment for the Proposed Small-scale Alluvial Diamond and Manganese Mining Operation, and Associated Infrastructure, Weleverdiend, North West
Attachments: Comments & Reg Form.docx; Letter to I&APs_BID.pdf

Good day,

You are kindly notified about the release of the Background Information Document (BID) regarding a Basic Assessment for the proposed small-scale Alluvial Diamond and MAnganese mining project on portion 1 and 35 of Farm No. 361 JP, approximately 3km from the Welverdiend Village, NorthWest Province. Please find attached the BID, which has beeb released for 30 day review, and the Registration/Comment Form. Please return on or before **12 April 2016.**

Should the contents of this project not pertain to you, kindly forward the documents to the person in your department that is affected. Additionally, please forward their contact details to the CSIR Project Manager or ask the affected party to contact the CSIR Project MAnager. Should you wish to be registered or de-registered from from receiving any further information during the Basic Assessment and Public Participation Process, kindly contact the CSIR Project Manager. Correspondence in this regard should preferably be writtten, i.e Email, Fax or Letter.

Contact via: Ms Babalwa Mqokeli
Email: **bmqokeli@csir.co.za**
Tel: **021 888 2432**
Fax: **021 888 2693**

Regards,
Babalwa

Proof email delivery sent on 11 April 2016

aaron.kharive@dmr.gov.za Transferred

Transferred	10/03/2016 08:57
Delivered	10/03/2016 09:02

BC: aaron.kharive@dmr.gov.za

amafole@nwpg.gov.za Undeliverable

Transferred	10/03/2016 08:57
Undeliverable	10/03/2016 09:03

BC: amafole@nwpg.gov.za

andrew.mvundle@gmail.com Transferred

Transferred	10/03/2016 08:57
Delivered	10/03/2016 09:02

BC: andrew.mvundle@gmail.com

avanstraaten@nwpg.gov.za Transferred

Transferred	10/03/2016 08:57

BC: avanstraaten@nwpg.gov.za

barbersp@lantic.net Transferred

Transferred	10/03/2016 08:57
Delivered	10/03/2016 09:01

BC: barbersp@lantic.net

bogopal@dwa.gov.za Transferred

Transferred	10/03/2016 08:57
Delivered	10/03/2016 09:02

BC: bogopal@dwa.gov.za

bonginkosi.zulu@drdlr.gov.za Transferred

Transferred	10/03/2016 08:57
Delivered	10/03/2016 09:01

BC: bonginkosi.zulu@drdlr.gov.za

cmmutle@nwpg.gov.za Transferred

Transferred	10/03/2016 08:57

BC: cmmutle@nwpg.gov.za

goitsetau123@gmail.com Transferred

Transferred	10/03/2016 08:57
Delivered	10/03/2016 09:02

BC: goitsetau123@gmail.com

gontsanat@nmmmdm.gov.za Undeliverable

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Undeliverable	10/03/2016 09:01

BC: gontsanat@nmmmdm.gov.za

howard.hendricks@sanparks.org Transferred

Transferred	10/03/2016 08:57
Delivered	10/03/2016 09:10

BC: howard.hendricks@sanparks.org

ipeleng.wesi@dmr.gov.za Transferred

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Delivered 10/03/2016 09:02
BC: kgauta.mokoena@dmr.gov.za

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Transferred 10/03/2016 08:57
Delivered 10/03/2016 09:02
BC: khayalethu.matrose@dmr.gov.za

leroivanniekerk@gmail.com Transferred
Transferred 10/03/2016 08:57
Delivered 10/03/2016 09:02
BC: leroivanniekerk@gmail.com

lesego.molotwane@gmail.com Transferred
Transferred 10/03/2016 08:57
Delivered 10/03/2016 09:02
BC: lesego.molotwane@gmail.com

lfourie@nwpg.gov.za Transferred
Transferred 10/03/2016 08:57
BC: lfourie@nwpg.gov.za

lmotlhanke@nwpg.gov.za Transferred
Transferred 10/03/2016 08:57
BC: lmotlhanke@nwpg.gov.za

lobakengc@dwa.gov.za Transferred
Transferred 10/03/2016 08:57
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makoam@nra.co.za Transferred
Transferred 10/03/2016 08:57
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BC: makoam@nra.co.za

mashuduma@daff.gov.za Transferred
Transferred 10/03/2016 08:57
Delivered 10/03/2016 09:38
BC: mashuduma@daff.gov.za

mbila@nwpg.gov.za Transferred
Transferred 10/03/2016 08:57
BC: mbila@nwpg.gov.za

mmolefane@thedti.gov.za Transferred
Transferred 10/03/2016 08:57
Delivered 10/03/2016 09:24
BC: mmolefane@thedti.gov.za

MohapiN@dwa.gov.za Transferred
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Delivered 10/03/2016 09:02
BC: MohapiN@dwa.gov.za

mosadim@nwpg.gov.za Transferred
Transferred 10/03/2016 08:57
BC: mosadim@nwpg.gov.za

mrabothata@environment.gov.za Transferred
Transferred 10/03/2016 08:57
Delivered 10/03/2016 09:02
BC: mrabothata@environment.gov.za

mtumane@nwpg.gov.za Transferred

Transferred	10/03/2016 08:57

BC: mtumane@nwpg.gov.za

MuthraparsadN@dwa.gov.za Transferred

Transferred	10/03/2016 08:57
Delivered	10/03/2016 09:02

BC: MuthraparsadN@dwa.gov.za

ntnango@nwpg.gov.za Undeliverable

Transferred	10/03/2016 08:57
Undeliverable	10/03/2016 09:03

BC: ntnango@nwpg.gov.za

okgathea@nwpg.gov.za Transferred

Transferred	10/03/2016 08:57

BC: okgathea@nwpg.gov.za

philli_l1955@yahoo.com Transferred

Transferred	10/03/2016 08:57
Delivered	10/03/2016 09:01

BC: philli_l1955@yahoo.com

pieter.swart@dmr.gov.za Transferred

Transferred	10/03/2016 08:57
Delivered	10/03/2016 09:02

BC: pieter.swart@dmr.gov.za

pkhrisjan@nwpg.gov.za Undeliverable

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Undeliverable	10/03/2016 09:03

BC: pkhrisjan@nwpg.gov.za

pmokaila@nwpg.gov.za Transferred

Transferred	10/03/2016 08:57

BC: pmokaila@nwpg.gov.za

rmathebula@nwpg.gov.za Transferred

Transferred	10/03/2016 08:57

BC: rmathebula@nwpg.gov.za

Sfoya@geoscience.org.za Transferred

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Delivered	10/03/2016 09:01

BC: Sfoya@geoscience.org.za

SHlela@environment.gov.za Transferred

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Delivered	10/03/2016 09:02

BC: SHlela@environment.gov.za

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Delivered	10/03/2016 09:02

BC: snnete@gmail.com

stephanie@ewt.org.za Transferred

Transferred	10/03/2016 08:57

BC: stephanie@ewt.org.za

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Delivered	10/03/2016 09:02	
BC: tnemarude@environment.gov.za		
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Transferred	10/03/2016 08:57	
Delivered	10/03/2016 09:02	
BC: tshilidzi.phalala@dmr.gov.za		

Postal List for mail sent 11/03/16: Project Announcement documents (BID, Letter dated 09 April 2016, and Registration/Comment Form)

Department of Environmental Affairs- National Mmatlala Rabothata Private Bag X447 Pretoria 0002	Department of Rural Development and Land Reform Bonginkosi Zulu Private Bag X833 Pretoria 0001	National Department of Water and Sanitation Ndileka Mohapi Private Bag X313 Pretoria 0001
Department of Agriculture, Forestry and Fisheries Mashudu Marubini Private Bag X138 Pretoria 0001	National Department of Mineral Resources Kgauta Mokoena Private Bag X59 Arcadia 0007	National Department Mineral Resources Khayalethu Matrose Private Bag X59, Arcadia 0007
Department Mineral Resources North West Pieter Swart Private Bag A 1 KLERKSDORP 2570	Department Mineral Resources North West I Wesi Private Bag A 1 KLERKSDORP 2570	Department Mineral Resources North West Aaron Kharivhe Private Bag A 1 KLERKSDORP 2570
Ditsobotla Local Municipality Le.Roi van Niekerk PO Box 7 Lichtenburg 2740	Ditsobotla Local Municipality Municipal Manager PO Box 7 Lichtenburg 2740	Ditsobotla Local Municipality Municipal Manager's PA PO Box 7 Lichtenburg 2740
Ditsobotla Local Municipality Nono Kekesi PO Box 7 Lichtenburg 2740	Ward Councillor: Nono Kgiba PO Box 2146 Lichtenburg 2740	National Department of Water & Sanitation Namisha Muthraparsad Private Bag X313 Pretoria 0001

Maoto Molefane National Department of Trade & Industry Private Bag X84 Pretoria 0001	South African National Parks (SANParks) Dr. Howard Hendriks PO Box 787 Pretoria 0001	Mrs L.C Phillips 17 Skilpad Street Meyerton Park Meyerton 1961
Council for Geoscience Dr Stewart Foya Private Bag X112 Pretoria 0001	South African Heritage Resources Agency (SAHRA) Marie South PO Box 4637 Cape Town 8000	AgriLand Anneliza Collett Private Bag X120 Pretoria 0001
Grasslands Society of South Africa Feyni Du Toit P.O. Box 41 Hilton 3245	Department of Mineral Resources North West Tshilidzi Phalala Private Bag A1 Klerksdorp 2570	Department of Mineral Resources North West Phumudzo Nethwadzi Private Bag A1 Klerksdorp 2570
Department of Mineral Resources North West Thando Malinga Private Bag A1 Klerksdorp 2570	Department of Agriculture and Rural Development North West Dr P. Mokaila Private Bag X2039 Mmabatho 2736	Department of Agriculture and Rural Development North West Kgomotso Mafole Private Bag X2039 Mmabatho 2736
Department of Water and Sanitation North West Mr C. Lobakeng Private Bag X5 Mmabatho 2735	Department of Water and Sanitation North West Mr L. Bogopa Private Bag X5 Mmabatho 2735	Department of Economic Development, Environment & Tourism Nedick Bila Private Bag X15 Mmabatho 2735
Department of Economic Development, Environment & Tourism Steven Mukhola Private Bag X15 Mmabatho 2735	Department of Economic Development, Environment & Tourism Tharina Boshoff Private Bag X15 Mmabatho 2735	Mrs L.M Mashaba & Welverdiend Community PO Box 2146 Lichtenburg 2740

Appendix C3: Proof of newspaper advertisements

Newspaper advertisement in English published in Mahikeng Mail on 11 March 2016

11 MARCH 2016 MAHIKENG MAIL PAGE 7

Agriculture , Culture and Tourisms to take the center stage in the 2016-2017 financial year.

ACT to continue to take center stage –Provincial Budget Vote

Mahikeng Mail-Mahikeng: The North West Government to continue to pump money in to projects supporting the three pillars of the provincial economy namely; ACT - Agriculture, Culture and Tourism.

In terms of Culture some of the key functions and events supporting the five provincial concretes will include; Promotion and implementation of Mahika Mahikeng Music and Cultural festival, establishment of the North West Arts Agency; Re-establishment of the North West Cultural Ensemble, establishing a Publishing House for the creative writers, promotion of the Motsvako and Setswana Cultural dance brands; Establishing recording studios in all districts as part of the Rebranding, Repositioning and Renewal of Bokone Bophirima Province; Commissioning of statues for Provincial icons. The budget to the amount of R7 million has been set aside for the success of the Programme.

On Agriculture an amount of R290 million has been provided for AGRI-Parks in the 2016/17 financial year to address the issue of food security and R40 million for Tsung Skill. Total cost of the livestock development programme was estimated at R100 million and approximately 350 jobs are envisaged to be created. The province was also in support to improve food Security through the Fetsa Tlala Programme by construction of the Animal feed manufacturing plant in Taung, Establishing a Feedlot in Mahikeng, Meat processing plant including abattoir and packaging facilities in Mahikeng, Rehabilitation of Springbokpan, Vryhof and Kraaipan grain silos will be looked into.

On Tourism the department will be working with the NWDC for the implementation of other hostel schools in Dr Kenneth Kaunda and Bojanala District by leveraging funding from private sector. The allocation makes provision for the implementation of the Completion of renovations and improvements of infrastructure to the Taung Hostel School and Convention Center (allocated R28 million); Tourism Information and Development Centre in Phele village (allocated R4 million); Tourism Information and Development Centre in Tshing (allocated R4 million); Tourism Information and Development Centre in Marikana (Cultural Precinct), allocated R6 million.

Through North West Development Corporation the introduction of Corporate Finance activities and establish amongst others, a Growth fund as well as identify existing companies for Equity Investments and the co-funding of Foreign Direct Investment projects. This was to position the Province as a preferred trade and investment destination. In order to enhance communication and improve government efficiency throughout the province, the NWDC will facilitate the rollout of broadband infrastructure estimated in excess of R 1.145 billion for the layout of 1178km of fibre cable. Amongst other activities to this end, an amount of R5 million was allocated for the Agricultural Growth and Investment Show; R4 million for the Arts, Culture Growth and Investment Show; R2 million for Tourism Growth and Investment Lekgotla; R5 million for Health and Social Development Show. FEED will also host the Mining Growth and Development Lekgotla as a flagship event to attract investment to the province. An amount of R1.5 million in 2016/17 was allocated. The Obesity Awareness campaign targeted for politicians, public servants and the public in general was allocated R2.5 million and for the Women and Children Abuse Awareness Campaign an amount of R7 million was set aside. An amount of R25 million was also set aside for the Drought Mitigation & Relief Campaign.

Contents of the Newspaper advertisement in English published in the Mahikeng Mail on 11/03/16

Notice of Basic Assessment: Kwa-Nozici Minerals (Pty) Ltd on Farm 361 JP, Welverdiend, North West.

CSIR Reference No: CSIR/CAS/EMS/MEMO/2015/0001/A

Notice is given of a Basic Assessment (BA) process being undertaken on behalf of Kwa-Nozici Minerals (Pty) Ltd (the Project Applicant) for the proposed establishment of a small-scale 5 hectares mining project for Alluvial Diamonds and Manganese, on Portion 1 and 35 of Farm 361 JP, near Welverdiend village, North West.

In terms of the NEMA EIA Regulations published in Government Notice Regulation (GNR) 983 and 985 on 4 December 2014 Government Gazette 38282, a BA process is required as the project triggers the following listed activities: *GNR 983 Activities 21 & 27* and *GNR 985 Activity 12(a) ii*.

The Council for Scientific and Industrial Research (CSIR) is the Environmental Assessment Practitioner (EAP) who will be managing the process.

You are invited to register as an Interested and/or Affected Party (I&AP) and/or to provide any written comments on the BA process. To obtain further information on the project and/or to register as an I&AP, please provide your full name, full postal address, phone numbers, email address and state your area of interest and/or concern to: **Ms. Babalwa Mqokeli, CSIR, PO Box 320, Stellenbosch 7599, Phone: (021) 888 2432, Fax: (021) 888 2693 or Email: bmqokeli@csir.co.za**. Please contact the indicated person within 30 days of this notification.

CSIR

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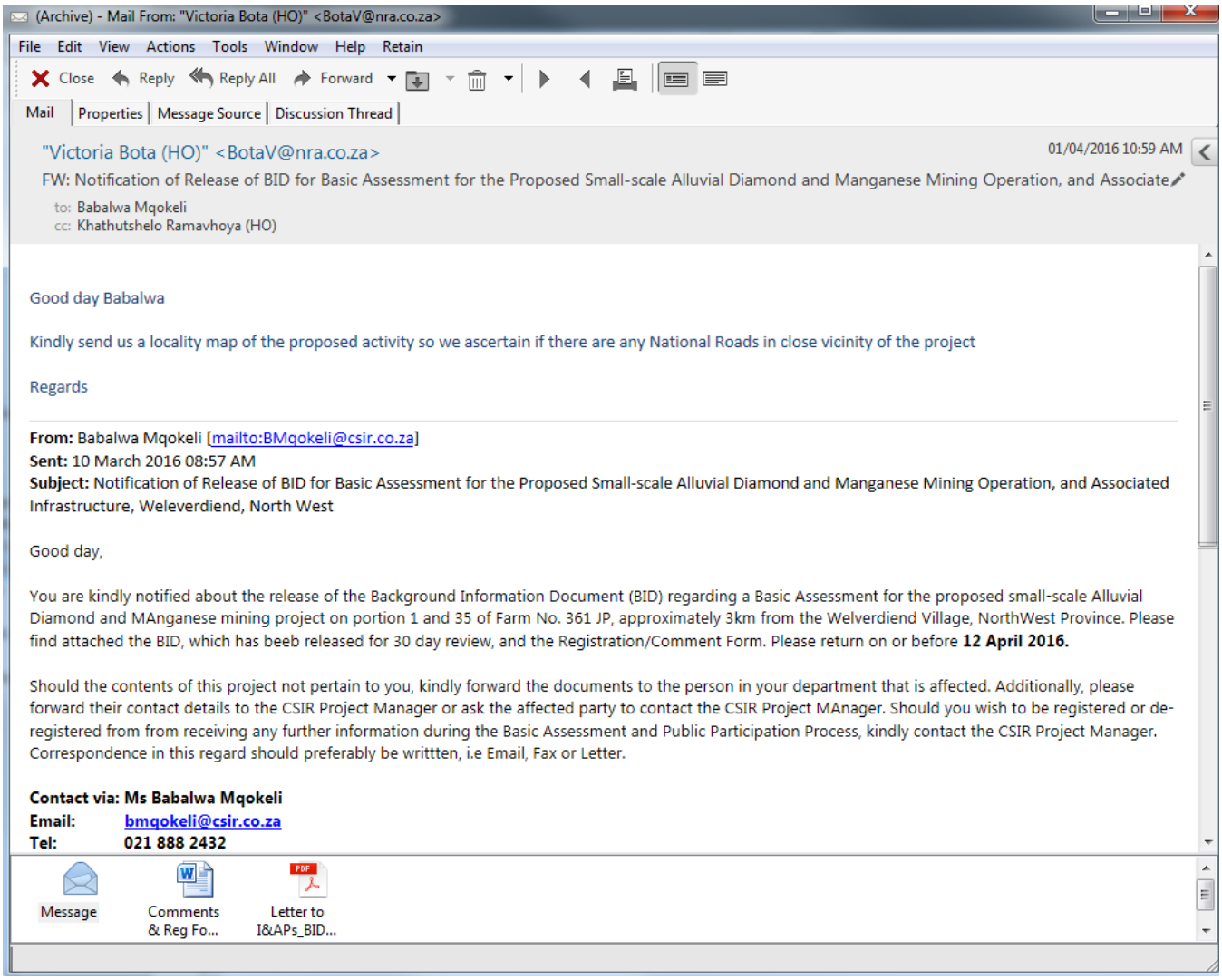
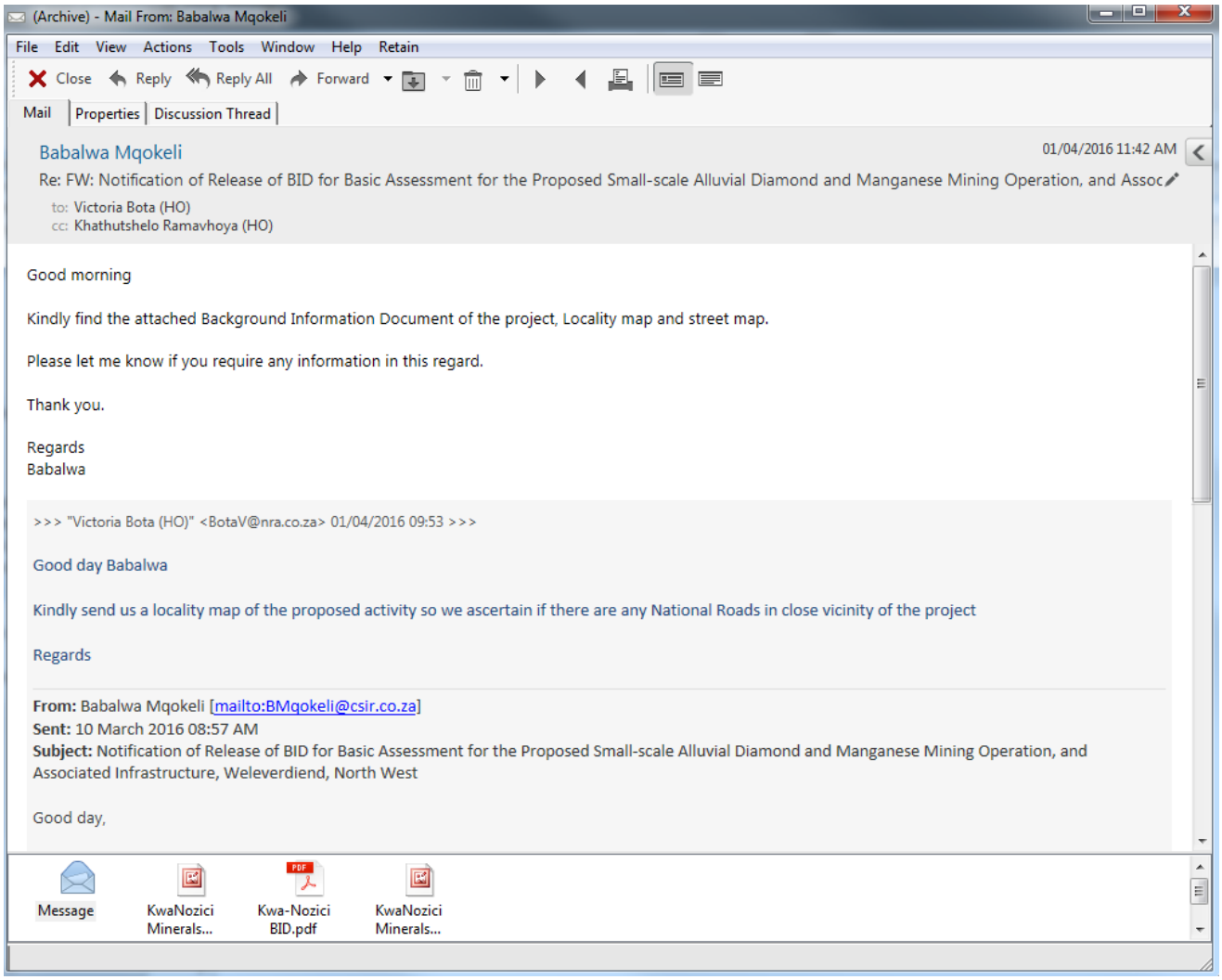
Appendix C4: Communications to and from interested and affected parties

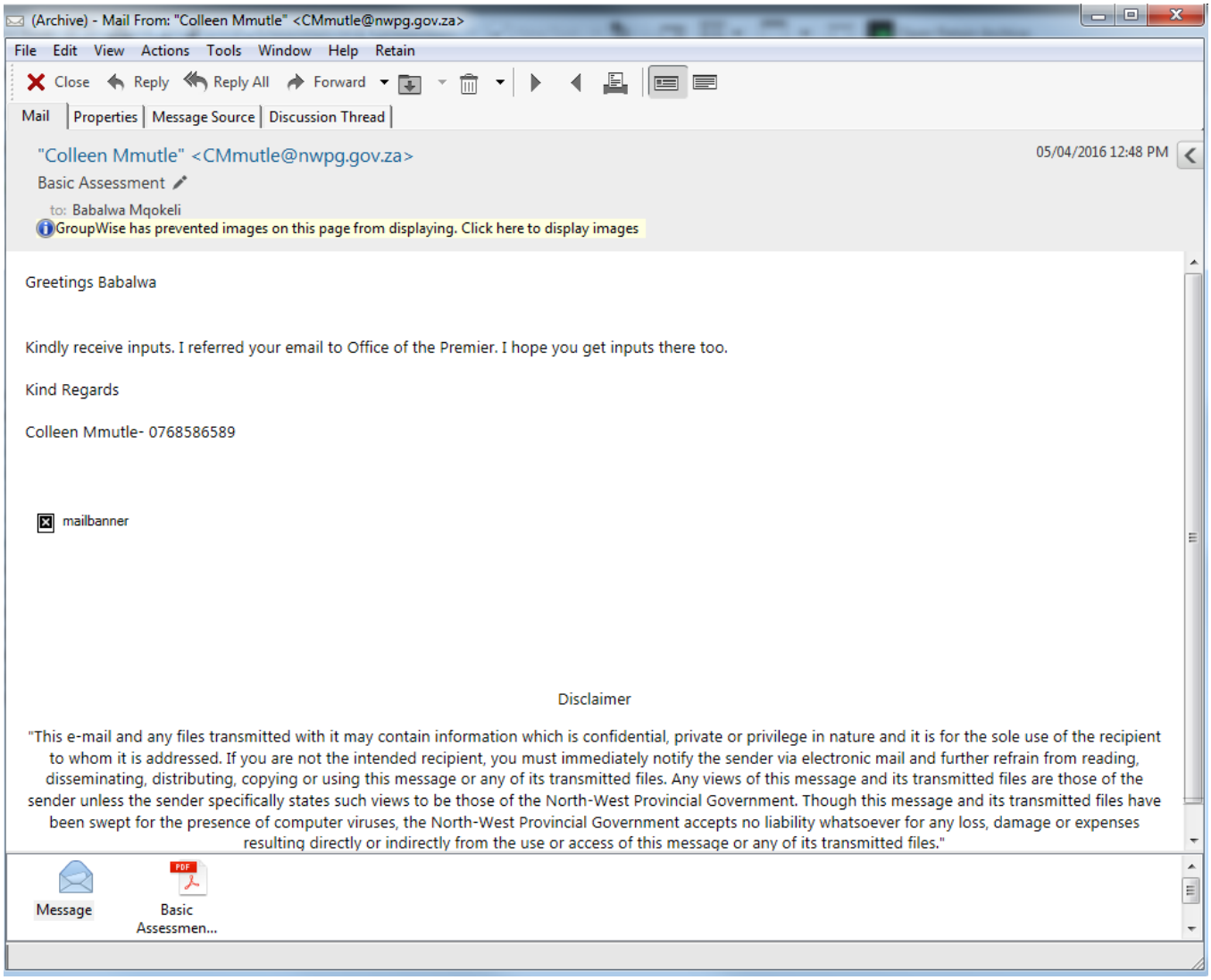
(In response to Project Announcement documents)

1.




(Archive) - Mail From: Babalwa Mqokeli
File Edit View Actions Tools Window Help Retain
Close Reply Reply All Forward
Mail Properties Discussion Thread
Babalwa Mqokeli
01/04/2016 11:42 AM
Re: FW: Notification of Release of BID for Basic Assessment for the Proposed Small-scale Alluvial Diamond and Manganese Mining Operation, and Assoc
to: Victoria Bota (HO)
cc: Khathutshelo Ramavhoya (HO)
Good morning
Kindly find the attached Background Information Document of the project, Locality map and street map.
Please let me know if you require any information in this regard.
Thank you.
Regards
Babalwa
>>> "Victoria Bota (HO)" <BotaV@nra.co.za> 01/04/2016 09:53 >>>
Good day Babalwa
Kindly send us a locality map of the proposed activity so we ascertain if there are any National Roads in close vicinity of the project
Regards
From: Babalwa Mqokeli [mailto:BMqokeli@csir.co.za]
Sent: 10 March 2016 08:57 AM
Subject: Notification of Release of BID for Basic Assessment for the Proposed Small-scale Alluvial Diamond and Manganese Mining Operation, and Associated Infrastructure, Weleverdiend, North West
Good day,
Message
KwaNozici Minerals...
Kwa-Nozici BID.pdf
KwaNozici Minerals...

2.


(Archive) - Mail From: "Colleen Mmutle" <CMmutle@nwpg.gov.za>
File Edit View Actions Tools Window Help Retain
Close Reply Reply All Forward
Mail Properties Message Source Discussion Thread
"Colleen Mmutle" <CMmutle@nwpg.gov.za>
05/04/2016 12:48 PM
Basic Assessment
to: Babalwa Mqokeli
GroupWise has prevented images on this page from displaying. Click here to display images
Greetings Babalwa
Kindly receive inputs. I referred your email to Office of the Premier. I hope you get inputs there too.
Kind Regards
Colleen Mmutle- 0768586589
mailbanner
Disclaimer
"This e-mail and any files transmitted with it may contain information which is confidential, private or privilege in nature and it is for the sole use of the recipient to whom it is addressed. If you are not the intended recipient, you must immediately notify the sender via electronic mail and further refrain from reading, disseminating, distributing, copying or using this message or any of its transmitted files. Any views of this message and its transmitted files are those of the sender unless the sender specifically states such views to be those of the North-West Provincial Government. Though this message and its transmitted files have been swept for the presence of computer viruses, the North-West Provincial Government accepts no liability whatsoever for any loss, damage or expenses resulting directly or indirectly from the use or access of this message or any of its transmitted files."
Message
Basic Assessmen...

Basic Assessment for the proposed Kwa-Nozici Minerals (Pty) Ltd Alluvial Diamond & Manganese Mining Project on Farm 361 JP near Welverdiend, North West Province

November 2015
CSIR Reference Number: CSIR/CAS/EMS/MEMO/2015/0001/A

COMMENT AND REGISTRATION FORM

Name: Colleen Mmutle	
ID no: 6508060899081	**Telephone:** 018 3883598
Organisation: Department of Local Government and Human Settlements – North West Province	**Fax:**
Position: Acting Director: MDP	**Email:** cmmutle@nwpg.gov.za
Physical address: 1st Floor Ga-Rona Building Corner University Drive and Provident Street, Mmabatho	**Postal address:** Private Bag x2099, Mmabatho 2735

Please indicate if you would like to register as an Interested and Affected Party (I&AP). Registration is required in order to receive further correspondence during the Basic Assessment Process. Please tick the appropriate box.	
YES	X
NO	

Please indicate if you have any interest (business, financial, personal or other) in the application for Environmental Authorisation:

None

Please describe any issues or concerns you may have regarding the proposed project, which you think should be considered during the Basic Assessment Process.

The project needs to consider and be guided by the Spatial Development Framework, Integrated Development Plan priorities of the area. The sector plans (Water, Electricity, Sanitation, Human Settlements)

Priority to inclusive and integrated rural economy

Empowerment of local community – individuals and local business in terms of job creation and skills development

Partnerships and linkages of the project to be aligned to government priorities.

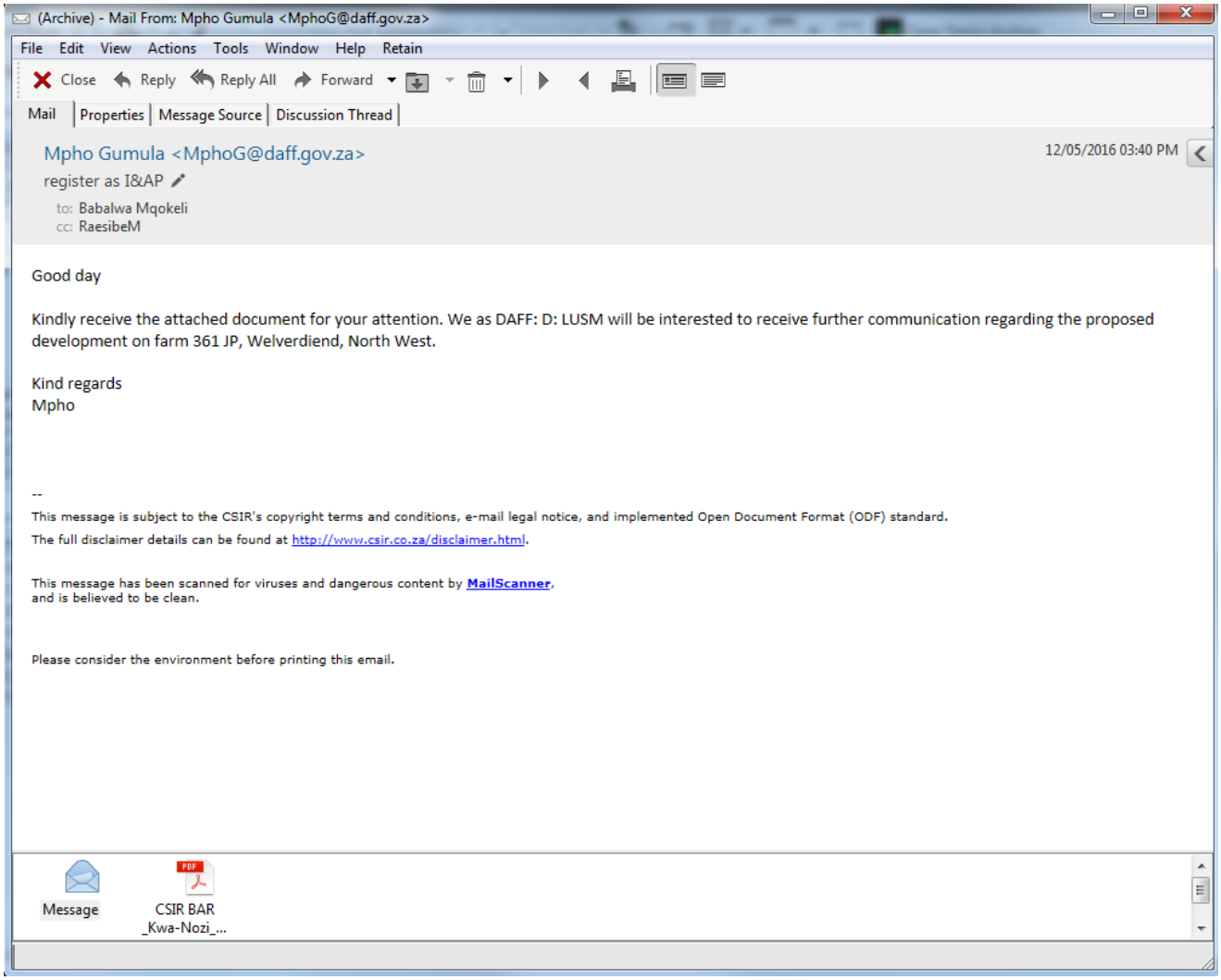
Please provide details of any other individuals or organisations that should be registered as I&APs:

Traditional Council and the Local Municipality

Please complete this Comment and Registration Form and submit it to:

Ms. BabalwaMqokeli
P O Box 320,
Stellenbosch, 7599
Tel: 021 888 2432
Fax: 021 888 2693
E-mail: bmqokeli@csir.co.za

3.


(Archive) - Mail From: Mpho Gumula <MphoG@daff.gov.za>
File Edit View Actions Tools Window Help Retain
Close Reply Reply All Forward
Mail Properties Message Source Discussion Thread
Mpho Gumula <MphoG@daff.gov.za>
12/05/2016 03:40 PM
register as I&AP
to: Babalwa Mqokeli
cc: RaesibeM
Good day
Kindly receive the attached document for your attention. We as DAFF: D: LUSM will be interested to receive further communication regarding the proposed development on farm 361 JP, Welverdiend, North West.
Kind regards
Mpho
--
This message is subject to the CSIR's copyright terms and conditions, e-mail legal notice, and implemented Open Document Format (ODF) standard.
The full disclaimer details can be found at http://www.csir.co.za/disclaimer.html.
This message has been scanned for viruses and dangerous content by MailScanner,
and is believed to be clean.
Please consider the environment before printing this email.
Message
CSIR BAR _Kwa-Nozi_...

Basic Assessment for the proposed Kwa-Nozici Minerals (Pty) Ltd Alluvial Diamond & Manganese Mining Project on Farm 361 JP near Welverdiend, North West Province

November 2015
CSIR Reference Number: CSIR/CAS/EMS/MEMO/2015/0001/A

COMMENT AND REGISTRATION FORM

Name: Mpho Gumuiq	
ID no: 7802030448 8080	**Telephone:** 018 285 0310
Organisation: DAFF	**Fax:** 018 297 4642
Position: Control Resource Auditor	**Email:** MphoG@daff.gov.za
Physical address: 124 Louis Le Grange Building Corner Peter Mokaba & Wolmaran Potchefstroom	**Postal address:** P.O. Box 2557 Potchefstroom 2520

Please indicate if you would like to register as an Interested and Affected Party (I&AP). Registration is required in order to receive further correspondence during the Basic Assessment Process. Please tick the appropriate box.	
YES	X
NO	

Please indicate if you have any interest (business, financial, personal or other) in the application for Environmental Authorisation:

N/A

Please describe any issues or concerns you may have regarding the proposed project, which you think should be considered during the Basic Assessment Process.

DAFF:D:LUSM understand mining is basically short term activity compared to Agriculture. It is for this reason that through Conservation of Agricultural Resources Act 43 of 1983 we seek to encourage, promote and enforce the sound utilisation and management of natural agricultural resources namely Water sources, Soil and vegetation.

Please provide details of any other individuals or organisations that should be registered as I&APs:

Agri-Potch contact Piet Theron
P.theron49@telkomsa.net

Please complete this Comment and Registration Form and submit it to:

Ms. Babalwa Mqokeli
P O Box 320,
Stellenbosch, 7599
Tel: 021 888 2432
Fax: 021 888 2693
E-mail: bmqokeli@csir.co.za

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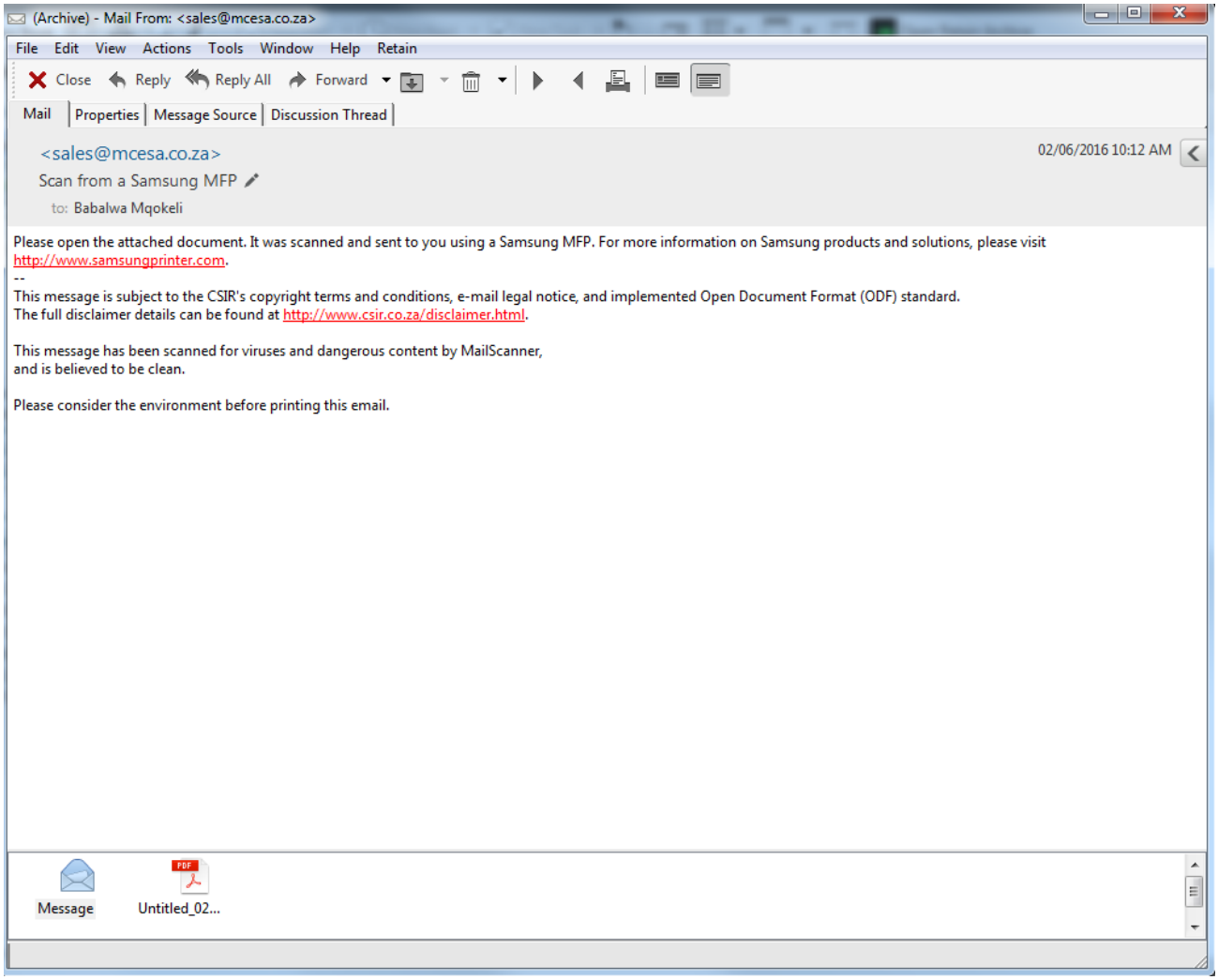
4.


(Archive) - Mail From: <sales@mcesa.co.za>
File Edit View Actions Tools Window Help Retain
Close Reply Reply All Forward
Mail Properties Message Source Discussion Thread
<sales@mcesa.co.za>
02/06/2016 10:12 AM
Scan from a Samsung MFP
to: Babalwa Mqokeli
Please open the attached document. It was scanned and sent to you using a Samsung MFP. For more information on Samsung products and solutions, please visit http://www.samsungprinter.com.
--
This message is subject to the CSIR's copyright terms and conditions, e-mail legal notice, and implemented Open Document Format (ODF) standard.
The full disclaimer details can be found at http://www.csir.co.za/disclaimer.html.
This message has been scanned for viruses and dangerous content by MailScanner,
and is believed to be clean.
Please consider the environment before printing this email.
Message
Untitled_02...

Basic Assessment for the proposed Kwa-Nozici Minerals (Pty) Ltd Alluvial Diamond & Manganese Mining Project on Farm 361 JP near Welverdiend, North West Province

November 2015
CSIR Reference Number: CSIR/CAS/EMS/MEMO/2015/0001/A

COMMENT AND REGISTRATION FORM

Name: BETTY Dimakatso Kgiba	
ID no: 800528 0410086	**Telephone:** 0727113823/0725907919
Organisation: Diamond and Manganese Mining	**Fax:**
Position: Ward committee	**Email:** Sceles@mcesa.co.za
Physical address: P.obox 2146 house Number 188 Welverdiend Lichtenburg 2740	**Postal address:** P.Obox 2146 Lichtenburg 2740

Please indicate if you would like to register as an Interested and Affected Party (I&AP). Registration is required in order to receive further correspondence during the Basic Assessment Process. Please tick the appropriate box.

YES X	
NO	

Please indicate if you have any interest (business, financial, personal or other) in the application for Environmental Authorisation:

Please describe any issues or concerns you may have regarding the proposed project, which you think should be considered during the Basic Assessment Process.

My issues is we dont have roads, we dont have creach, schools Even shops waters in Our yard - Lack of Jobs, Our youth they dont have JOBS - We are Fare from Everything; SO Please it can help us so much expecially for raising fund for helping us with schools. So that our Children can learn

Please provide details of any other individuals or organisations that should be registered as I&APs:

Diamond and Manganise
Oil, Parraffin

Please complete this Comment and Registration Form and submit it to:

Ms. Babalwa Mqokeli
P O Box 320,
Stellenbosch, 7599
Tel: 021 888 2432
Fax: 021 888 2693
E-mail: bmqokeli@csir.co.za

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Appendix C5: Comments and Responses Report

Interested and Affected Parties		Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this Report where the issues and/or responses were incorporated
Name	**Organisation**				
Victoria Bota	South African National Roads Agency Limited (SANRAL)	01/04/2016	- Kindly send us a locality map of the proposed activity so we ascertain if there are any National Roads in close vicinity of the project.	- Kindly find the attached Background Information Document of the project, Locality map and street map. Please let me know if you require any information in this regard.	The locality map is included as Map 1 in **Appendix B** of the Draft BAR
Collen Mmutle	Department of Local Government & Human Settlements – North west Province	05/04/2016	- The project needs to consider and be guided by the Spatial Development Framework, Integrated Development Plan priorities of the area. The sector plans (Water, Electricity, Sanitation, Human Settlements). - Priority to inclusive and integrated rural economy - Empowerment of local community – individuals and local business in terms of job creation and skills development - Partnerships and linkages of the project to be aligned to government priorities	Thank you for the comments provided. The proposed project is in line with the Ditsobotla Municipality's IDP as it is one of the economic sectors identified as important in this municipality. It also addresses the municipality's Local Economic Development Strategy of 2016.	Kindly refer to Section **f)** and **g)**

Interested and Affected Parties		Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this Report where the issues and/or responses were incorporated
Name	**Organisation**				
Mpho Gumula	Department of Agriculture, Forestry & Fisheries –Control Resource Auditor (Potchefstroom)	12/05/2016	- DAFF: D: LUSM understand that mining is basically a short term activity compared to agriculture. It is for this reason that through Conservation of Agricultural Resources Act 43 of 1983 we seek to encourage, promote and enforce the sound utilisation and management of natural agricultural resources namely water sources, soil and vegetation.	Thank you for the comment. Specialist studies, including an assessment of the Agricultural soil potential, has been undertaken with regards to the proposed project, reports produced thereof provide details of the impacts as well as mitigation measures to reduce negative impacts on the environment, and to inform decision making. According to the Agricultural Geo-Referenced Information System, soils of the general area are loamy and appear relatively shallow with sections of prominent surface rock (dolomite). Land capability of the area is described as non-arable, with moderate potential grazing land. The area is thus not very suitable for cultivation, with grazing capacity estimated at approximately 14 – 17 hectares per large livestock unit.	Kindly refer to Appendix G Refer to Section **f)** and **g)**

				It should be noted that mining is in line with the municipality's IDP and that mining operations are taking place in the surrounding area.	
Betty D. Kaiba	Diamond and Manganese Mining Ward Committee	02/06/2016	- My issues is we don't have roads, we don't have creach (crèches), schools even shops, water in our yard, lack of jobs, our youth they don't have jobs, we are far from everything. So please it can help us so much especially for raising funds for helping us with schools so that our children can learn.	Thank you for the comment. The proposed development aims to address socio-economic issues in the village such as unemployment challenges. Local jobs will be created which will aim to alleviate some of the socio-economic challenges mentioned.	Kindly see Section **g)**

Appendix C6: Comments from I&APs on Basic Assessment (BA) Report – N/A at this stage of the BA process.

Appendix C7: Comments from I&APs on amendments to the BA Report - N/A at this stage of the BA process.

Appendix C8: Copy of the register of I&APs

Company/organization	Name	Physical Address	Phone	Postal	Cell	Email	BID + letter 1 + comment form
NATIONAL							
Department of Environmental Affairs	Mmatlala Rabothata						email + post
Department of Environmental Affairs	Sibusisiwe Hlela						email
Department of Environmental Affairs	Takalani Nemarude						email
Department of Rural Development and Land Reform	Bonginkosi Zulu						email
Department of Agriculture, Forestry and Fisheries	Mashudu Marubini						email + post
National Department of Mineral Resources	Kgauta Mokoena						email + post
National Department of Water Affairs	Ms Ndileka K mohapi						email + post
National Department of Water Affairs	Namisha Muthraparsad						email + post
National Department Mineral Resources	Khayalethu Matrose						email + post
National Department of Trade and Industry	Maoto Molefane						email
PROVINCIAL & MUNICIPALITY							
Local Government & Traditional Council	Lucky Fourie						email

Department Mineral Resources North West	Pieter Swart						email + post
Department Mineral Resources North West	I Wesi						email + post
Department Mineral Resources North West	Aaron Kharivhe						email + post
Department Mineral Resources North West Assistant Director: Mine Environmental Management Section	Tshilidzi Phalala						email + post
Department Mineral Resources North West	Phumudzo Nethwadzi						email + post
Department Mineral Resources North West - Small Scale Mining	Thando Malinga						email + post
Department of Agriculture and Rural Development (Director Agricultural Support Services)	Dr. P Mokaila						email+post
Department of Agriculture and Rural Development (Director Agricultural Support Services Secretary)	Kgomotso Mafole						email+post
North West Department of Water and Sanitation (Chief Director)	Mr C Lobakeng						email + post
North West Department of Water and Sanitation (Director: Water Sector Support)	Mr L Bogopa						email + post
South African Local Government Association: North West (SALGA: NW)	Tikologo Makhoana						email
DEDECT	Nedick Bila						email + post
DEDECT Environmental Officer	Steven Mukhola						email + post
DEDECT	Tharina Boshoff						email
North West Development Corporation	Lovemore T Makunike						email

Department of Local Government and Human Settlement	Nonkululeko Myeza						email
Department of Local Government and Human Settlement	Colleen Mmutle						email
North West Department of Finance, Economy & Enterprise Development (FEED)	Mercy Tumane						email
North West Department of Finance, Economy & Enterprise Development (FEED)	Opgopleng Kgathea						email
North West Department of Finance, Economy & Enterprise Development (FEED)	Lebogang Motlhanke						email
NW READ	Rhuleni Mathebula						email
NW READ	Malefyane Mosadi						email
NW READ	Portia Khrisjan						email
NW READ	Adriaan Van Straaten						email
Ditsobotla Local Municipality	Le.Roi van Niekerk						email + post
Ditsobotla Local Municipality	Municipal Manager						email + post
Ditsobotla Local Municipality	Municipal Manager PA						email + post
Ditsobotla Local Municipality(Health and Environmental Services)	Nono Kekesi						post
Ngaka Modiri Molema District Municipality	Goitsimosimo Tau						email
Ngaka Modiri Molema District Municipality	Thandi Gontsana						Email
Ward Councillor: Welverdiend Village (ward 14)	Nono Kgiba						post
LANDOWNERS & NEIGHBOURS							
Community Leader (Landowner)	Mrs L M Mashaba						post

OTHER							
North West Parks & Tourism Board	Andrew Mvundle						email
NW Parks Board Bird Sanctuary	Sampie van der Merwe						email
South African National Parks (SANParks)	Dr. Howard Hendriks						email + post
Council for Geoscience	Dr Stewart Foya						email + post
South African Heritage Resources Agency (SAHRA)	Marie South						post
South African National Roads Agency	Ms Mpati Makoa						email
Endangered Wildlife Trust (EWT)	Stephanie Aken						email
AgriLand	Anneliza Collett						post
Client	Mrs L.C Phillips						email + post

APPENDIX D

Specialist Reports

Contents

FAUNA AND FLORA

Basic Assessment for the proposed development of Kwa-Nozici Minerals Mining, North West Province

Report prepared for:	Report prepared by:
CSIR	Digby Wells Environmental
P O Box 320 Stellenbosch 7599 South Africa	Turnberry Office Park 48 Grosvenor Road Bryanston 2191 South Africa

June 2016

This document has been prepared by Digby Wells Environmental.

Report Type:	**Fauna and Flora Basic Assessment**
Project Name:	**Basic Assessment for the proposed development of Kwa-Nozici Minerals Mining, North West Province**
Project Code:	**CSI3916**

Name	Responsibility	Signature	Date
Rudi Greffrath (Pr.Sci.Nat)	Report compilation		2016/06/20
Phil Patton (Pr.Sci.Nat)	Reviewer		2016/06/24

SPECIALIST EXPERTISE

Rudi Greffrath is a member of Digby Wells' Biophysical Department's Ecology Unit and has a National Diploma and B-tech in Nature Conservation from the Nelson Mandela Metropolitan University's (NMMU) George Campus. He is also SACNASP registered. Rudi has ten years' experience in the environmental consulting field specifically in terrestrial ecology within the Highveld grasslands and Savanna regions of Southern and central Africa and the forest regions of central and West Africa. He specialises in fauna and flora surveys, biodiversity surveys, environmental management plans, environmental monitoring and rehabilitation for projects in accordance with the International Finance Corporation (IFC) and World Bank. Rudi has gained experience working throughout Africa specifically the Democratic Republic of Congo, Sierra Leone, Ghana, Mali, Botswana, Namibia and Ivory Coast.

Staff CV is attached in Appendix A.

SPECIALIST DECLARATIONS

Rudi Greffrath

I, **Rudi Greffrath**, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that:

- I act as the independent specialist in this application;
- I perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and

- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Name of Specialist: **Rudi Greffrath** (Pri. Sci. Nat. Conservation Science)

Date: 2016/06/09

EXECUTIVE SUMMARY

Kwa-Nozici Minerals (Pty) Ltd is proposing to establish a small-scale (5 hectares) mining project for Alluvial Diamonds and Manganese. The mining project will be located on Portions 1 and 35 of Farm 361 JP, near Welverdiend Village, in the North West Province. An application for an Environmental Authorisation (EA) will be made by the Council for Scientific & Industrial Research (CSIR) on behalf of Kwa-Nozici Minerals (Pty) Ltd to the North West Department of Mineral Resources, in terms of the Environmental Impact Assessment (EIA) Regulations, 2014 published in Government Notice (GN) R982 of 4 December 2014. The application will be done in terms of activities listed in GN R.983 and 985 which require a Basic Assessment to obtain EA prior to development. The aim of the ecological assessment (as part of the BA) is to identify potential impacts associated with the development and to recommend methods to avoid or reduce adverse impacts and promote positive impacts.

The proposed development is within a Critical Biodiversity Area (CBA) and will encompass approximately 5 hectares of the 26.66ha farm. Activities on site will include clearing of indigenous vegetation, excavation and processing of minerals (crushing and/or grading, washing and sorting); therefore triggers listed activities in terms of GNR 983 and 985.

The South African mining industry has its origin in small-scale mining activities, with these operations offering much needed employment opportunities and entrepreneurship, as well as contributing to the Mineral sector and local economies. The development and operation of the proposed mine is expected to be of great benefit to the local community, promoting employment opportunities and contributing greatly to the mining industry in the area. The BA Process plays an important role in promoting sustainable mining through commitment of small-scale miners to their projects and adherence to mining and environmental regulations.

Field work was conducted on the 20 of May 2016. The site visit took place during the dry season, and the effects of this year's drought conditions were evident during field work. This places a limitation on the study, especially since many plant species could not be identified. One regional vegetation unit is associated with the site, namely Carltonville Dolomite Grassland.

The small scale mining study area was predominantly covered by *Themeda triandra – Eragrostis trichophora* mixed shrubland/grassland, in addition to alien bushclumps. Areas that showed obvious signs of overgrazing, such as the presence of indicator species and exposed substrate, were dominated by shrubs. Overgrazing indicators included *Aristida congesta* and *Seriphium plumosum.*

In terms of ecological sensitivity, two flora SSC and no fauna Red Data species were recorded. Further to this, the site does not fall within any formally protected areas, Important Bird Areas or areas earmarked for future protected status according to the National Projected Areas Expansion Strategy. None of the remaining habitat was regarded as particularly significant or unique.

The proposed development will result in the loss of vegetation and habitat due to the preferred location of the proposed infrastructure. Clearing of vegetation for the construction

of infrastructure was regarded as the most significant impact (moderately negative) but this impact can be reduced to low if prescribed mitigation measures are adhered to. Alien plant invasion is expected and monitoring should take place for a period of five to seven years after construction has been completed and two to three years after decommissioning has been completed.

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LIST OF ABBREVIATIONS

Acronym	Description
EX	Extinct
EW	Extinct in the Wild
CR	Critically Endangered
EN	Endangered
VU	Vulnerable
NT	Near Threatened
LC	Least Concern
DDT	Data Deficient
CITES	Convention on International Trade in Endangered Species of Flora and Fauna
CSIR	Council for Scientific and Industrial Research
EIA	Environmental Impact Assessment
BA	Basic Assessment
DEA	Department of Environmental Affairs
IUCN	International Union for the Conservation of Nature
HR	Habitat requirements
HS	Habitat status
HL	Habitat link
NEMBA	National Environmental Biodiversity Act 2004 (Act 10 of 2004),
PRECIS	PRECIS list (National Herbarium Pretoria (PRE) Computerised Information System).
POSA	Plants of Southern Africa
SANBI	South African National Biodiversity Institute
SSC	Species of Special Concern
ToPs	Threatened or Protected Species List

1 Introduction

Digby Wells was commissioned by the Council for Scientific and Industrial Research (CSIR) to conduct specialist ecological studies required a Basic Assessment Application as part of the EIA for a small scale alluvial diamonds and manganese mining operation. The CSIR have been contracted by Kwa-Nozici Minerals (Pty) Ltd to complete the necessary environmental assessments. The project is located within 20km north of the town Lichtenburg in the North West Province.

An application for an Environmental Authorisation (EA) will be made to the North West Department of Mineral Resources, in terms of the Environmental Impact Assessment (EIA) Regulations, 2014 published in Government Notice (GN) R982 of 4 December 2014. The application will be done in terms of activities listed in GN R.983 and 985 which require a Basic Assessment to obtain EA prior to development.

This fauna and flora assessment report is for the 5 hectare footprint of the Kwa-Nozici project and associated infrastructure. The impacts of the small scale mining project on the fauna and flora and general ecology associated with the site will be assessed. Further to this, the impacts of the project development will be assessed.

2 Scope and Purpose of this Specialist Report

This specialist study serves to undertake a basic ecological assessment of the local flora and fauna communities associated with the Kwa-Nozici project, referred to as the study area, to determine the current state of these components.

To achieve this aim, the following objectives were considered:

- Determine if any flora and fauna species or assemblages will be directly impacted upon by the proposed mining project activities and its associated infrastructure. This includes the flora and fauna communities present, the state of these communities, identification of possible Red Data species according to the International Union for Conservation of Nature (IUCN), National and Provincial criteria; and
- To undertake an assessment of the impacts associated with various activities on the health of the flora and fauna species or assemblages and to recommend measures that should be included in the Environmental Management Plan (EMP) to prevent or limit impacts to flora and fauna species or assemblages.

2.1 Terms of Reference

Digby Wells Environmental (Digby Wells) were commissioned by The Council for Scientific and Industrial Research (CSIR) to complete a terrestrial biodiversity basic assessment report which will include the findings of a single site visit as detailed in the methodology section. . Potential impacts on terrestrial biodiversity were identified and the significance of these impacts assessed in order to determine suitable mitigation measures that can be included in a Biodiversity Management Plan for the development.

The agreed Terms of Reference (ToR) are summarised below and include:

- Flora and fauna list of expected species for the area;
- Potential Species of Special Concern (SSC);
- Identification and description of habitats on site;
- Identification of flora and fauna on site;
- Sensitivity assessment and
- Impacts Assessment, as well as relevant mitigation and management measures.

2.2 Assessment Details

The table below indicates the details of this report from a type, date and season point of view.

Type of specialist investigation	Flora and Fauna Assessment
Date of specialist investigation	20 May 2016
Season, relevance of season	Early dry season

3 Approach and Methodology

3.1.1 Desktop Assessment

Prior to the site visit, for vegetation, broad habitats were defined using aerial imagery for the desktop component. In addition, the following literature and databases were used in order to generate expected species lists and to ascertain the likelihood of the presence of Species of Special Concern on site:

- PRECIS (Pretoria Computerised Information System). This database provides taxonomic information for plant species occurring in southern Africa and follows the format of Germishuizen and Meyer, 2003. It is updated every two months and is supplied by SANBI. It is accessed on the Plants of Southern Africa (POSA) website;
- SIBIS: SABIF - South African Biodiversity Information Facility established by the Department of Science and Technology (DST); and
- Threatened Species Programme (TSP) listing in collaboration with the National Botanical Institute (NBI)].

Regional Biodiversity Planning documents were consulted including:

- North West Biodiversity Sector Plan 2015;
- North West Province Biodiversity Conservation Assessment, Technical Report 2009;

3.1.2 Flora

All species encountered during random transects was recorded. Species lists were compiled and the following will be reported on:

- Red Data listed plant species recorded on site (including their locations);
- Alien plant species recorded on site (including their alien categories according to NEMBA);
- Dominant plant species in each community and
- A map will be generated to show the distribution of each plant community.

3.2 Fauna

A list of all potential fauna was compiled by means of a desktop study and all potential red data species were highlighted. Field surveys were conducted concurrently with vegetation surveys and all animals observed in the area were noted. The presence of fauna (including mammals, amphibians, reptiles, avifauna, and selected invertebrates) were evaluated using tracks, dung, ecological indicators, and visual sightings. Fauna lists were generated and discussed and related back to the floristic component of the area.

The current status of the faunal environment was determined and an evaluation of the extent of site-related effects in terms of certain ecological indicators, as well as identification of specific important ecological attributes such as rare and endangered species, protected species, sensitive species and endemic species were made. The faunal environment and habitat was characterised in relation to biota and the extent of site related effects.

3.3 Sensitive areas

The position and locality, as well as species composition of sensitive areas such as the wetlands of pans, streams and rivers was conducted in order to identify and map all wetlands in the area.

Officially protected areas as described by the IUCN, was specifically investigated, the IUCN specifies six categories of protected areas they are:

I. Strict nature reserve/wilderness area: protected area managed mainly for science or wilderness protection.

II. National park: protected area managed mainly for ecosystem protection and recreation

III. Natural Monument: protected area managed mainly for conservation of specific natural features.

IV. Habitat/Species Management Area: protected area managed mainly for conservation through management intervention.

V. Protected Landscape/Seascape: protected area managed mainly for landscape/seascape protection and recreation.

VI. Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems.

3.4 Information Sources

The following literature and databases were used for this flora and fauna assessment:

- Plants of Southern Africa (POSA) database (http://posa.sanbi.org/searchspp.php);
- Free State Nature Conservation Ordinance (No. 8 of 1969);
- International Union for the Conservation of Nature (IUCN) Red List;
- Convention on International Trade in Endangered Species of Wild Fauna and Flora;
- The South African Red Data lists for mammals, birds, butterflies,
- The National Forests Act (Act No. 84 of 1998) Protected Trees, and
- The National Environmental Biodiversity Act, 2004 (Act 10 of 2004), Threatened and Protected Species.

3.5 Assumptions, Knowledge Gaps and Limitations

The following assumptions have been made for this study:

- Drought conditions and high temperatures preceded the site visit and as a result, many plant species were not in flower. Vegetation cover was sparse, which was further exacerbated by overgrazing by cattle and sheep, since little palatable plant matter remained. Whilst every effort was made to account for all species present on site, it is likely that many were not identified;
- The faunal sampling assessment was intended to document any faunal activity or evidence thereof on site. It is likely that some elusive, shy, nocturnal or migrant species may not have been recorded during the faunal survey;
- The project was assessed according to the project activities listed herein (that were made available to Digby Wells by the client). Any changes to these after the assessments were done would not be captured in this report. Should any changes be made, additional studies may be required; and
- Cumulative impacts are assessed by adding expected impacts from this proposed development to existing and proposed developments with similar impacts in a 20km radius.

3.6 Consultation Processes Undertaken

No consultation was undertaken for this project.

4 Description of the Receiving Environment

4.1 Locality

The facility will be located on Portions 1 and 35 of Farm 361 JP, near Welverdiend Village, North West (as represented in Figure 4-1).

Figure 4-1: Kwa-Nozici Project area locality

4.2 Regional Vegetation

The proposed project falls within one regional vegetation type, namely: Carletonville Dolomite Grassland; with the Highveld Salt Pans, in close proximity (Mucina and Rutherford, 2006). The project site falls within the Western Grasslands that cover the central and eastern plains of the province. Trees are mostly absent in this landscape except on ridges/koppies or azonal habitats. Grasslands fall into two distinct groups – those on dolomites, which are mostly intact, and those on sandy/loam soils, which are nearly extinct due to habitat loss. (North West Department of Rural, Environment and Agricultural Development (READ)). (2015).

4.2.1 Carletonville Dolomite Grassland

This vegetation unit mainly occurs in the North-West Province but also in Gauteng and marginally into the Free State Province. It is distributed in the region of Potchefstroom, Ventersdorp and Carletonville, extending westwards to the vicinity of Ottoshoop, but also occurring as far east as Centurion and Bapsfontein in Gauteng Province. The altitude ranges from 1360-1620 m.

This vegetation occurs on slightly undulating plains dissected by prominent rocky chert ridges. It forms a complex mosaic pattern dominated by many species. Grasses such as: *Loudetia simplex* (Common Russet Grass), *Hyparrhenia hirta* (Common Thatching Grass), *Brachiaria serrata* (Velvet Signal Grass) and *Heteropogon contortus* (Spear Grass) are prominent while shrubs such as: *Euclea undulata* (Common Guarri), *Searsia magalismontana* (Berg Taaibos), *Zanthoxylon capense* (Small Knobwood) and *Diospyros lycioides* (Bluebush) are scattered in protected places (e.g. among rocks and boulders). The geology of this vegetation unit consists of dolomites and cherts of the Malmani subgroup from the Transvaal super group.

Conservation status is currently considered vulnerable, with only a small extent conserved in statutory reserves (Sterkfontein Caves, part of the Cradle of Humankind World Heritage Site, Oog Van Malmani, Abe Bailey, Boskop Dam, Schoonspruit, Krugersdorp, Olifantsvlei, Groenkloof) and in at least six private conservation areas. Almost a quarter of the vegetation type has already been transformed by cultivation, urban sprawl or by mining activity as well as the building of the Boskop and Klerkskraal Dams. Erosion is considered to be very low (84%) and low (15%).

A total of 177 plants have been recorded for the QDS 2526CC in which the study area occurs (POSA, 2012). The project site however was found to contain less species, 38 species. The expected plant species list is represented in Appendix 2. A single Red Data listed species has been recorded in the QDS 2526CC, namely: *Brachystelma incanum* (Vulnerable). Figure 4-2 represents the regional vegetation (Mucina and Rutherford, 2006) for the site.

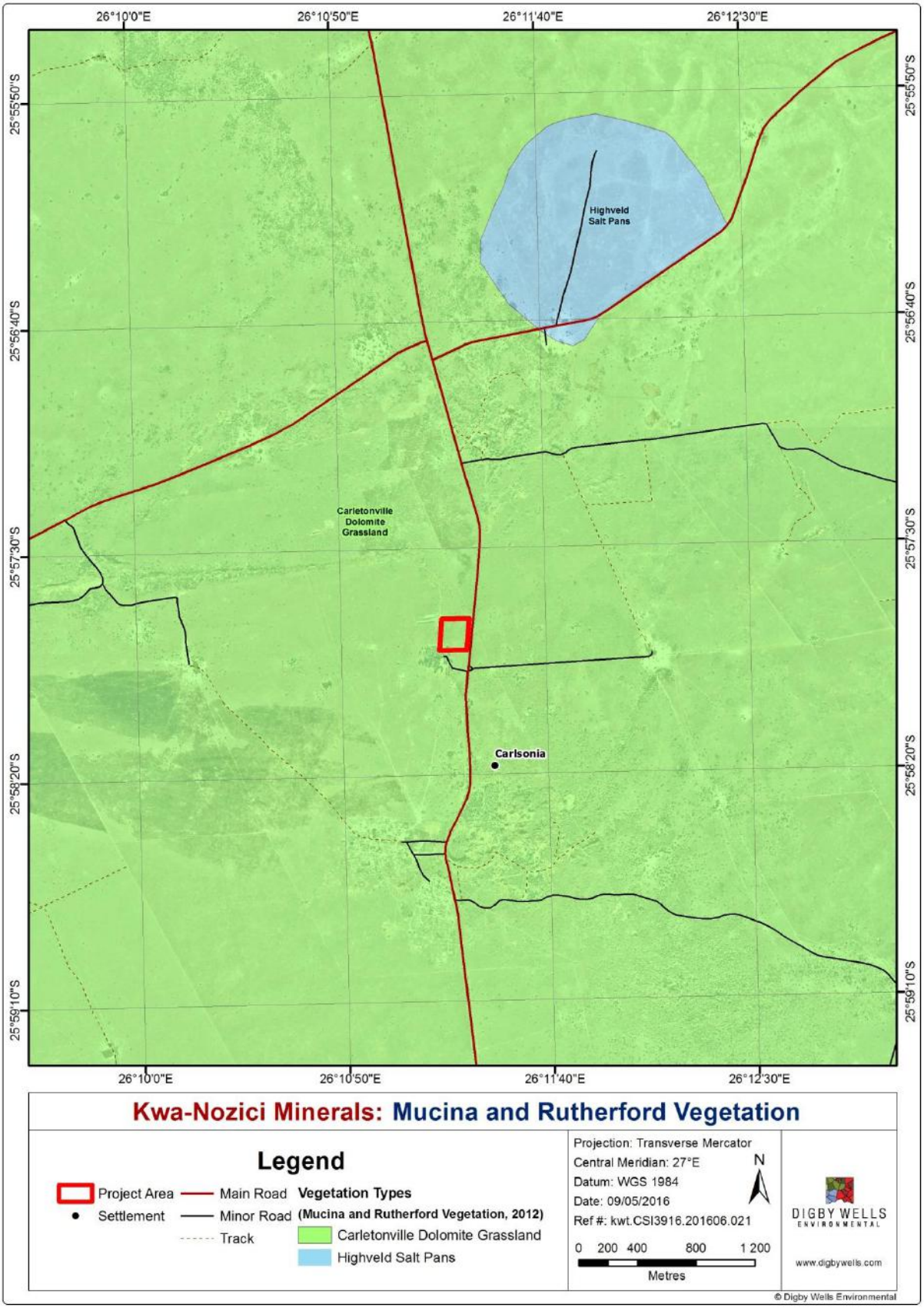


Figure 4-2: Regional Vegetation

4.3 Flora

The study site can be divided into two main areas: Transformed and Degraded land. The study area includes an alien tree bush clump. The majority of the land area is used for cattle grazing and, as such, is degraded from its natural state. Alien stands fall into the transformed category. Degraded land includes those grassland areas that are currently being used as grazing land, mainly for cattle. Domestic livestock can have high impacts on natural vegetation, resulting in decreases to species richness and diversity. Transformed areas contain few or no indigenous species, whereas degraded areas comprise mainly indigenous species with some invasive species in disturbed areas.

As degraded areas contain some indigenous elements, it is important to provide a brief description of these areas. Most degraded sites are areas that may have been cleared a little in the past, or have been heavily overgrazed, resulting in the majority of this vegetation type comprising pioneer grass species with scattered shrubs. The remaining indigenous species tend to be those that are not favoured by grazing livestock and are noted for their presence in overgrazed areas (such as *Serphium plumosum*, known as bankrupt bush). Degraded areas are thus a grassland habitat, with high numbers of plants indicating over grazing and few geophyte species. Common species include *Themeda triandra, Aristida congesta barbicolis* and *Heteropogon contortus*. It is important to note that despite the degraded nature of the site, the grassland areas form important habitat for species such as small mammals and birds forming process areas that are vital to the functioning of the ecosystem. The two main vegetation types forming the degraded areas, are open grassland and wooded grassland, which are described in Table 4-1 below as well as Figure 4-3 to Figure 4-6 respectively.

Table 4-1: Vegetation types found in the study area.

Vegetation type	Description	Dominant and Notable Species
Open Grassland	Grassland occurs throughout the study area. These tend to be quite degraded throughout the area with low species diversity and richness and many species commonly associated with overgrazing. Despite this they contain some two provincially protected species and it is suspected that more may be found.	*Hyparrhenia hirta* *Pogonarthria squarrosa* *Trachypogon spicatus* *Aristida stipitata* *Setaria sphacelata var. sphacelata* *Trichoneura grandiglumis* *Dicoma anomala*
Wooded Grassland	Wooded grassland occurs in the south eastern corer of the study site with several tree species encountered here. These areas were found to be frequented more by bird species.	*Ziziphus mucronata* *Searsia lancea* *Diospyros lycioides*

		Searsia pyroides *Acacia tortillis* *Boscia foetida subsp rehmanniana*

The majority of the study area had undergone transformation due to livestock utilisation. Livestock were observed throughout most of the site and evidence of overgrazing was recorded in grassland areas; showing a dominance of increaser species and some erosion. Despite these impacts, areas that were left intact showed a high diversity of grasses and forbs. Below in Figure 4-4 to Figure 4-6, the dominant vegetation structure is displayed.

Figure 4-3: Wooded grassland vegetation type

Figure 4-4: Open Grassland vegetation type

Figure 4-5: Alien trees vegetation type

Figure 4-6: Overgrazed open grassland vegetation type

4.3.1 Species of Special Concern

A single Red Data listed species was previously recorded in the QDS 2526CC, namely: *Brachystelma incanum* (Vulnerable). Two protected species were encountered during the site walk through, these were, *Boophane disticha (Poison bulb),* declining under SA red data list and possibly *Crinum bulbispermum (Orange/Vaal River Lily),* protected under the Transvaal Nature Conservation Ordinance, No. 12 of 1983, and declining under SA red data list.

4.4 Fauna

As described in the flora findings, much of the terrestrial vegetation and habitat within the project footprint area has been modified by current and historical land use. It is assumed that these impacts have had a subsequent effect on the fauna species diversity and abundance. The findings of the fauna survey are used as a secondary reflection of the ecosystem health.

4.4.1 Mammals

Actual sightings, spoor, calls, dung and nesting sites, but no active sampling by means of motion detection cameras and Sherman traps, were used to establish the presence of mammals proposed project site. The evidence of dung and spoor suggests that animals were present in the area although very few were recorded during the surveys.

No mammal species were observed during the field visit, however the following species could occur on site.

Table 4-2: Mammal species with high probability of occurrence

English	Scientific	(IUCN 2015-4)	NEMBA TOPS
Black Backed Jackal	*Canis mesomelas*	LC	-
Bushpig	*Potamochoerus larvatus*	LC	-
Cape hare	*Lepus capensis*	LC	-
Cape Porcupine	*Hystrix africaeaustralis*	LC	-
Common Duiker	*Sylvicapra grimmia*	LC	-
Common reedbuck	*Redunca arundinum*	LC	-
Serval	*Leptailurus serval*	NT	NT
Steenbuck	*Raphicerus campestris*	LC	Protected
Yellow Mongoose	*Cynictis penicillata*	LC	-

The southern African hedgehog *Atelerix frontalis* is found at the site and the spotted-necked otter *Lutra maculicollis*, striped weasel *Poecilogale albinucha* and African wild cat *Felis lybica* are known to occur in the general area but have not been confirmed on the project site.

4.4.2 Avifauna

Birds have been viewed as good ecological indicators, since their presence or absence tends to represent conditions pertaining to the proper functioning of an ecosystem. Bird communities and ecological condition are linked to land cover. As the land cover of an area changes, so do the types of birds in that area (The Bird Community Index, 2007). Land cover is directly linked to habitats within the study area. The diversity of these habitats should give rise to many different species. The bird species observed during the site visit are listed in Table 4-3.

Table 4-3: Avifauna species recorded

Birds	Scientific Name	Protection status
Black Shouldered kite	*Elanus axillaris*	Not protected

Blacksmith Lapwing	*Vanellus armatus*	Not protected
Cape Turtle Dove	*Streptopelia capicola*	Provincially/protected
Common Waxbill	*Estrilda astrild*	Not protected
Common Stonechat	*Saxicola torquatus*	Not protected
Fiscal Flycatcher	*Sigelus silens*	Not protected
Greater-striped Swallow	*Cecropis cucullata*	Not protected
Hadeda Ibis	*Bostrychia hagedash*	Not protected
Helmeted Guineafowl	*Numida meleagris*	Not protected
Laughing Dove	*Spilopelia senegalensis*	Protected
Long-tailed Widow Bird	*Euplectes progne*	Not protected
Masked Weaver	*Ploceus velatus*	Not protected
Speckled Pigeon	*Columba guinea*	Not protected
Spotted thick-knee	*Burhinus capensis*	Not protected
Northern Black Korhaan	*Afrotis afraoides*	Not protected (SA Endemic)
Swainson's Spurfowl	*Pternistis swainsonii*	Not protected

Avifauna diversity was found to low, primarily due to the limited amount and diversity of habitat types available in the study area. As is discussed previously the habitat varied between overgrazed grassland and open woodlands. No species of special concern was encountered, however the threatened Secretarybird *Sagittarius serpentarius* and critically endangered White-backed Vulture *Gyps africanus* have been recorded in the vicinity.

4.4.3 Herpetofauna

According to Du Preez and Carruthers (2009), frogs occur throughout every habitat within Southern Africa. A number of factors influence their distribution, and they are generally restricted to the habitat type they prefer, especially in their choice of breeding site. The choices available of these habitats coincide with different biomes, these biomes in turn, are distinguished by means of biotic and abiotic features prevalent within them. Therefore a collection of amphibians associated with the Grassland Biome will all choose to breed under the prevailing biotic and abiotic features present. Further niche differentiation is encountered by means of geographic location within the biome, this differentiation includes, banks of

pans, open water, inundated grasses, reed beds, trees, rivers and open ground, all of which are present within the area of interest.

Southern African endemic reptiles in the vicinity that may be present within or close to the project area include leopard tortoise *Geochelone pardalis*, Kalahari tent tortoise *Psammobates oculiferus*, two-striped shovel-snout *Prosymna bivittata*, shield-nose snake *Aspidelaps scutatus,* Cape spade-snouted worm lizard *Monopeltis capensis* and thin-tailed legless skink *Acontias gracilicauda*. However, no reptile nor amphibian species were encountered during this field survey even though active searching was employed. The expected reptile species for the area totals one species the Serrated Tortoise (*Psammobates oculifer*). The absence of amphibian species is thought to be because of the current drought.

4.4.4 Invertebrates

During the field survey, selected invertebrates were recorded using butterfly nets and opportunistic observations and photographed where possible. In support of this, transects were walked along the roads, vegetation types, and grassland areas in order to identify any scorpion or spider nests.

The diversity and density of the invertebrates was relatively low for the proposed project footprint area and surroundings, however this in general could assist in providing an indication of the health of the regional ecology. Although agriculture and livestock has modified the immediate area, there is sufficient habitat that still remains to sustain moderate populations of the typical grassland species of fauna. Recorded invertebrate species included, African Monarch Butterfly, Citrus Swallowtail, Yellow Pansy and Broad bordered grass yellow.

4.5 Identification of Environmental Sensitivities

In terms of ecological sensitivity, the following features are assessed to determine how sensitive the habitat identified within the site is:

- Presence or absence of Red Data or protected plant and animal species;
- Presence or absence of exceptional species diversity;
- Extent of intact habitat in good ecological condition in the absence of disturbance;
- Presence or absence of important ecosystems such as Important Bird Areas (IBA's), Protected Areas, areas demarcated for future protected area status (NPAES) and wetlands.

The project area has undergone a moderate degree of disturbance due to overstocking of livestock and disturbance to the soil, resulting in the establishment of a large bushclump of alien trees. The project site falls within a Critical Biodiversity area 2 as far as regional ecological importance is concerned.

Land management objectives of areas classified as CBA 2 are:

Maintain in a natural or near-natural state that maximises the retention of biodiversity pattern and ecological process:

- Ecosystems and species fully or largely intact and undisturbed;
- Areas with intermediate irreplaceability or some flexibility in terms of meeting biodiversity targets. There are options for loss of some components of biodiversity in these landscapes without compromising the ability to achieve biodiversity targets, although loss of these sites would require alternative sites to be added to the portfolio of CBAs; and
- These are biodiversity features that are approaching but have not passed their limits of acceptable change.

4.5.1 Sensitivity and Conservation Planning Tools

There are several assessments for South Africa as a whole, as well as on provincial levels that allow for detailed conservation planning as well as meeting biodiversity targets for the country's variety of ecosystems. These guides are essential to consult for development projects, and will form an important part of the sensitivity analysis. Areas earmarked for conservation in the future, or that are essential to meet biodiversity and conservation targets should not be developed, and have a high sensitivity as they are necessary for overall functioning. In addition, sensitivity analysis in the field based in much finer scale data can be used to ground truth the larger scale assessments and put it into a more localised context.

4.5.1.1 Protected areas

Officially protected areas, either Provincially or Nationally that occur close to a project site could have consequences as far as impact on these areas are concerned. For this project

however, there are no protected areas in close proximity to the study area, apart from a local Nature Reserve, approximately 1.2 km east (Figure 4-7).

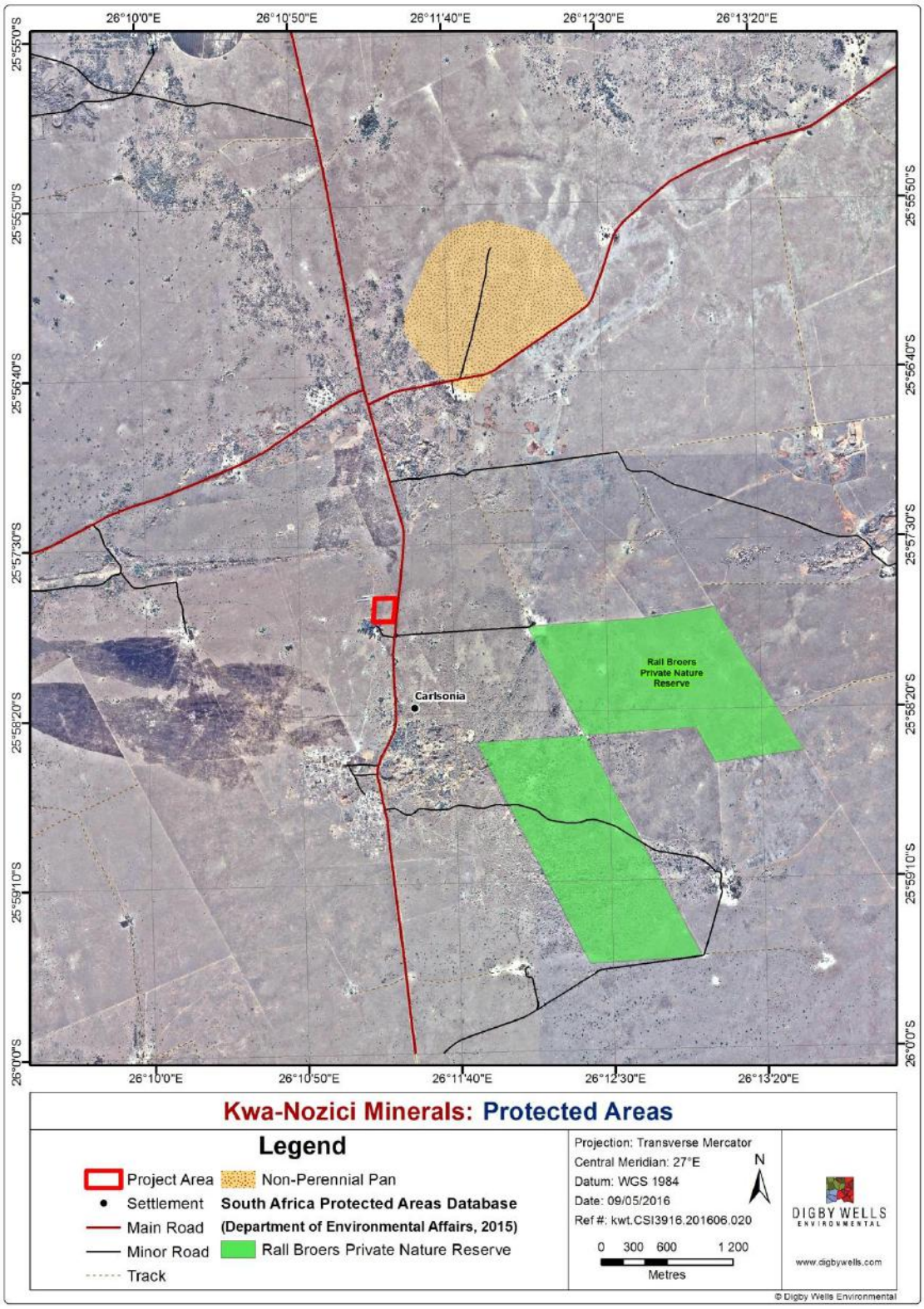


Figure 4-7: Protected area in relation to the study site

4.5.1.2 Important Bird Areas

An Important Bird Area (IBA) is an area recognised as being globally important habitat for the conservation of bird populations. Currently there are about 10,000 IBAs worldwide. At present, South Africa has 124 IBA's, covering over 14 million hectares of habitat for our threatened, endemic and congregatory birds. Yet only a million hectares of the total land surface covered by our IBA's is legally protected. The BirdLife SA IBA programme continues a programme of stewardship which will ultimately achieve formal protection (Birdlife, 2013). No IBA's occur close to the project site, the closest IBA is the Magaliesberg IBA, approximately 100 km away.

4.5.1.3 Nationally Threatened Ecosystems

The list of national Threatened Ecosystems has been gazetted (NEM:BA: National list of ecosystems that are threatened and in need of protection) and result in several implications in terms of development within these areas. Four basic principles were established for the identification of threatened ecosystems. These include:

- The approach must be explicit and repeatable;
- The approach must be target driven and systematic, especially for threatened ecosystems;
- The approach must follow the same logic as the IUCN approach to listing threatened species, whereby a number of criteria are developed and an ecosystem is listed based on its highest ranking criterion; and
- The identification of ecosystems to be listed must be based on scientifically credible, practical and simple criteria, which must translate into spatially explicit identification of ecosystems.

Areas were delineated based on as fine a scale as possible and are defined by one of several assessments:

- The South African Vegetation Map (Mucina and Rutherford 2006);
- National forest types recognised by the Department of Water Affairs and Forestry (DWAF);
- Priority areas identified in a provincial systematic biodiversity plan; and
- High irreplaceability forest patches or clusters identified by DWAF.

The criteria for identifying threatened terrestrial ecosystems include six criteria overall, two of which are dormant due to lack of data (criteria B and E). The criteria are presented in **Table** 4-4 below.

Table 4-4: Criteria for the listing of National Threatened Ecosystems

Criterion	Details
A1	Irreversible loss of natural habitat

A2	Ecosystem degradation and loss of integrity
B	Rate of loss of natural habitat
C	Limited extent and imminent threat
D1	Threatened plant species associations
D2	Threatened animal species associations
E	Fragmentation
F	Priority areas for meeting explicit biodiversity targets as defined in a systematic biodiversity plan

The study area does not fall within protected ecosystem.

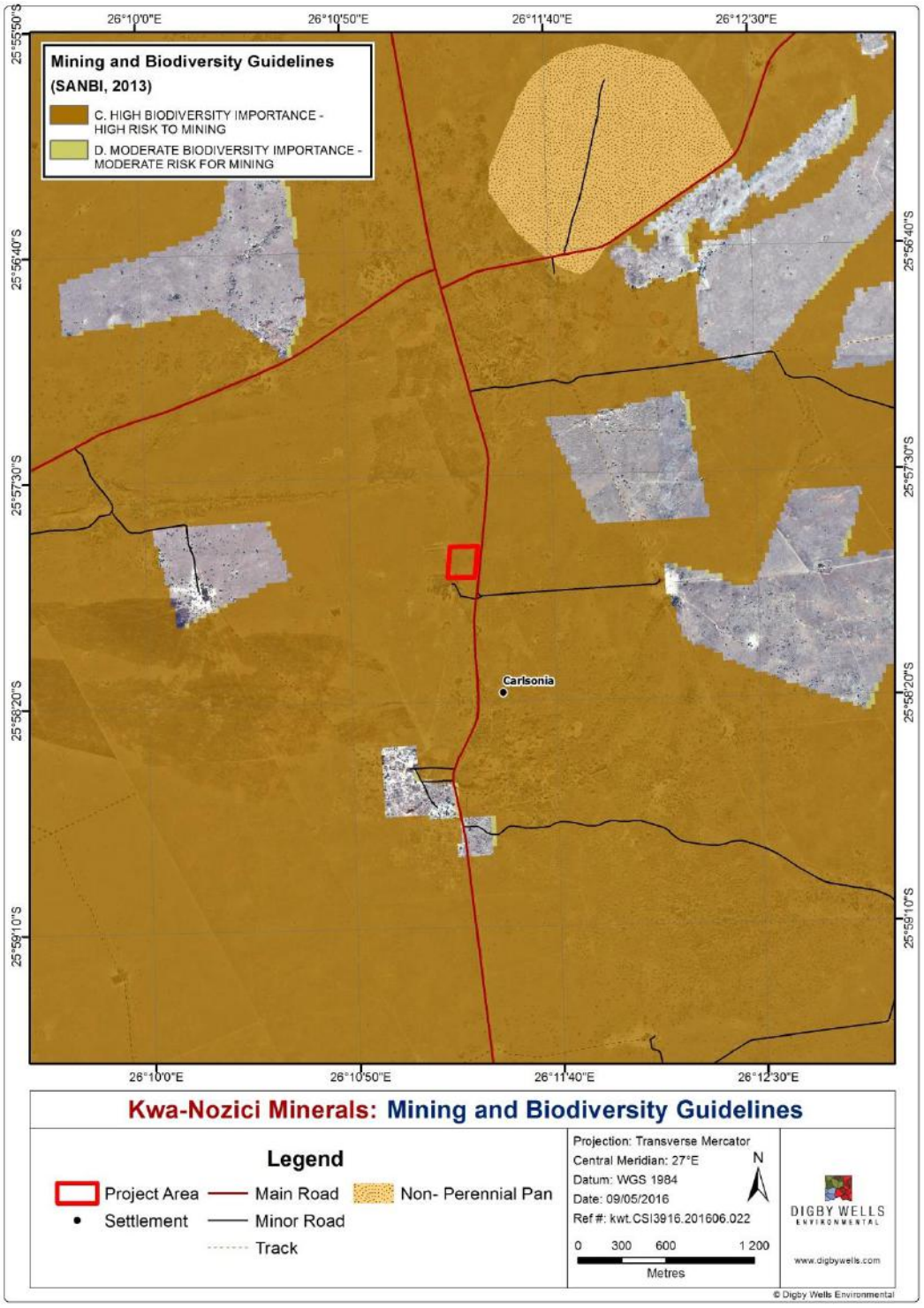
4.5.1.4 National Protected Areas Expansion Strategy (NPAES)

The NPAES are areas designated for future incorporation into existing protected areas (both National and informal protected areas). These areas are large, mostly intact areas required to meet biodiversity targets, and suitable for protection. They may not necessarily be proclaimed as protected areas in the future and are a broad scale planning tool allowing for better development and conservation planning. There are no areas earmarked for conservation within 40km of the proposed development.

4.5.1.5 Mining and Biodiversity Guideline

This guideline describes the principles, tools and information that should inform the consideration of biodiversity in the mining life cycle to support the sustainable use of the country's mineral resources. This guideline takes into account the multitude of laws that govern the impacts of mining on the environment (and in particular, biodiversity) and, secondly, provides information on how to factor biodiversity into the life cycle of a mining project. South Africa has the benefit of some of the best biodiversity science in the world and is at the forefront of developing spatial and non-spatial information and tools for the management and conservation of biodiversity. These tools assist in identifying and addressing impacts on biodiversity at the level of ecosystems and habitats. While management and conservation of biodiversity is often associated with formal reserves or protected areas, and protected areas are a key component of biodiversity management, the majority of important remaining biodiversity is found outside protected areas, on private or communal land in production landscapes and seascapes. Numerous opportunities and tools exist to integrate the management and conservation of biodiversity into production sectors (mining, forestry, agriculture) to reduce impacts on biodiversity and ensure ecosystem integrity. This Guideline helps to facilitate the use of these tools by the regulatory authorities and companies in the mining sector (DEA *et. al*. 2013). One of these tools is the mitigation hierarchy that must be followed.

The small scale mining project coincides with high biodiversity importance and high risk to mining this occurs across the entire project area.



4.5.2 Comments and Responses Trail

No comments have been received and therefore this section remains empty, however comments and there specific responses will be added as soon as these are received.

4.6 Identification of potential impacts

The impacts of the proposed project have been rated using the standard Impacts Assessment rating scale as described here. The aim of the Impact Assessment is to strive to avoid damage or loss of ecosystems and services that they provide, and where they cannot be avoided, to reduce and mitigate these impacts (DEA, 2013). Offsets to compensate for loss of habitat are regarded as a last resort, after all efforts have been made to avoid, reduce and mitigate. The mitigation hierarchy is described in Table 4-5.

Table 4-5: Mitigation Hierarchy

	**Avoid or Prevent**	Refers to considering options in project location, sitting, scale, layout, technology and phasing to avoid impacts on biodiversity, associated ecosystem services and people. This is the best option, but is not always possible. Where environmental and social factors give rise to unacceptable negative impacts, mining should not take place. In such cases, it is unlikely to be possible or appropriate to rely on the other steps in the mitigation.
	Minimise	Refers to considering alternatives in the project location, sitting, scale, layout, technology and phasing that would minimise impacts on biodiversity, associated ecosystem services. In cases where there are environmental constraints, every effort should be made to minimise impacts.
	Rehabilitate	Refers to rehabilitation of areas where impacts are unavoidable and measures are provided to return impacted areas to near natural state or an agreed land use after closure. Rehabilitation may, however, fall short of replicating the diversity and complexity of natural systems.
	Offset	Refers to measures over and above rehabilitation to compensate for the residual negative impacts on biodiversity after every effort has been made to minimise and then rehabilitate the impacts. Biodiversity offsets can provide a mechanism to compensate for significant residual impacts on biodiversity.

The potential development will result in the loss of 5 ha of natural and disturbed habitat. No sensitive landscapes were encountered within the project boundary.

4.6.1 Construction Phase

The construction phase will entail the following activities:

- Development of a road to the camp site (2.5 km long and 4m wide);
- Preparing an area of 900 m2 for a portable camp site to accommodate infrastructure associated with stockpiling, crushing, washing, sorting and offices;
- Site clearing and topsoil removal for mining operation, and development of a mining pit;
- Construction of pollution control dam and trenches;
- Use of the existing 30 – 70m depth borehole and installing a water pipe (50 mm diameter and 50 – 100m length);
- Installation of a 10 0000 litre water tank;
- Construction of storm water management facilities upstream of the pits to divert water away from the pit.

The construction phase will result in the following impacts:

- Loss of plant species associated with the open and wooded grassland vegetation types; and
- Loss of fauna diversity due to habitat destruction.

4.6.2 Operational Phase

The operational phase will entail the following activities:

- Topsoil removal measuring 0.5m deep, excavation up to 4m deep and transportation of ore;
- TLB activity and operation of mining equipment;
- Water extraction from borehole and/or tank;
- Crushing, washing and sorting of ore in mobile plant;
- Storage of diesel and vehicle/machinery maintenance equipment;
- Water and waste management.

The operational phase will result in the following impact:

4.6.2.1 Habitat Fragmentation

Ecosystem function is the measure of the combined functioning of the vegetation and associated species, faunal habitats and wetlands, all of which result in the ecosystem health. The construction of the small scale mining operation will affect the ecosystem function in two main ways. The first is the fragmentation of the ecosystem, which will occur with large land surface changes. Fragmentation occurs conjointly with edge-effects, which change the composition of the ecosystem on the edge of structures such as buildings and roads. The consequence of this is a loss of cohesiveness between larger fragments of habitat which limits the exchange of genes and resources across them. The habitat associated with the footprint area is linked to a regional vegetation type: Carltonville Dolomite Grassland and the loss of this habitat will add to the cumulative loss of this unit.

4.6.2.2 Soil Disturbance Resulting in the Spread of Alien Plant Species on Site

As aforementioned, alien plant species erode the natural biodiversity of habitat by outcompeting native species. *Eucalyptus camuldulensis* and *Opuntia ficus-indica* are invasive species and further disturbance may result in the establishment of dense monospecific stands of these species surrounding the site.

This can be avoided by applying proper management practices such as monitoring for alien plants after development/construction for between five and seven years on an annual basis. Initially, monitoring should take place every three months for one year after closure and rehabilitation has been completed.

4.6.3 Decommissioning Phase

The operational phase will entail the following activities:

- Demolition and/or removal of mobile camp site infrastructure/equipment and vehicles
- Rehabilitation and restoration of disturbed areas

4.6.3.1 Invasion by Alien Plant Species

Alien plant species are prone to invade impacted or disturbed areas where natural vegetation has been removed by construction activities. These plant species outcompete indigenous species by making better use of available resources such as water and space and nutrients, thereby eliminating the indigenous species as completion.

5 Impact Assessment

The following tables describe the various activities associated with the phases of small scale mining project area. Associated with these activities are several impacts, which are described in the section below.

5.1 Construction Phase

The construction of various surface infrastructure components will mean the removal, partial or complete of vegetation/habitat types present.

5.1.1 Loss of natural habitat

Aspect/Activity	**Fauna and Flora/Internal access roads and vehicular activities on site**
Type of impact	Direct
Potential Impact	Internal access roads will be required to access the individual components within the small scale mining area during the construction and operational phases. Use of existing farm tracks will be maximised, however, in some areas this might require the stripping of existing vegetation. This will entail the partial destruction of moderately sensitive habitat.
Mitigation Required	Keep the footprint of the disturbed area to the minimum and designated areas only. Vegetate and irrigate open areas to limit erosion, but take care not to promote erosion by irrigating. Removal of vegetation during construction and operation will be minimised to reduce the risk of excessive open areas occurring. Adhere to existing roads, and if new roads are constructed, these must not cross sensitive areas such as the ridges or drainage lines. Preconstruction walk through of the facility in order to locate species of conservation concern that can be translocated as well as comply with permitting conditions. Preconstruction environmental induction should be done for all construction staff and visitors on site to ensure that basic environmental principles are adhered to. This includes awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions and remaining within demarcated construction areas.
Impact Significance (Pre-Mitigation)	3 (moderate)

Aspect/Activity	**Fauna and Flora/Internal access roads and vehicular activities on site**
Impact Significance (Post-Mitigation)	4 (low)
I&AP Concern	No
Conditional Authorisation	Removal of vegetation must be followed closely by rehabilitation within 3 months of disturbance. Native species should be used for rehabilitation e.g. *Cynodon dactylon, Digitaria eriantha, E. plana, Heteropogon contortus and Themeda triandra.*

Aspect/Activity	Fauna and Flora/Site preparation
Type of impact	Direct
Potential Impact	Site preparation will include the removal of vegetation at the footprint of mini pits. Rocks may be removed, as well as tall shrubs and bushes that may be obstacles. Topsoil must be stripped and stockpiled for use during rehabilitation. Laydown yards must be situated in previously disturbed areas. Protected plant or animal species encountered must be managed in accordance with an accepted management plan for these species.
Mitigation Required	Keep the footprint of the disturbed area to the minimum and designated areas only and completely avoid no-go. Vegetate and irrigate open areas to limit erosion and dust. Removal of vegetation during construction and operation must be minimised to reduce the risk of excessive open areas occurring. Adhere to existing roads, and if new roads are constructed, these must not cross sensitive areas such as the ridges or drainage lines and completely avoid no go and sensitive areas as stipulated by the sensitivity maps. Removal of vegetation must be followed closely by rehabilitation by specialists qualified in this vegetation type's remediation. The removal of the vegetation will have a negative impact on the amount of ground cover, biodiversity and soil binding (by plants roots). This will increase the risk and occurrence of soil erosion. The positive impact will be that alien invasive plant species will be removed during the same process. This, however, should be done with caution to prevent the spread of seeds and therefore the plants. During construction the risk of soil contamination by spills of hazardous materials increases dramatically. Increased water runoff due to removal of vegetation could contaminate water sources with sediment. Construction phase activities will increase the local dust levels and noise level, which includes noise and dust from heavy machinery and trucks. The increased traffic of heavy duty vehicles and machinery will pose a threat to animals in the area. Once construction starts these animals will move out of the area, if given the chance, and settle in a more sheltered area. With the removal of the vegetation during construction phase less food items will be available to animals in the area, and the risk of erosion will make the area even less desirable for animals especially the browsing/grazing species. If protected animals, as discussed in this report, are encountered, the environmental manager must be alerted.
Impact Significance (Pre-Mitigation)	3 (moderate)
Impact Significance (Post-Mitigation)	4 (low)
I&AP Concern	No

Aspect/Activity	Fauna and Flora/Site preparation
Conditional Authorisation	All alien plant species recorded on site should be removed. An Alien Vegetation Management Plan must be implemented. And alien plants should be monitored biannually after construction for 5-7 years.

Aspect/Activity	Fauna and Flora/Soil disturbance resulting in the spread of alien plant species on site
Type of impact	Indirect
Potential Impact	As aforementioned, alien plant species erode the natural biodiversity of habitat by outcompeting native species. *Eucalyptus camuldulensis* and *Opuntia ficus-indica* are invasive species and further disturbance may result in the establishment of dense monospecific stands of these species surrounding the site.
Mitigation Required	Keep the footprint of the disturbed area to the minimum and designated areas only, completely avoid no-go and sensitive areas as stipulated by the sensitivity maps. Vegetate and irrigate open areas to limit erosion, but take care not to cause erosion by irrigating. Removal of vegetation during construction and operation will be minimised to reduce the risk of excessive open areas occurring. Adhere to existing roads, and if new roads are constructed, these must not cross sensitive areas such as the ridges or drainage lines. This can be avoided by applying proper management practices such as monitoring for alien plants after development for between 5-7 years on an annual basis. Initially, monitoring should take place every three months for one year after closure and rehabilitation.
Impact Significance (Pre-Mitigation)	3 (moderate)
Impact Significance (Post-Mitigation)	4 (low)
I&AP Concern	No
Conditional Authorisation	Removal of vegetation must be followed closely by rehabilitation. An Alien Vegetation Management Plan must be implemented. And alien plants should be monitored biannually after construction for 5-7 years.

5.2 Operation Phase

Aspect/Activity	Fauna and Flora/Access control and fencing
Type of impact	Direct

Potential Impact	The construction of fences around the property will have a dual effect on the flora and fauna frequenting the area, it will exclude grazing animals (mostly livestock, possibly wild animals) from the property negatively affecting the available graze for these animals, but also allowing vegetation to recover from overgrazing.
Mitigation Required	Veld management measures will have to be employed. This can be achieved by allowing gaps in fencing for animal species to move between grazing areas, during prescribed times of the year. Any electric fencing must have a bottom strand not lower that 30cm to the ground, in order for smaller faunal species to pass safely.
Impact Significance (Pre-Mitigation)	3 (moderate)
Impact Significance (Post-Mitigation)	4 (low)
I&AP Concern	No
Conditional Authorisation	An Alien Vegetation Management Plan must be implemented. And alien plants should be monitored biannually after construction for 5-7 years.

Aspect/Activity	**Fauna and Flora/Undertake site remediation**
Type of impact	Direct
Potential Impact	On completion of construction and after all construction equipment has been removed from the site, the site will be rehabilitate where practical.
Mitigation Required	Ensure the use of indigenous, local plant species, and remediation is completed by qualified personnel with the correct equipment in the correct season (wet season).
Impact Significance (Pre-Mitigation)	4 (low)
Impact Significance (Post-Mitigation)	4 (low)
I&AP Concern	No
Conditional Authorisation	No

5.3 Decommissioning Phase

Aspect/Activity	**Fauna and Flora/Disassemble components** The components of the plant will be disassembled and removed. Components will be reused and recycled (where possible) or disposed of in accordance with regulatory requirements.
Type of impact	Direct
Potential Impact	Habitat loss
Mitigation Required	The disassembly of infrastructure may result in impacts to vegetation, as large machinery is needed for removal of the infrastructure components. Of concern here is the destruction of vegetation, creation of favourable habitat for fast growing invasive species and ground compaction. Also of concern are the possible spillages from construction vehicles. In the event that spillages and leaks do occur, these would impact negatively on vegetation and soil quality. The demolition of infrastructure may require vehicles making use of non-designated areas; special care must be taken not to destroy rehabilitated areas. All hard surfaces must be removed from site. All disturbed areas must be rehabilitated. This activity is considered to be medium in duration as well as site specific in extent with impacts being on site. The severity of the impact was determined to be minor.
Impact Significance (Pre-Mitigation)	3 (moderate)
Impact Significance (Post-Mitigation)	4 (low)
I&AP Concern	No
Conditional Authorisation	Alien plant monitoring should take place for 2-3 years. All alien plant species should be removed, preferably as juveniles, before they become established and bear seed and flowers.

5.4 Cumulative Impacts

The greater study area has been impacted due to historical agriculture and livestock farming, with much of the site overgrazed. The cumulative effects of the planned small scale mining infrastructure will affect the available graze and browse that wild herbivores need for survival. The ecosystem functioning and services that are currently produced in the area could be impaired or reduced in small areas; these include food and shelter for the animals.

The footprint of the proposed small scale mining will impact on the ecosystem services and vulnerable habitats such as grassland plains. This will be through reduced viability in plant communities due to reduction in area and compromising of habitats due to fencing and keeping out of fauna and pollinators.

Table 5-1: Impact Assessment Summary Table – Construction Phase Impacts

Aspect/ Impact pathway	Nature of potential impact/risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
CONSTRUCTION PHASE DIRECT IMPACTS													
Internal access roads and vehicular activities on site	Habitat and species loss	Negative	Site	Long-term	Moderate (5)	Very likely (1)	Yes (rehabilitation after Construction)	Moderate (endangered vegetation)	Plant and Animal search and rescue (EMPr)	Moderate	Low	4	High
	Exposed soil susceptible to erosion	Negative	Site	Medium-term	Moderate	Likely	Yes (rehabilitation after Construction)	Moderate	Erosion Management Plan (EMPr)	Low	Very low	5	High
Site Preparation	Habitat and species loss	Negative	Site	Long-term	Substantial	Very likely	Yes (rehabilitation after Construction)	Moderate (endangered vegetation)	Plant and Animals search and rescue (EMPr)	Moderate	Low	4	High
	Exposed soil susceptible to erosion	Negative	Site	Medium-term	Moderate	Likely	Yes (rehabilitation after Construction)	Moderate	Erosion Management Plan (EMPr)	Low	Very low	5	High
CONSTRUCTION PHASE INDIRECT IMPACTS													
Construction of surface infrastructure and preparation	Habitat and species loss	Negative	Site and surroundings	Long-term	Substantial	Very likely	Yes (rehabilitation after Construction)	Moderate (endangered vegetation)	Plant and Animal search and rescue (EMPr)	Moderate	Low	4	High
	Exposed soil susceptible to erosion	Negative	Site and surroundings	Medium-term	Moderate	Likely	Yes (rehabilitation after Construction)	Moderate	Erosion Management Plan (EMPr)	Low	Very low	5	High
Soil disturbance resulting in the spread of alien	Spread of Alien plant species	Negative	Site and surroundings	Long-term	Moderate	Likely	Yes (rehabilitation after Construction)	Moderate	Alien plant Management Plan (EMPr)	Low	Very low	5	High

plant species on site	Exposed soil susceptible to erosion	Negative	Site and surroundings	Medium-term	Moderate	Likely	Yes (rehabilitation after Construction)	Moderate	Erosion Management Plan (EMPr)	Low	Very low	5	High

Table 5-2: Impact Assessment Summary Table – Operational Phase Impacts

Aspect/ Impact pathway	Nature of potential impact/risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
OPERATIONAL PHASE DIRECT IMPACTS													
Access control and fencing	Fencing in, or out certain grazers	Negative	Site	Long-term	Substantial	Very likely	Yes (with mitigation measures)	Moderate (endangered vegetation)	Plant search and rescue (EMPr)	Moderate	Low	4	Medium
	Over or under grazed veld	Negative	Site	Medium-term	Moderate	Likely	Yes (rehabilitation after decommissioning)	Moderate	Erosion Management Plan (EMPr)	Low	Very low	5	High
Undertake site remediation	Rehabilitation of disturbed areas	Positive	Site	Medium-term	Moderate	Likely	Yes (rehabilitation after decommissioning)	Moderate	Erosion Management Plan (EMPr)	Low	Very low	5	High

Table 5-3: Impact Assessment Summary Table – Decommissioning Phase Impacts

Aspect/ Impact pathway	Nature of potential impact/risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
DECOMMISSIONING PHASE DIRECT IMPACTS													
Disassemble components	Damage of vegetation and habitat types	Negative	Site	Short-term	Moderate	Very likely	Yes (with mitigation measures)	Moderate (endangered vegetation)	Plant search and rescue (EMPr)	Moderate	Low	4	Medium

Table 5-4: Impact Assessment Summary Table – Cumulative Impacts

Aspect/ Impact pathway	Nature of potential impact/risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
DECOMMISSIONING PHASE													
Clearing of vegetation,	Habitat and species loss	Negative	Site	Long-term	Substantial	Very likely	Yes (rehabilitation after decommissioning)	Moderate (endangered vegetation)	Plant search and rescue (EMPr)	Moderate	Low	4	Medium
	Exposed soil susceptible to erosion	Negative	Site	Medium-term	Moderate	Likely	Yes (rehabilitation after decommissioning)	Moderate	Erosion Management Plan (EMPr)	Low	Very low	5	High

6 Legislative and Permit Requirements

No permits will be required for flora and fauna associated with the study site, as long as no protected plant or animal species are disturbed during construction phase. If this is the case a permit will be required form the local authorities. This report is compiled in accordance with the EIA regulations under the National Environmental Management Act, 1998 (Act No 107 of 1998), as set out in the schedule under Government Gazette Notice 38282.

7 Environmental Management Programme Inputs

7.1 Alien Plant Monitoring

Alien plant species were recorded on site. If the development is to go ahead, alien monitoring should take place. Monitoring should be initiated after constructed and should take place annually for 5-7 years to ensure that alien plant species area completely removed. After decommissioning, alien plant monitoring should be re-initiated for 2-3 years.

8 Conclusion and Recommendations

The study area falls within the Carltonville Dolomite grassland vegetation unit (Mucina and Rutherford, 2006). Vegetation was largely grassland and open woodland vegetation and mostly comprised of *Themeda triandra – Eragrostis trichophora* mixed shrubland/grassland, in addition to alien bushclumps.

Although Red Data species may be located within or close to the site, they were not evident during the survey.

The proposed development will result in the loss of moderate ecologically sensitive habitat in the form of disturbed grasslands. It is recommended that species of special concern be managed and specific mitigation measures described in this assessment are adhered to. The overall impact of the proposed small scale mining facility will be moderate to low.

9 Final Statement by the Specialist

9.1 Recommended Conditions to be included in Environmental Authorisation

Since the majority of the site is of moderate ecological sensitivity, it is of the specialist's opinion should the project proceed then the ecological aspects related to the impact assessment can be managed accordingly. Mitigation and management measures described in this report should be followed. As aforementioned, the field investigation took place after drought conditions, although this was during the expected rainy season. As not all plant species on site were identifiable during the flora survey, it is possible that Red Data species could have been missed. It is strongly recommended that an additional flora Red Data survey is conducted prior to the clearing of any habitat associated with the site.

10 References

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Appendix 1: Staff CV

Mr. Rudolph Greffrath

Senior Fauna and Flora Specialist

Biophysical Department

Digby Wells Environmental

1. Education

2005: B-tech Degree in Nature Conservation, Nelson Mandela Metropolitan University (NMMU).

2001- 2004: Diploma in Nature Conservation, Nelson Mandela Metropolitan University (NMMU).

2. Professional Registration

South African Council for Natural Scientific Professions (Membership No. 200245/13).

IAIA, International Association for Impact assessments;

Botanical Society of South Africa.

3. Employment

2006 – Present: Digby Wells Environmental, Johannesburg, South Africa.

2002 - 2003: Shamwari Game Reserve, Eastern Cape, South Africa.

2001: Kop-Kop Geotechnical instrumentation specialists, Johannesburg, South Africa.

4. Experience

Rudi's current role is that of a fauna and flora specialist, in this capacity he is responsible for planning and conducting fauna and flora impact assessments, including surveys/studies that are either completed in support of environmental authorisations or are focused specialist studies which meet local and international standards. In addition to this, Rudi is responsible for compiling Biodiversity Land Management Programs where different specialist studies are collated into a working document for clients in order to aid in pre or post mining management. He is also involved in rehabilitation studies which entail the planning, implementation and monitoring of vegetative rehabilitation in designated areas on mines. Rudi also fulfils the role of project manager for selected projects; here he manages national and international projects across Africa, specifically west, central and southern Africa, managing a multi-disciplinary team of specialists.

Rudi is also involved in the acquisition of permits for landowners, this includes the planning of relocation strategies for protected and endangered plant species in areas where mines are to be established. This involves the planning and execution of data gathering surveys, thereafter he manages the process involving relevant provincial and National authorities in order to obtain the specific permit that allows for a development to continue.

Information pertaining to the technical expertise of Rudi includes the following:

Environmental Impact Assessments (EIAs), Basic Assessments and Environmental Management Plans (EMPs) for environmental authorisations in terms of the South African National Environmental Management Act (NEMA), 1998 (Act 107 of 1998);

Environmental pre-feasibility studies for gold tailings reclamation and iron ore mining projects;

Biodiversity Assessments including Mammalia, Avifauna, Herpetofauna and Arthropoda;

Impact assessments based on the terrestrial environment;

Biodiversity and Land Management Programs;

Protected plant species management strategies planning and implementation;

Monitoring of rehabilitation success through vegetation establishment;

Rehabilitation planning;

Environmental auditing of rehabilitated areas;

Project management of ecological specialist studies;

Planning and design of Rehabilitation off-set strategies.

5. Training

Measurements of Biodiversity at the University of the Free State, led by Prof. M. T. Seaman. September 2008.

Bird Identification course led by Ettiene Maraise November 2009.

Introduction to VEGRAI and Eco-classification led by Dr. James Mackenzie December 2009.

Dangerous snake handling and snake bite treatment with Mike Perry 2011.

Rehabilitation of Mine impacted areas, with Fritz van Oudshoorn, Dr Wayne Truter and Gustav le Roux 2011.

6. Projects

The following project list is indicative of Rudi's experience, providing insight into the various projects, roles and locations he has worked in.

Project	Location	Client	Main project features	Positions held	Activities performed
Mmamabula Energy Project (MEP).	Botswana	CIC energy	Construction of a railway, opencast mine, wellfield, conveyors, addits, housing.	Ecologist	Fauna and Flora surveys for the project features, including impact

					assessments, management plans. Alien eradication plans.
Tongan Biodiversity Land Management Plan	Ivory Coast	Randgold	Design, compilation and implementation of the BLMP	Ecologist, Project Manager	Fauna and Flora surveys for the BLMP, compilation of BLMP. Alien eradication plans.
Kibali Gold mine	DRC Congo	Randgold	Gold mine infrastructure	Ecologist	Fauna and Flora surveys for the project features, including impact assessments, management plans.
Nzoro Hydroelectric station	DRC Congo	Randgold	Hydroelectric plant	Ecologist	Fauna and Flora surveys for the project features, including impact assessments, management plans.
Loulo Biodiversity Land Management Plan	Mali	Randgold	Design, compilation and implementation of the BLMP	Ecologist, Project Manager	Fauna and Flora surveys for the project features, compilation of BLMP.
Koidu Diamond Mine	Sierra Leone	Koidu Resources	Construction of new open pit	Ecologist	Fauna and Flora surveys for the project

					features, including impact assessments, management plans. Alien eradication plan.
Resource Generation	South Africa	Temo Coal	Coal mine/Railway Line	Ecologist	Fauna and Flora surveys, Protected plant species management plans, Permitting and Rehabilitation design.
Impunzi Rehabilitation monitoring	South Africa	Glencore	Monitoring of rehabilitation success and suggested management measures	Flora specialist, Project manager	Vegetation surveys, rehabilitation monitoring. Alien eradication plan.

7. Publications

Biodiversity Action Plans for faunal habitat maintenance and expansion in mining. Poster presented at the 48th Annual Grassland Society of Southern Africa (GSSA) conference.

Appendix 2: Regional Plant Species List

Species	**Threat status**	**Growth forms**
Barleria macrostegia Nees	LC	Herb
Crabbea angustifolia Nees	LC	Herb
Dyschoriste transvaalensis C.B.Clarke	LC	Dwarf shrub, shrub
Justicia anagalloides (Nees) T.Anderson	LC	Herb
Tulbaghia cernua Avé-Lall.	LC	Herb
Amaranthus hybridus L. subsp. hybridus var. hybridus	Not Evaluated	Herb
Amaranthus thunbergii Moq.	LC	Herb
Kyphocarpa angustifolia (Moq.) Lopr.	LC	Herb
Ozoroa paniculosa (Sond.) R.& A.Fern. var. paniculosa	LC	Shrub, tree
Searsia lancea (L.f.) F.A.Barkley	LC	Shrub, tree
Asclepias aurea (Schltr.) Schltr.	LC	Herb
Asclepias brevipes (Schltr.) Schltr.	LC	Herb
Asclepias fallax (Schltr.) Schltr.	LC	Herb
Aspidoglossum restioides (Schltr.) Kupicha	LC	Herb, succulent
Brachystelma incanum R.A.Dyer	**VU**	Geophyte, succulent
Pachycarpus schinzianus (Schltr.) N.E.Br.	LC	Herb, succulent
Raphionacme hirsuta (E.Mey.) R.A.Dyer	LC	Geophyte, herb, succulent
Raphionacme velutina Schltr.	LC	Geophyte, herb, succulent
Xysmalobium brownianum S.Moore	LC	Herb, succulent
Asparagus suaveolens Burch.	LC	Shrub
Chortolirion angolense (Baker) A.Berger	LC	Geophyte, succulent
Trachyandra laxa (N.E.Br.) Oberm. var. rigida (Suess.) Roessler	LC	Geophyte, succulent
Acanthospermum glabratum (DC.) Wild	Not Evaluated	Herb
Acanthospermum hispidum DC.	Not Evaluated	Herb
Arctotis arctotoides (L.f.) O.Hoffm.	LC	Herb
Centaurea melitensis L.	Not Evaluated	Herb
Conyza bonariensis (L.) Cronquist	Not Evaluated	Herb
Felicia fascicularis DC.	LC	Shrub
Flaveria bidentis (L.) Kuntze	Not Evaluated	Herb
Gazania krebsiana Less. subsp. serrulata (DC.) Roessler	LC	Herb
Geigeria brevifolia (DC.) Harv.	LC	Shrub

Geigeria burkei Harv. subsp. burkei var. zeyheri (Harv.) Merxm.	LC	Herb
Gerbera piloselloides (L.) Cass.	LC	Herb
Helichrysum aureum (Houtt.) Merr. var. monocephalum (DC.) Hilliard	LC	Herb
Helichrysum caespititium (DC.) Harv.	LC	Herb
Helichrysum callicomum Harv.	LC	Herb
Helichrysum cerastioides DC. var. cerastioides	LC	Herb
Senecio coronatus (Thunb.) Harv.	LC	Herb
Senecio venosus Harv.	LC	Herb
Sonchus oleraceus L.	Not Evaluated	Herb
Tarchonanthus parvicapitulatus P.P.J.Herman	LC	Shrub, tree
Ursinia nana DC. subsp. leptophylla Prassler	LC	Herb
Vernonia galpinii Klatt	LC	Herb
Xanthium strumarium L.	Not Evaluated	Herb
Lithospermum cinereum A.DC.	LC	Herb
Erucastrum strigosum (Thunb.) O.E.Schulz	LC	Herb
Lepidium africanum (Burm.f.) DC. subsp. africanum	LC	Herb
Raphanus raphanistrum L.	Not Evaluated	Herb
Sisymbrium turczaninowii Sond.	LC	Herb
Wahlenbergia denticulata (Burch.) A.DC. var. denticulata	LC	Herb
Wahlenbergia undulata (L.f.) A.DC.	LC	Herb
Cannabis sativa L. var. sativa	Not Evaluated	Herb
Cleome conrathii Burtt Davy	NT	Herb
Cleome maculata (Sond.) Szyszyl.	LC	Herb
Pollichia campestris Aiton	LC	Herb
Silene burchellii Otth var. angustifolia Sond.	Not Evaluated	Herb
Celtis africana Burm.f.	LC	Shrub, tree
Chenopodium multifidum L.	Not Evaluated	Herb
Parinari capensis Harv. subsp. capensis	LC	Dwarf shrub
Combretum erythrophyllum (Burch.) Sond.	LC	Shrub, tree
Combretum molle R.Br. ex G.Don	LC	Tree
Commelina africana L. var. krebsiana (Kunth) C.B.Clarke	LC	Herb
Convolvulus ocellatus Hook.f. var. ocellatus	LC	Herb
Convolvulus thunbergii Roem. & Schult.	LC	Herb
Ipomoea bolusiana Schinz	LC	Dwarf shrub, herb, succulent
Ipomoea crassipes Hook. var. crassipes	LC	Herb, succulent
Ipomoea gracilisepala Rendle	LC	Herb
Ipomoea oenotherae (Vatke) Hallier f. var.	LC	Herb

oenotherae		
Crassula lanceolata (Eckl. & Zeyh.) Endl. ex Walp. subsp. transvaalensis (Kuntze) Toelken	LC	Herb, succulent
Kalanchoe luciae Raym.-Hamet subsp. luciae	LC	Shrub, succulent
Acanthosicyos naudinianus (Sond.) C.Jeffrey	LC	Herb, succulent
Coccinia sessilifolia (Sond.) Cogn.	LC	Climber, herb, succulent
Cucumis hirsutus Sond.	LC	Herb, succulent
Cucumis myriocarpus Naudin subsp. myriocarpus	LC	Herb
Cyperus congestus Vahl	LC	Cyperoid, helophyte, herb
Cyperus esculentus L. var. esculentus	LC	Cyperoid, geophyte, herb, mesophyte
Kyllinga alba Nees	LC	Cyperoid, herb, mesophyte
Scabiosa columbaria L.	LC	Herb
Euclea natalensis A.DC. subsp. angustifolia F.White	LC	Shrub, tree
Euclea undulata Thunb.	LC	Shrub, tree
Eriospermum porphyrium Archibald	LC	Geophyte
Acalypha angustata Sond.	LC	Dwarf shrub, herb
Euphorbia clavarioides Boiss. var. truncata (N.E.Br.) A.C.White, R.A.Dyer & B.Sloane	LC	Dwarf shrub, shrub, succulent
Euphorbia davyi N.E.Br.	LC	Shrub, succulent
Euphorbia inaequilatera Sond. var. inaequilatera	LC	Dwarf shrub, herb
Acacia hereroensis Engl.	LC	Shrub, tree
Chamaecrista comosa E.Mey. var. capricornia (Steyaert) Lock	LC	Herb
Dolichos angustifolius Eckl. & Zeyh.	LC	Herb
Eriosema burkei Benth. ex Harv. var. burkei	LC	Herb
Indigofera filipes Benth. ex Harv.	LC	Dwarf shrub, herb, shrub
Indigofera heterotricha DC.	LC	Dwarf shrub, herb
Ophrestia oblongifolia (E.Mey.) H.M.L.Forbes var. oblongifolia	LC	Herb
Pearsonia cajanifolia (Harv.) Polhill subsp.	LC	Herb, shrub

cajanifolia		
Tephrosia elongata E.Mey. var. elongata	LC	Dwarf shrub, herb, shrub
Tephrosia longipes Meisn. subsp. longipes var. longipes	LC	Dwarf shrub, herb, shrub
Vigna unguiculata (L.) Walp. subsp. stenophylla (Harv.) Maréchal, Mascherpa & Stainier	LC	Climber, herb
Zornia linearis E.Mey.	LC	Herb
Pelargonium dolomiticum R.Knuth	LC	Dwarf shrub, succulent
Gisekia pharnacioides L. var. pharnacioides	LC	Herb
Dipcadi viride (L.) Moench	LC	Geophyte
Ledebouria ovatifolia (Baker) Jessop	LC	Geophyte
Hypoxis rigidula Baker var. rigidula	LC	Geophyte, herb
Moraea pallida (Baker) Goldblatt	LC	Geophyte, herb
Acrotome inflata Benth.	LC	Herb
Ocimum obovatum E.Mey. ex Benth. subsp. obovatum var. obovatum	LC	Herb
Rotheca hirsuta (Hochst.) R.Fern.	LC	Herb
Salvia disermas L.	LC	Herb, shrub
Salvia radula Benth.	LC	Herb
Teucrium trifidum Retz.	LC	Herb
Hermannia lancifolia Szyszyl.	LC	Herb
Hermannia stellulata (Harv.) K.Schum.	LC	Herb
Hermannia tomentosa (Turcz.) Schinz ex Engl.	LC	Herb
Hibiscus pusillus Thunb.	LC	Herb
Triumfetta sonderi Ficalho & Hiern	LC	Dwarf shrub
Antizoma angustifolia (Burch.) Miers ex Harv.	LC	Climber
Limeum fenestratum (Fenzl) Heimerl var. fenestratum	LC	Herb
Limeum viscosum (J.Gay) Fenzl subsp. viscosum var. kraussii Friedrich	LC	Herb
Limeum viscosum (J.Gay) Fenzl subsp. viscosum var. viscosum	LC	Herb
Myrsine africana L.	LC	Shrub
Ochna pulchra Hook.f.	LC	Shrub, tree
Oenothera tetraptera Cav.	Not Evaluated	Herb
Bonatea polypodantha (Rchb.f.) L.Bolus	LC	Geophyte, herb
Eulophia hereroensis Schltr.	LC	Geophyte, herb, succulent
Cycnium adonense E.Mey. ex Benth.	LC	Herb, parasite

Striga asiatica (L.) Kuntze	LC	Herb, parasite
Sesamum triphyllum Welw. ex Asch. var. triphyllum	LC	Herb
Plantago lanceolata L.	LC	Herb
Agrostis lachnantha Nees var. lachnantha	LC	Graminoid
Aristida congesta Roem. & Schult. subsp. congesta	LC	Graminoid
Bothriochloa bladhii (Retz.) S.T.Blake	LC	Graminoid
Brachiaria serrata (Thunb.) Stapf	LC	Graminoid
Digitaria ternata (A.Rich.) Stapf	LC	Graminoid
Eleusine coracana (L.) Gaertn. subsp. africana (Kenn.-O'Byrne) Hilu & de Wet	LC	Graminoid
Eragrostis biflora Hack. ex Schinz	LC	Graminoid
Eragrostis curvula (Schrad.) Nees	LC	Graminoid
Eragrostis racemosa (Thunb.) Steud.	LC	Graminoid
Eragrostis tef (Zuccagni) Trotter	Not Evaluated	Graminoid
Fingerhuthia africana Lehm.	LC	Graminoid
Hyparrhenia anamesa Clayton	LC	Graminoid
Hyparrhenia hirta (L.) Stapf	LC	Graminoid
Panicum coloratum L. var. coloratum	LC	Graminoid
Paspalum dilatatum Poir.	Not Evaluated	Graminoid
Pogonarthria squarrosa (Roem. & Schult.) Pilg.	LC	Graminoid
Schizachyrium sanguineum (Retz.) Alston	LC	Graminoid
Trachypogon spicatus (L.f.) Kuntze	LC	Graminoid
Oxygonum dregeanum Meisn. subsp. canescens (Sond.) Germish. var. canescens	LC	Herb
Rumex acetosella L. subsp. angiocarpus (Murb.) Murb.		Herb
Portulaca oleracea L.	Not Evaluated	Herb, succulent
Talinum caffrum (Thunb.) Eckl. & Zeyh.	LC	Dwarf shrub, herb, succulent
Potamogeton pusillus L.	LC	Herb, hydrophyte
Adiantum capillus-veneris L.	LC	Geophyte, herb, lithophyte
Pteris vittata L.	LC	Geophyte, herb, lithophyte
Ranunculus multifidus Forssk.		Herb
Riccia congoana Steph.		Bryophyte
Anthospermum rigidum Eckl. & Zeyh. subsp. rigidum	LC	Dwarf shrub
Kohautia amatymbica Eckl. & Zeyh.	LC	Herb

Kohautia caespitosa Schnizl. subsp. brachyloba (Sond.) D.Mantell	LC	Herb
Oldenlandia herbacea (L.) Roxb. var. herbacea	LC	Herb
Rubia horrida (Thunb.) Puff	LC	Herb
Thesium utile A.W.Hill	LC	Herb, parasite
Aptosimum elongatum Engl.	LC	Dwarf shrub
Chaenostoma patrioticum (Hiern) Kornhall	LC	Herb
Hebenstretia comosa Hochst.	LC	Herb
Nemesia fruticans (Thunb.) Benth.	LC	Dwarf shrub, suffrutex
Cheilanthes viridis (Forssk.) Sw. var. glauca (Sim) Schelpe & N.C.Anthony	LC	Geophyte, herb, lithophyte
Datura stramonium L.	Not Evaluated	Herb, shrub
Physalis angulata L.	Not Evaluated	Herb
Physalis peruviana L.	Not Evaluated	Herb, shrub
Solanum nigrum L.	Not Evaluated	Herb
Solanum retroflexum Dunal	LC	Herb
Withania somnifera (L.) Dunal	LC	Dwarf shrub, herb, shrub
Walleria nutans J.Kirk	LC	Geophyte
Gnidia kraussiana Meisn. var. kraussiana	LC	Dwarf shrub, shrub
Gnidia sericocephala (Meisn.) Gilg ex Engl.	LC	Dwarf shrub, shrub
Chascanum adenostachyum (Schauer) Moldenke	LC	Herb
Chascanum pinnatifidum (L.f.) E.Mey. var. pinnatifidum	LC	Herb
Lantana rugosa Thunb.	LC	Shrub

Appendix 3: Plant species list (site results)

Scientific Name	**Common Name**	**Ecological Status**	**Form**
Ziziphus mucronata	Buffalo thorn	Medicinal	Tree
Aristida congesta barbicolis	Spreading three awn	Pioneer Increase 2	Grass
Aristida congesta congesta	Tassel Tree-awn	Increaser 2 - Pioneer	Grass
Searsia lancea	Karee	Edible fruit	Tree
Diospyros lycioides	Bluebush		Tree
Searsia pyroides	Common wild current		Shrub
Acacia tortillis	Umbrella thorn	Medicinal	Tree
Asparagus africanus	Bush asparagus	Medicinal	Herb
Setaria sphacelata var. sphacelata	Bristle Grass	Decreaser - Climax	Grass
Cymbopogon caesius	Broad-leaved Turpentine Grass	Increaser 1 - Climax	Grass
Dicoma anomala		Medicinal	Herb
Melinis repens	Natal Red Top	Increaser 2 - Pioneer to subclimax	Grass
Chloris virgata	Feather top chloris	Pioneer increaser 2	Grass
Seriphium plumosum	Bankrupt Bush	Weed	Shrub
Eragrostis trichophora	Hairy Love Grass	Increaser 2 - Subclimax	Grass
Senecio inornatus		Medicinal	Herb
Schizachyrium sanguineum	Red Autumn Grass	Increaser 1 - Climax	Grass
Eragrostis racemosa	Narrow Heart Love Grass	Increaser 2 - Subclimax	Grass
Trichoneura grandiglumis	Small Rolling Grass	Increaser 2 - Subclimax	Grass
Sporobolus centrifugus	Olive Dropseed	Climas/Increaser2	Grass
Heteropogon contortus	Spear Grass	Increaser 2 - Subclimax	Grass
Blepharus subvolubilis			Herb
Hyparrhenia hirta	Common Thatching Grass	Increaser 1 - Subclimax to climax	Grass
Themeda triandra	Red Grass	Decreaser - Climax	Grass
Pogonarthria squarrosa	Herringbone Grass	Increaser 2 - Subclimax	Grass
Clematis brachiata	Travelers joy		Herb
Trachypogon spicatus	Giant Spear Grass	Increaser 1 - Climax	Grass
Boscia foetida subsp rehmanniana	Stink bush		Tree
Indigofera velutina	Grey leaved indigo		Herb
Cylindropuntia imbricata	Devil's rope pear		Succulent
Eucalyptus camaldulensis	Red River Gum	Alien Invasive**	Tree
Eucalyptus grandis		Alien Invasive**	Tree
Aristida stipitata	Long awned grass	Pioneer Subclimax Increaser 2	Grass
Schizachyrium jeffreysii	Silky Autumn Grass	Increaser 1	Grass
Striga aziatica			Herb
Boophane disticha	Poison bulb	**Protected**	Herb

Crinum bulbispermum	Orange/Vaal River Lily	**Medicinal, Protected Declining**	Herb

Common name	***Scientific name***
Barbet, Black-collared	*Lybius torquatus*
Barbet, Crested	*Trachyphonus vaillantii*
Bee-eater, Blue-cheeked	*Merops persicus*
Bee-eater, European	*Merops apiaster*
Bee-eater, Swallow-tailed	*Merops hirundineus*
Bishop, Southern Red	*Euplectes orix*
Bishop, Yellow-crowned	*Euplectes afer*
Bokmakierie, Bokmakierie	*Telophorus zeylonus*
Bulbul, African Red-eyed	*Pycnonotus nigricans*
Bulbul, Dark-capped	*Pycnonotus tricolor*
Buzzard, Steppe	*Buteo vulpinus*
Canary, Black-throated	*Crithagra atrogularis*
Canary, Yellow	*Crithagra flaviventris*
Canary, Yellow-fronted	*Crithagra mozambicus*
Chat, Anteating	*Myrmecocichla formicivora*
Cisticola, Cloud	*Cisticola textrix*
Cisticola, Desert	*Cisticola aridulus*
Cisticola, Levaillant's	*Cisticola tinniens*
Cisticola, Rattling	*Cisticola chiniana*
Cisticola, Zitting	*Cisticola juncidis*
Cliff-swallow, South African	*Hirundo spilodera*
Coot, Red-knobbed	*Fulica cristata*
Cormorant, Reed	*Phalacrocorax africanus*

Cormorant, White-breasted	*Phalacrocorax carbo*
Coucal, Burchell's	*Centropus burchellii*
Coucal, White-browed	*Centropus superciliosus*
Courser, Double-banded	*Rhinoptilus africanus*
Crane, Blue	*Anthropoides paradiseus*
Crombec, Long-billed	*Sylvietta rufescens*
Crow, Cape	*Corvus capensis*
Crow, Pied	*Corvus albus*
Cuckoo, Diderick	*Chrysococcyx caprius*
Darter, African	*Anhinga rufa*
Dove, Laughing	*Streptopelia senegalensis*
Dove, Namaqua	*Oena capensis*
Dove, Red-eyed	*Streptopelia semitorquata*
Dove, Rock	*Columba livia*
Duck, Comb	*Sarkidiornis melanotos*
Duck, Maccoa	*Oxyura maccoa*
Duck, White-backed	*Thalassornis leuconotus*
Duck, White-faced	*Dendrocygna viduata*
Duck, Yellow-billed	*Anas undulata*
Egret, Cattle	*Bubulcus ibis*
Egret, Great	*Egretta alba*
Egret, Little	*Egretta garzetta*
Egret, Yellow-billed	*Egretta intermedia*
Eremomela, Yellow-bellied	*Eremomela icteropygialis*

Falcon, Amur	*Falco amurensis*
Finch, Red-headed	*Amadina erythrocephala*
Finch, Scaly-feathered	*Sporopipes squamifrons*
Firefinch, Red-billed	*Lagonosticta senegala*
Fiscal, Common (Southern)	*Lanius collaris*
Flycatcher, Fiscal	*Sigelus silens*
Flycatcher, Marico	*Bradornis mariquensis*
Flycatcher, Spotted	*Muscicapa striata*
Francolin, Orange River	*Scleroptila levaillantoides*
Goose, Egyptian	*Alopochen aegyptiacus*
Goose, Spur-winged	*Plectropterus gambensis*
Grebe, Little	*Tachybaptus ruficollis*
Greenshank, Common	*Tringa nebularia*
Guineafowl, Helmeted	*Numida meleagris*
Hamerkop, Hamerkop	*Scopus umbretta*
Heron, Black	*Egretta ardesiaca*
Heron, Black-headed	*Ardea melanocephala*
Heron, Grey	*Ardea cinerea*
Heron, Purple	*Ardea purpurea*
Hoopoe, African	*Upupa africana*
Ibis, African Sacred	*Threskiornis aethiopicus*
Ibis, Glossy	*Plegadis falcinellus*
Ibis, Hadeda	*Bostrychia hagedash*
Indigobird, Village	*Vidua chalybeata*

Kestrel, Greater	*Falco rupicoloides*
Kestrel, Lesser	*Falco naumanni*
Kestrel, Rock	*Falco rupicolus*
Kingfisher, Brown-hooded	*Halcyon albiventris*
Kingfisher, Pied	*Ceryle rudis*
Kite, Black-shouldered	*Elanus caeruleus*
Kite, Yellow-billed	*Milvus aegyptius*
Korhaan, Northern Black	*Afrotis afraoides*
Lapwing, Blacksmith	*Vanellus armatus*
Lapwing, Crowned	*Vanellus coronatus*
Lark, Agulhas Clapper	*Mirafra marjoriae*
Lark, Cape Clapper	*Mirafra apiata*
Lark, Eastern Clapper	*Mirafra fasciolata*
Lark, Red-capped	*Calandrella cinerea*
Lark, Rufous-naped	*Mirafra africana*
Lark, Spike-heeled	*Chersomanes albofasciata*
Longclaw, Cape	*Macronyx capensis*
Martin, Brown-throated	*Riparia paludicola*
Masked-weaver, Southern	*Ploceus velatus*
Moorhen, Common	*Gallinula chloropus*
Mousebird, Red-faced	*Urocolius indicus*
Mousebird, Speckled	*Colius striatus*
Mousebird, White-backed	*Colius colius*
Neddicky, Neddicky	*Cisticola fulvicapilla*

Night-Heron, Black-crowned	*Nycticorax nycticorax*
Owl, Barn	*Tyto alba*
Owl, Marsh	*Asio capensis*
Palm-swift, African	*Cypsiurus parvus*
Paradise-whydah, Long-tailed	*Vidua paradisaea*
Pigeon, Speckled	*Columba guinea*
Pipit, African	*Anthus cinnamomeus*
Pipit, Long-billed	*Anthus similis*
Plover, Kittlitz's	*Charadrius pecuarius*
Plover, Three-banded	*Charadrius tricollaris*
Pochard, Southern	*Netta erythrophthalma*
Pratincole, Black-winged	*Glareola nordmanni*
Prinia, Black-chested	*Prinia flavicans*
Prinia, Tawny-flanked	*Prinia subflava*
Pytilia, Green-winged	*Pytilia melba*
Quailfinch, African	*Ortygospiza atricollis*
Quelea, Red-billed	*Quelea quelea*
Robin-chat, Cape	*Cossypha caffra*
Roller, Lilac-breasted	*Coracias caudatus*
Roller, Purple	*Coracias naevius*
Ruff, Ruff	*Philomachus pugnax*
Rush-warbler, Little	*Bradypterus baboecala*
Sandpiper, Common	*Actitis hypoleucos*

Sandpiper, Curlew	*Calidris ferruginea*
Sandpiper, Marsh	*Tringa stagnatilis*
Sandpiper, Wood	*Tringa glareola*
Scrub-robin, Kalahari	*Cercotrichas paena*
Secretarybird, Secretarybird	*Sagittarius serpentarius*
Shoveler, Cape	*Anas smithii*
Shrike, Crimson-breasted	*Laniarius atrococcineus*
Shrike, Lesser Grey	*Lanius minor*
Shrike, Red-backed	*Lanius collurio*
Snipe, African	*Gallinago nigripennis*
Sparrow, Cape	*Passer melanurus*
Sparrow, House	*Passer domesticus*
Sparrow, Northern Grey-headed	*Passer griseus*
Sparrow, Southern Grey-headed	*Passer diffusus*
Sparrow-weaver, White-browed	*Plocepasser mahali*
Sparrowlark, Chestnut-backed	*Eremopterix leucotis*
Sparrowlark, Grey-backed	*Eremopterix verticalis*
Spoonbill, African	*Platalea alba*
Spurfowl, Swainson's	*Pternistis swainsonii*
Starling, Cape Glossy	*Lamprotornis nitens*
Starling, Pied	*Spreo bicolor*

Starling, Wattled	*Creatophora cinerea*
Stilt, Black-winged	*Himantopus himantopus*
Stint, Little	*Calidris minuta*
Stonechat, African	*Saxicola torquatus*
Stork, Abdim's	*Ciconia abdimii*
Sunbird, White-bellied	*Cinnyris talatala*
Swallow, Barn	*Hirundo rustica*
Swallow, Greater Striped	*Hirundo cucullata*
Swallow, Red-breasted	*Hirundo semirufa*
Swallow, White-throated	*Hirundo albigularis*
Swamp-warbler, Lesser	*Acrocephalus gracilirostris*
Swift, Little	*Apus affinis*
Swift, White-rumped	*Apus caffer*
Tchagra, Brown-crowned	*Tchagra australis*
Teal, Red-billed	*Anas erythrorhyncha*
Tern, Whiskered	*Chlidonias hybrida*
Tern, White-winged	*Chlidonias leucopterus*
Thick-knee, Spotted	*Burhinus capensis*
Thrush, Groundscraper	*Psophocichla litsipsirupa*
Thrush, Karoo	*Turdus smithi*
Thrush, Kurrichane	*Turdus libonyanus*
Thrush, Olive	*Turdus olivaceus*
Tit-babbler, Chestnut-vented	*Parisoma subcaeruleum*

Turtle-dove, Cape	*Streptopelia capicola*
Wagtail, Cape	*Motacilla capensis*
Warbler, Willow	*Phylloscopus trochilus*
Waxbill, Blue	*Uraeginthus angolensis*
Waxbill, Common	*Estrilda astrild*
Weaver, Cape	*Ploceus capensis*
Wheatear, Capped	*Oenanthe pileata*
White-eye, Cape	*Zosterops virens*
White-eye, Orange River	*Zosterops pallidus*
Whydah, Pin-tailed	*Vidua macroura*
Widowbird, Long-tailed	*Euplectes progne*
Widowbird, White-winged	*Euplectes albonotatus*

HERITAGE IMPACT ASSESSMENT FOR A PROPOSED SMALL-SCALE ALLUVIAL DIAMOND AND MANGANESE MINE ON FARM WELVERDIEND 361 JP, LICHTENBURG MAGISTERIAL DISTRICT, NORTH WEST

SAHRA Case No.: 9656

Required under Section 38 (8) of the National Heritage Resources Act (No. 25 of 1999).

Report for:

CSIR – Environmental Management Services
P.O. Box 320, Stellenbosch, 7599
Tel: (021) 888 2432
Email: bmqokeli@csir.co.za

On behalf of:

Kwa-Nozici Minerals (Pty) Ltd

Dr Jayson Orton
ASHA Consulting (Pty) Ltd
6A Scarborough Road, Muizenberg, 7945
Tel: (021) 788 8425 | 083 272 3225
Email: jayson@asha-consulting.co.za

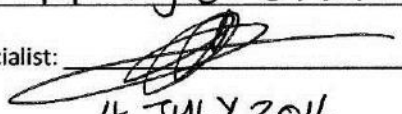
4 July 2016

Specialist declaration

I, JAYSON ORTON, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Name of Specialist: Dr Jayson Orton

Signature of the specialist: 

Date: 4 JULY 2016

EXECUTIVE SUMMARY

ASHA Consulting (Pty) Ltd was appointed by the Council for Scientific and Industrial Research (CSIR) to conduct an assessment of the potential impacts to heritage resources that might occur through the proposed establishment of a small-scale alluvial diamond and manganese mine on Portions 1 and 35 of the farm Welverdiend 361 JP, some 20 km north of central Lichtenburg.

The site is flat and covered in indigenous vegetation, although gum trees from a nearby plantation have encroached into its south-western corner. The substrate is largely composed of gravel and rock fragments. In the south-western corner there is evidence of historical diamond digging in the form of shallow holes and spoil heaps that have eroded with time.

The site inspection revealed a rectangular stone feature that seems most likely to represent stones cleared to the side of a field and, just outside the study area to its south, a circular stone and cement foundation that may be the base of a reservoir. Some small fossil stromatolites were also found.

None of these heritage resources is deemed to have high cultural significance and, as such, no further heritage actions are required prior to the commencement of mining. However, the project Environmental Control Officer (ECO) and/or mine manager should be aware of the possibility of uncovering fossil wood and/or large stromatolites during excavations. Should any such finds be made they should be safeguarded, preferably *in situ*, and reported to SAHRA (Tel: 021 462 4502). A palaeontologist may need to be appointed to examine and, if necessary rescue the finds and associated scientific data.

Because there will be no significant impacts to heritage resources, it is recommended that the proposed mining project should be authorised but subject to the following condition (which should be included in the environmental authorisation):

- If any archaeological or palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist or palaeontologist as appropriate. Such heritage is the property of the state and may require excavation and curation in an approved institution. The project EMPr should make reference to this possibility so that appropriate action can be taken as and when necessary.

Glossary

Early Stone Age: Period of the Stone Age extending approximately between 2 million and 200 000 years ago.

Later Stone Age: Period of the Stone Age extending over the last approximately 20 000 years.

Middle Stone Age: Period of the Stone Age extending approximately between 200 000 and 20 000 years ago.

Abbreviations

APHP: Association of Professional Heritage Practitioners

ASAPA: Association of Southern African Professional Archaeologists

BAR: Basic Assessment Report

CRM: Cultural Resources Management

CSIR: Council for Scientific and Industrial Research

ECO: Environmental Control Officer

ESA: Early Stone Age

GPS: global positioning system

HIA: Heritage Impact Assessment

LSA: Later Stone Age

MSA: Middle Stone Age

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

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

NWPHRA: North West Provincial Heritage Resources Authority

PHS: Provincial Heritage Site

PPP: Public Participation Process

SAHRA: South African Heritage Resources Agency

SAHRIS: South African Heritage Resources Information System

Compliance with Appendix 6 of the 2014 EIA Regulations

Requirements of Appendix 6 – GN R982	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 1.4 Appendix 1
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	page ii
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.3
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 3.2
e) a description of the methodology adopted in preparing the report or carrying out the specialised process;	Section 3
f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;	Section 1.1
g) an identification of any areas to be avoided, including buffers;	n/a
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	n/a
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 3.5
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	Section 6
k) any mitigation measures for inclusion in the EMPr;	Sections 7 & 9
l) any conditions for inclusion in the environmental authorisation;	Section 11
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 9
n) a reasoned opinion- i. as to whether the proposed activity or portions thereof should be authorised; and ii. if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 11
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	n/a (Section 3.6)
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	n/a
q) any other information requested by the competent authority.	n/a

Contents

1. INTRODUCTION

ASHA Consulting (Pty) Ltd was appointed by the Council for Scientific and Industrial Research (CSIR) to conduct an assessment of the potential impacts to heritage resources that might occur through the proposed establishment of a small-scale alluvial diamond and manganese mine on Portions 1 and 35 of the farm Welverdiend 361 JP (Figures 1 & 2). The site lies some 20 km north of central Lichtenburg.

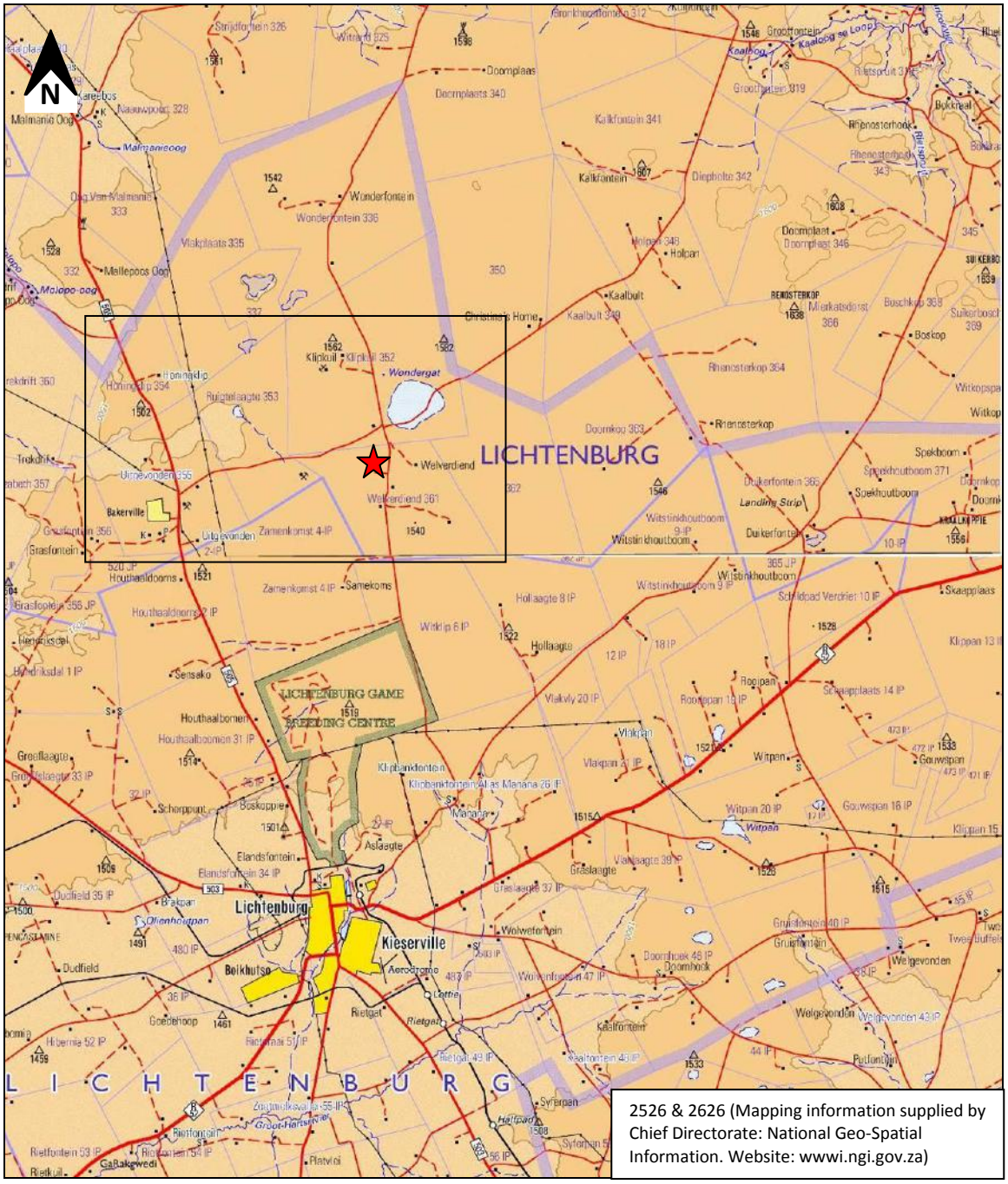


Figure 1: *Map (1:250 000) showing the location of the site some 20 km north of the town of Lichtenburg. The area enclosed by the box is enlarged in Figure 2.*

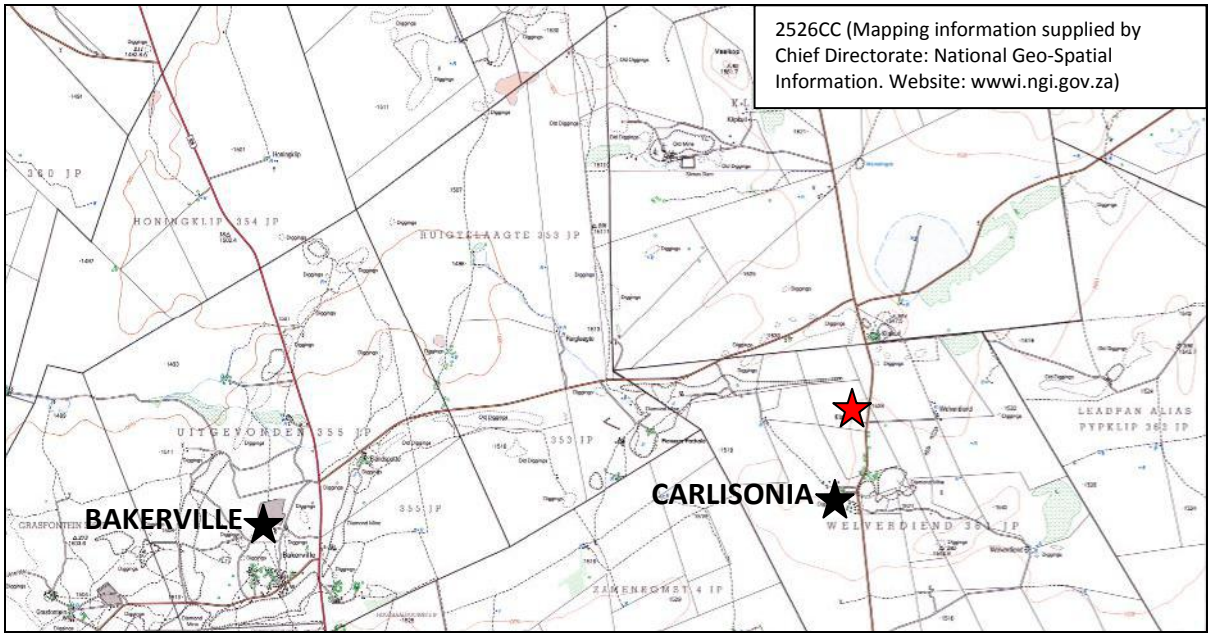


Figure 2: *Map (1:50 000) showing the location of the site (red star) 10.5 km east of the village of Bakerville and 1.5 km north of Carlisonia.*

1.1. Project description

The establishment of a small-scale alluvial diamond and manganese mine has been proposed by Kwa-Nozici Minerals (Pty) Ltd. The mine will cover 5 ha of land and will include a camp where mining equipment and associated processing infrastructure and facilities will be located. The mining operations will involve excavation and processing (crushing, grading, washing and sorting) of minerals.

All aspects of the proposed project have the potential to impact on heritage resources.

No alternatives have been identified for the project.

1.2. Terms of reference

ASHA Consulting was requested to conduct a heritage impact assessment that would meet the requirements of the South African Heritage Resources Agency (SAHRA). SAHRA, when notified about the project, requested that a heritage impact assessment be carried out. The assessment should include archaeology and any other applicable heritage components (SAHRA comment dated 07 June 2016).

It should also be noted, however, that following S.38(3) of the National Heritage Resources Act (No. 25 of 1999), even though certain specialist studies may be specifically requested, all heritage resources should be identified and assessed.

1.3. Scope and purpose of the report

A heritage impact assessment (HIA) is a means of identifying any significant heritage resources before development begins so that these can be managed in such a way as to allow the development to proceed (if appropriate) without undue impacts to the fragile heritage of South Africa. This HIA report aims to fulfil the requirements of the heritage authorities such that a comment can be issued for consideration by North West Department of Mineral Resources who will review the Basic Assessment report (BAR) and grant or withhold authorisation. The HIA report will outline any mitigation requirements that will need to be complied with from a heritage point of view and that should be included in the conditions of authorisation should this be granted.

1.4. The author

Dr Jayson Orton has an MA (UCT, 2004) and a D.Phil (Oxford, UK, 2013), both in archaeology, and has been conducting Heritage Impact Assessments and archaeological specialist studies throughout the western half of South Africa since 2004 (Please see curriculum vitae included as Appendix 1). He has also conducted research on aspects of the Later Stone Age in Northern and Western Cape and published widely on the topic. He is an accredited heritage practitioner with the Association of Professional Heritage Practitioners (APHP) and also holds archaeological accreditation with the Association of Southern African Professional Archaeologists (ASAPA) CRM section (Member #233) as follows:

- Principal Investigator: Stone Age, Shell Middens & Grave Relocation; and
- Field Director: Colonial Period & Rock Art.

2. HERITAGE LEGISLATION

The National Heritage Resources Act (NHRA) No. 25 of 1999 protects a variety of heritage resources as follows:

- Section 34: structures older than 60 years;
- Section 35: palaeontological, prehistoric and historical material (including ruins) more than 100 years old;
- Section 36: graves and human remains older than 60 years and located outside of a formal cemetery administered by a local authority; and
- Section 37: public monuments and memorials.

Following Section 2, the definitions applicable to the above protections are as follows:

- **Structures**: “any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith”;
- **Palaeontological material**: “any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace”;
- **Archaeological material**: a) “material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years,

including artefacts, human and hominid remains and artificial features and structures"; b) "rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation"; c) "wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the Republic, as defined respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation"; and d) "features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found";

- **Grave**: "means a place of interment and includes the contents, headstone or other marker of such a place and any other structure on or associated with such place"; and
- **Public monuments and memorials**: "all monuments and memorials a) "erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organisation funded by or established in terms of the legislation of such a branch of government"; or b) "which were paid for by public subscription, government funds, or a public-spirited or military organisation, and are on land belonging to any private individual."

While landscapes with cultural significance do not have a dedicated Section in the NHRA, they are protected under the definition of the National Estate (Section 3). Section 3(2)(c) and (d) list "historical settlements and townscapes" and "landscapes and natural features of cultural significance" as part of the National Estate. Furthermore, Section 3(3) describes the reasons a place or object may have cultural heritage value; some of these speak directly to cultural landscapes.

Section 38 (2a) states that if there is reason to believe that heritage resources will be affected then an impact assessment report must be submitted. This report fulfils that requirement.

Under the National Environmental Management Act (No. 107 of 1998; NEMA), as amended, the project is subject to a BAR. SAHRA (for archaeology and palaeontology) and the North West Provincial Heritage Resources Authority (NWPHRA; for built environment and landscapes) are required to provide comment on the proposed project in order to facilitate final decision making by the North West Department of Mineral Resources.

3. METHODS

3.1. Literature survey and information sources

A survey of available literature was carried out to assess the general heritage context into which the development would be set. This literature included published material, unpublished commercial reports and online material, including reports sourced from the

South African Heritage Resources Information System (SAHRIS). The 1:50 000 and 1:250 000 maps and the historical aerial photographs were sourced from the Chief Directorate: National Geo-Spatial Information.

3.2. Field survey

The site was subjected to a detailed foot survey on 28 June 2016. This was during mid-winter. Vegetation was low and dry and ground visibility was generally good. During the survey the positions of finds were recorded on a hand-held GPS receiver set to the WGS84 datum. Photographs were taken at times in order to capture representative samples of both the affected heritage and the landscape setting of the proposed development.

3.3. Impact assessment

For consistency, the impact assessment was conducted through application of a scale supplied by the CSIR.

3.4. Grading

Section 7 of the NHRA provides for the grading of heritage resources into those of National (Grade 1), Provincial (Grade 2) and Local (Grade 3) significance. Grading is intended to allow for the identification of the appropriate level of management for any given heritage resource. Grade 1 and 2 resources are intended to be managed by the national and provincial heritage resources authorities, while Grade 3 resources would be managed by the relevant local planning authority. These bodies are responsible for grading, but anyone may make recommendations for grading.

3.5. Assumptions and limitations

The study is carried out at the surface only and hence any completely buried archaeological sites or palaeontological material will not be readily located. Similarly, it is not always possible to determine the depth of such material visible at the surface.

3.6. Consultation processes undertaken

The NHRA requires consultation as part of an HIA but, since the present study falls within the context of an EIA which includes a public participation process (PPP), no dedicated consultation was undertaken as part of the HIA.

4. PHYSICAL ENVIRONMENTAL CONTEXT

4.1. Site context

The site lies in a rural area but there are many small-scale mining operations scattered throughout the region. A gravel road and small electricity line run past the eastern edge of

the site. Other infrastructure is lacking from the general area. The farmland in the broader region is mostly used for livestock grazing.

4.2. Site description

The site is flat land and has a large grove of blue gum trees just outside its south-western corner (Figure 3). The surface has gravel and rock fragments in some places (Figure 4), while in others the substrate is revealing stromatolites far sandier. Most of the rock fragments are rich in iron and/or manganese, but some calcrete also occurs. In the northern part a few small lumps of *in situ* dolomite were noted. Natural vegetation occurs throughout the site, although a few smaller gum trees lie just within the south-western corner. The sparseness of larger bushes meant that the site was open and visibility across it was good. It is evident that some very small scale exploration for diamonds has taken place in the south-western corner but none of the holes was more than about 0.5 m deep with erosion having resulted in much material having washed back into them. A number of piles of soil and gravel are also present (Figure 6).

Figure 3: *View across the site towards the gum trees just beyond the southwest corner. The road lies to the left where the telephone pole stands.*

Figure 4: *View of the mixed gravel substrate.*

Figure 5: *View of the sandy substrate in*

in the south-western part of the site *the north-western part of the site.*

Figure 6: *Disturbed area where historical diamond exploration has taken place.*

5. CULTURAL HERITAGE CONTEXT

This section of the report contains the desktop study and establishes what is already known about heritage resources in the vicinity of the study area. What was found during the field survey as presented below may then be compared with what is already known in order to gain an improved understanding of the significance of the newly reported resources.

5.1. Archaeological aspects

The National Cultural History Museum (1995) conducted a broad survey of the general area, including Farm 361. They report on the presence of Early Stone Age (ESA) artefacts at the diamond mines, while Van Schalkwyk (2008) notes that ESA and Middle Stone Age (MSA) artefacts have been unearthed in the various diamond mines of the area and are also sometimes found along river courses. Further west, the gravels of the lower Vaal River are very well known for the ESA material and fossil animal bones that they have produced (Cooke 1949; Goodwin 1928; Klein 1988; Peringuey 1911). Whether the same degree of archaeological and fossil material might be present further east in palaeo-river channels is not known, but at least some artefactual material has been collected from the region (Mitchell 2002; Peringuey 1911). The National Cultural History Museum (1995) also noted the existence of earlier mining settlements in the area with one (Carlisonia) having been reduced to rubble and another (Grasfontein) being represented solely by its general dealer's shop. In a more detailed survey of a site just north of Lichtenburg, Hutten (2012) was unable to locate any heritage resources. Van Schalkwyk (2008), too, found no Stone Age material on his linear survey extending north-westwards from Lichtenburg through Bakerville. We do know, however, that Later Stone Age (LSA) engravings do occur on dolomitic rocks in the general area (Willcox 1963; Figure 7). The Gestoptefontein-Driekuil Complex is a well-known set of engraving sites occurring some 90 km to the southwest of the study area and that

include both Stone Age and historical imagery (Hollman 2011). Iron Age archaeology is well-known to occur in the general region, although the lack of suitable building rock in the area is the likely reason why kraal structures have not been recorded here. Mason (1968:172) noted that "Iron Age settlers avoided extensive grasslands such as the grasslands of the western Karoo Highveld on the Lichtenburg Plain, possibly because of the rarity of surface streams and low relief which denied water and natural topographic protection to settlers in such territory."

Figure 7: *Extract of a map showing the distribution of rock engravings (\\\) and paintings (///) in South Africa. The present study area lies to the northeast of Site 13 (Gestoptefontein) on the map (red oval). Source: Willcox (1963: fig. 2).*

5.2. Historical aspects and the built environment

Lichtenburg was a farming community that developed during the latter half of the nineteenth century. The town itself was established in 1873. The nearby village of Bakerville lies at the site of the early twentieth century diamond diggings.

Lichtenburg saw action during the South African War (a.k.a. Anglo-Boer War). The town was a strategic position and was held by both the Boer and British forces in turn. Colonel Robert Baden-Powell led a large British force to secure the town and surrounding territory in November 1900, but on Sunday 3rd March 1901 some 400 Boers under the joint commands of Generals De la Rey, Smuts, Celliers, Vermaas and Lemmer attacked the town. This was the Battle of Lichtenburg. Fourteen Boers and eighteen British were killed, while 38 Boers and 24 British were wounded (Van Vuuren 2015).

The first diamond to be discovered in the area was found in 1924 on the farm Elandsputte by John Voorendyk when digging a hole to construct a cattle dip. However, the State Geologist at the time, Dr Harger, was unconvinced of the nature of the deposits and it was

only two years later when diamonds were again discovered in the area that Dr Harger commenced prospecting. Ironically, and due to a navigational error on his part subsequent work by him was carried out on part of Elandsputte and his rich findings there precipitated the 1926 Lichtenburg diamond rush (Smith 2006). Figures 8 and 9 show early mining scenes from the area. Voorendyk's cattle dip was declared a National Monument (now a Provincial Heritage Site [PHS]) in 1980 (SAHRA n.d.).

Figure 8: *Grasfontein Diamond Diggings, 1927 (Source: Smith 2006).*

Figure 9: *Vaalboschpatte Diamond Diggings (Source: Smith 2006).*

The National Cultural History Museum (1995) noted that the historic diamond mining landscape was constantly changing as a result of people reworking old mine dumps and sometimes using the material to refill old mine pits. The area was also found to be littered

with old equipment and machinery, while a variety of corrugated iron structures dating to the old mining days were also noted.

The National Cultural History Museum (1995) also recorded a number of cemeteries in the area. These were for either black or white people and were generally in very poor condition.

6. FINDINGS OF THE HERITAGE STUDY

This section describes the heritage resources recorded in the study area during the course of the project.

6.1. Palaeontology

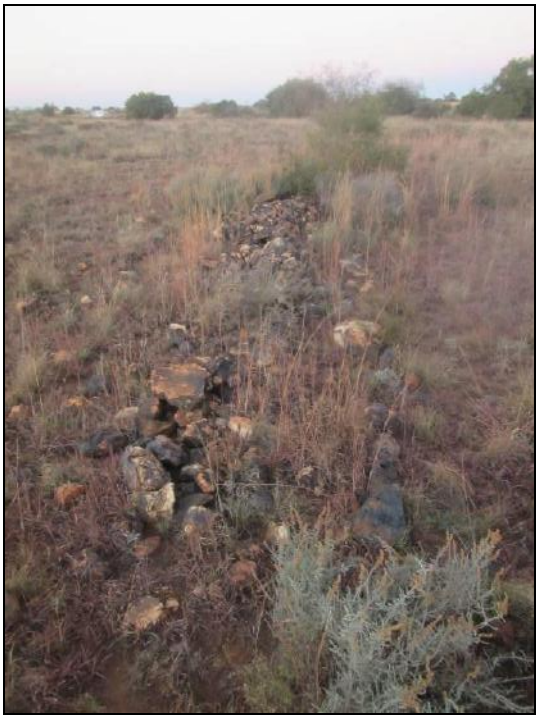
The palaeontological resources of the study area include stromatolites within the dolomites of the Malmani Subgroup and possible fossil wood and pollens within the gravels. Small stromatolites were seen on site but these are common and of far less significance than larger examples. Please see the palaeontological specialist study by Dr John Almond contained in Appendix 2 for further details.

6.2. Archaeology

No archaeological material, whether Stone Age or Iron Age, was found during the ground survey. The only signs of human activity consisted of a circular stone and cement foundation (waypoint 167; Figure 10), some stone alignments (waypoints 163-166; Figures 11 and 12), and the old diggings mentioned above (Figure 6).

The circular foundation is perhaps for a reservoir. It is of unknown age but may well date to the mid-twentieth century. If less than 100 years of age then it does not qualify as generally protected archaeological heritage under the NHRA. The stone alignments are variable and irregular in form but they trace a rough rectangle in the southern part of the site (Figure 13), suggesting perhaps that they had been cleared to the edges of a field. At times the alignments are of two lines of stones, while in places there are larger mounds in between the lines. This feature, too, is of unknown age and may also be twentieth century. The diggings we know to have occurred during the late 1920s.

Figure 10: *The circular foundation found at waypoint 167.*



Figures 11 & 12: *Two views of the alignments of rocks forming a rough rectangle in the southern part of the study area.*

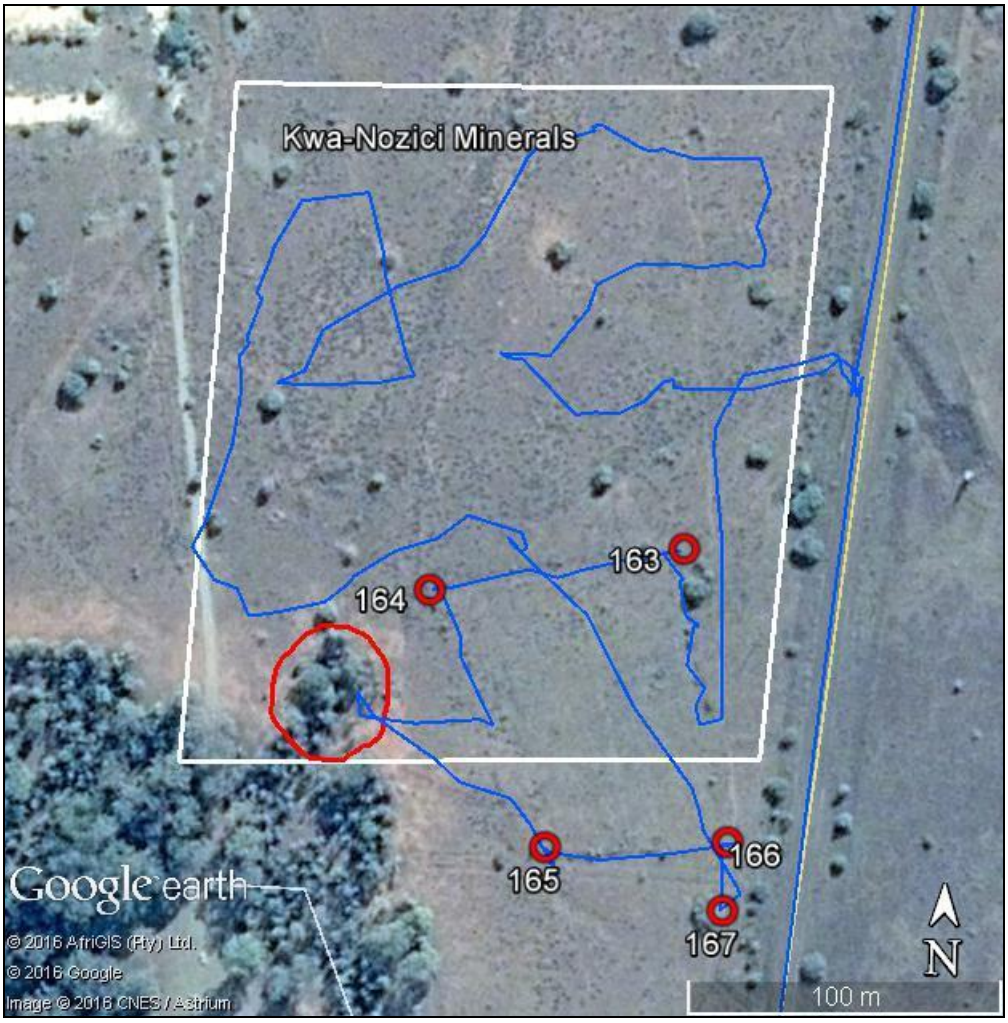


Figure 13: *Aerial view of the study area showing the locations of finds. 163-166 = rectangular stone alignments, 167 = circular foundation, red circle = diggings. The blue lines indicate the walk paths created during the survey and the white polygon shows the study area. The gravel road lies to the east.*

6.3. Graves

There was no evidence of any graves within the study area. Unmarked graves are highly unlikely because of the rocky substrate.

6.4. Built environment

There were no built heritage features within the study area.

6.5. Cultural landscape

The cultural landscape is poorly developed and relates to two aspects. The first and older aspect is the agricultural one. The area is used for livestock grazing and, as such, fences and other features of the landscape like gum tree plantations have been created for agricultural purposes. The second and more important aspect is the landscape of alluvial diamond

digging from the late 1920s Lichtenburg diamond rush. The present site was not subjected to much activity in this regard with only a few small excavations and spoil heaps testifying to this activity having occurred. Further afield though there was plenty of activity with the landscape being severely pock-marked as a result. Fairly large-scale digging occurred some 1.4 km north and 1.3 km south of the present study area. Figure 14 shows the site as it appeared in 1957. The only changes are the additional indigenous tree growth over the general landscape, the additional gum tree growth around the plantation and the loss of all the small tracks as the vegetation recovered. Unfortunately the site was just missed by the 1944 aerial survey of the area.

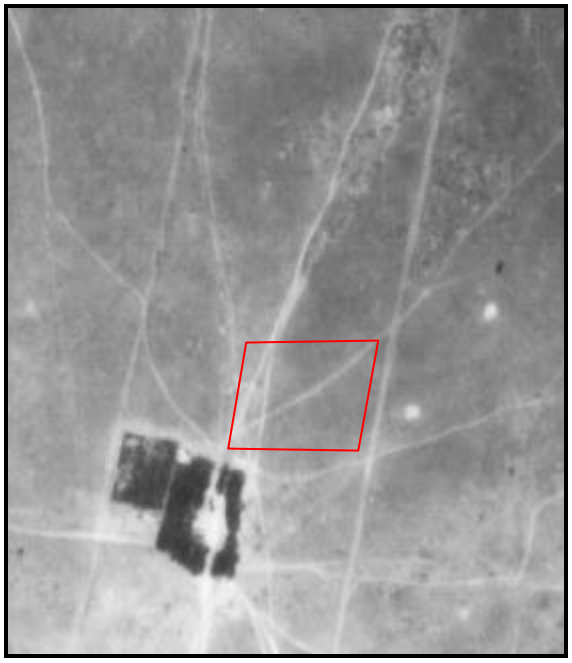


Figure 14: *Aerial view of the study area as seen in 1957 (Job 389, Strip 25, photograph 08484).*

6.6. Statement of significance

Section 38(3)(b) of the NHRA requires an assessment of the significance of all heritage resources. In terms of Section 2(vi), ‘‘cultural significance’’ means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

It is uncertain whether any of the finds made are in fact archaeological in terms of the NHRA definition. However, even assuming they are, they are deemed to have very low cultural significance for their historical value and perhaps also social value (in the case of the diamond diggings).

The palaeontological heritage is deemed to have low cultural significance for its scientific value.

The cultural landscape has low heritage significance for its social value.

6.7. Summary of heritage indicators and provisional grading

No significant heritage indicators were found in the study area and no significant impacts to heritage resources are expected. There are no resources worthy of grading present.

7. IMPACT ASSESSMENT

Any heritage resources (palaeontology, possible archaeology and the cultural landscape) that are affected by the proposed development would be impacted during the construction and operation phases when the site is cleared and then excavated. The impacts would be direct but because of their very low significance would not require any further studies or mitigation work prior to the commencement of development.

It is questionable as to whether any archaeological resources are in fact present on the site. The historical features appear quite recent and the residues of the diamond rush are less than 100 years of age. As such, the impacts to archaeological heritage resources are rated as being of very low significance.

Impacts to palaeontology, however, will certainly occur because fossil stromatolites were recorded within the study area. However, they are of very limited scientific value and the impact consequence is thus moderate. It is recommended that the Environmental Control Officer (ECO) and mine staff should be made aware of the possibility of uncovering fossils such as wood in the gravels and large stromatolites in the dolomite bedrock. With this plan in place the significance of impacts would be reduced from low to very low.

Mining is not generally compatible with the local rural landscape but a historical precedent has been set. For this reason the status of landscape impacts has been noted as neutral.

Table 1 below provides a formal assessment of the expected impacts. Cumulative impacts are not of any great concern because:

- No archaeological resources are present;
- The only recorded fossils on the site are common and of low significance; and
- The site is very small in relation to the broader cultural landscape and many other historical diamond diggings occur in the landscape setting a precedent for this activity.

Overall, only impacts of low to very low significance are expected.

Table 1: Impact assessment summary table – Construction Phase direct impacts.

Aspect/ Impact pathway	Nature of potential impact/risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
CONSTRUCTION AND OPERATION PHASES													
Clearing and excavation of site	**Destruction of archaeology**	Negative	Site	Permanent	Slight	Unlikely	No	High	None required	Very low	Very low	5	High
	Destruction of palaeontology	Negative	Site	Permanent	Moderate	Very likely	No	High	None required	Low	Very low	5	Medium
	Erosion of cultural landscape	Neutral	Local	Long term	Slight	Very likely	Yes (with rehabilitation)	Moderate	None required	Very low	Very low	5	High
CUMULATIVE IMPACTS													
Clearing and excavation of site	**Destruction of archaeology**	Negative	Site	Permanent	Slight	Unlikely	No	High	None required	Very low	Very low	5	High
	Destruction of palaeontology	Negative	Site	Permanent	Slight	Very likely	No	High	None required	Very low	Very low	5	Medium
	Erosion of cultural landscape	Neutral	Local	Long term	Slight	Very likely	Yes (with rehabilitation)	Moderate	None required	Very low	Very low	5	High

8. LEGISLATIVE AND PERMIT REQUIREMENTS

The project will not be subject to any heritage permits. Only in the event that important heritage was discovered during mining, and which needed mitigation, would an archaeologist or palaeontologist need to apply for a permit in their own name to undertake the work.

9. ENVIRONMENTAL MANAGEMENT PROGRAMME INPUTS

Only one aspect requires further consideration as part of the EMPr. The project Environmental Control Officer (ECO) and/or mine manager should be aware of the possibility of uncovering fossil wood and/or large stromatolites during excavations. Should any such finds be made they should be safeguarded, preferably *in situ*, and reported to SAHRA (Tel: 021 462 4502). A palaeontologist may need to be appointed to examine and, if necessary rescue the finds and associated scientific data.

10. CONCLUSIONS

There are no significant heritage resources present on the site and significant impacts are thus not expected. The only minor concern is palaeontology, but the only fossil material seen were small stromatolites that have very little scientific value because they are very common.

It is also noted that the NHRA requires a consideration of social need and, since this project is a job creation initiative, it must be given preference over heritage resources of low significance.

11. RECOMMENDATIONS

Because there will be no significant impacts to heritage resources, it is recommended that the proposed mining project should be authorised but subject to the following condition (which should be included in the environmental authorisation):

- If any archaeological or palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist or palaeontologist as appropriate. Such heritage is the property of the state and may require excavation and curation in an approved institution. The project EMPr should make reference to this possibility so that appropriate action can be taken as and when necessary.

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13. APPENDIX 1 – Curriculum Vitae

Curriculum Vitae

Jayson David John Orton

ARCHAEOLOGIST AND HERITAGE CONSULTANT

Contact Details and personal information:

Address: 6A Scarborough Road, Muizenberg, 7945
Telephone: (021) 788 8425
Cell Phone: 083 272 3225
Email: jayson@asha-consulting.co.za

Birth date and place: 22 June 1976, Cape Town, South Africa
Citizenship: South African
ID no: 760622 522 4085
Driver's License: Code 08
Marital Status: Married to Carol Orton
Languages spoken: English and Afrikaans

Education:

SA College High School	Matric	1994
University of Cape Town	B.A. (Archaeology, Environmental & Geographical Science)	1997
University of Cape Town	B.A. (Honours) (Archaeology)*	1998
University of Cape Town	M.A. (Archaeology)	2004
University of Oxford	D.Phil. (Archaeology)	2013

*Frank Schweitzer memorial book prize for an outstanding student and the degree in the First Class.

Employment History:

Spatial Archaeology Research Unit, UCT	Research assistant	Jan 1996 – Dec 1998
Department of Archaeology, UCT	Field archaeologist	Jan 1998 – Dec 1998
UCT Archaeology Contracts Office	Field archaeologist	Jan 1999 – May 2004
UCT Archaeology Contracts Office	Heritage & archaeological consultant	Jun 2004 – May 2012
School of Archaeology, University of Oxford	Undergraduate Tutor	Oct 2008 – Dec 2008
ACO Associates cc	Associate, Heritage & archaeological consultant	Jan 2011 – Dec 2013
ASHA Consulting (Pty) Ltd	Director, Heritage & archaeological consultant	Jan 2014 –

Memberships and affiliations:

South African Archaeological Society Council member	2004 –
Assoc. Southern African Professional Archaeologists (ASAPA) member	2006 –
ASAPA Cultural Resources Management Section member	2007 –
UCT Department of Archaeology Research Associate	2013 –
Heritage Western Cape APM Committee member	2013 –
UNISA Department of Archaeology and Anthropology Research Fellow	2014 –
Fish Hoek Valley Historical Association	2014 –

Professional Accreditation:

ASAPA membership number: 233, CRM Section member

Principal Investigator:	Coastal shell middens (awarded 2007)
	Stone Age archaeology (awarded 2007)
	Grave relocation (awarded 2014)
Field Director:	Rock art (awarded 2007)
	Colonial period archaeology (awarded 2007)

Fieldwork and project experience:

Extensive fieldwork as both Field Director and Principle Investigator throughout the Western and Northern Cape, and also in the western parts of the Free State and Eastern Cape as follows:

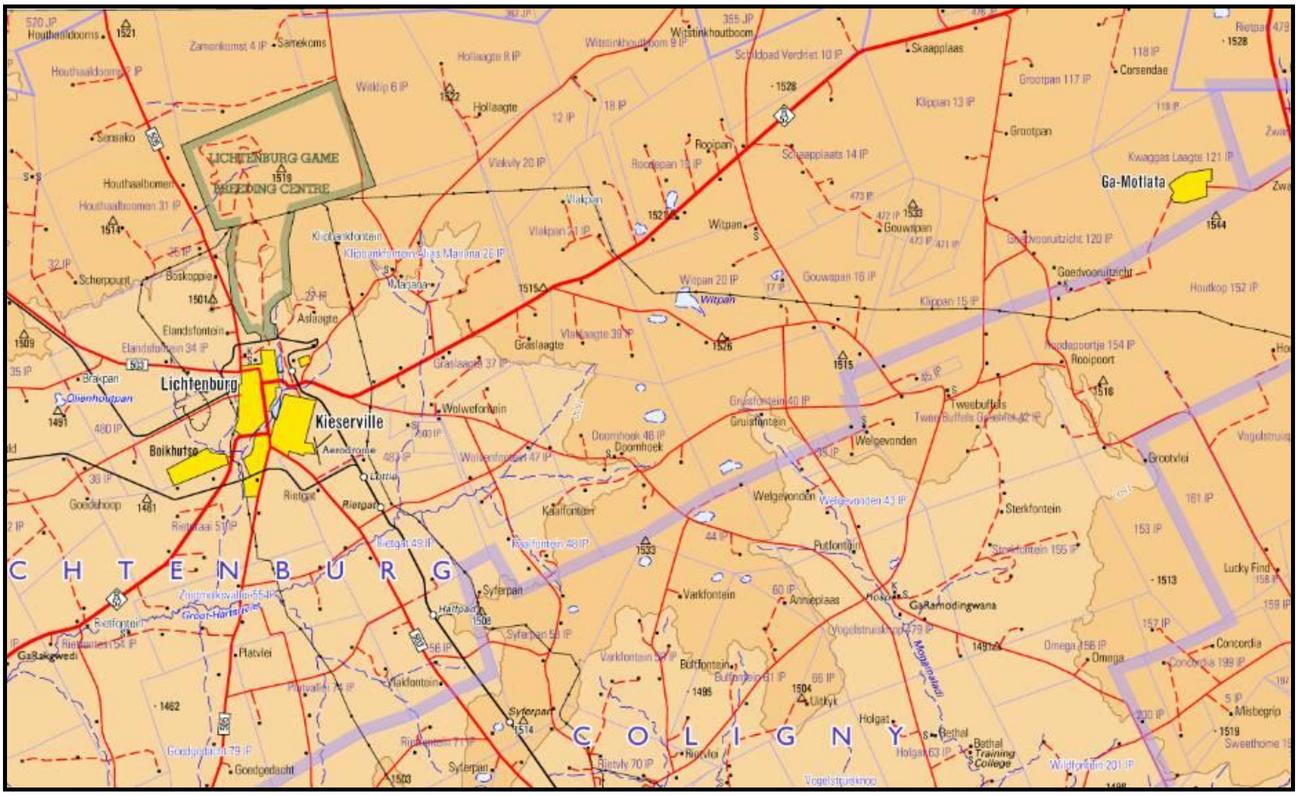
<u>Phase 1 surveys and impact assessments:</u>

- Project types
  - Notification of Intent to Develop applications (for Heritage Western Cape)
  - Heritage Impact Assessments (largely in the Environmental Impact Assessment or Basic Assessment context under NEMA and Section 38(8) of the NHRA, but also self-standing assessments under Section 38(1) of the NHRA)
  - Archaeological specialist studies
  - Phase 1 test excavations in historical and prehistoric sites
  - Archaeological research projects
- Development types
  - Mining and borrow pits
  - Roads (new and upgrades)
  - Residential, commercial and industrial development
  - Dams and pipe lines
  - Power lines and substations
  - Renewable energy facilities (wind energy, solar energy and hydro-electric facilities)

<u>Phase 2 mitigation and research excavations:</u>

- ESA open sites
  - Duinefontein, Gouda
- MSA rock shelters
  - Fish Hoek, Yzerfontein, Cederberg, Namaqualand
- MSA open sites
  - Swartland, Bushmanland, Namaqualand
- LSA rock shelters
  - Cederberg, Namaqualand, Bushmanland
- LSA open sites (inland)
  - Swartland, Franschhoek, Namaqualand, Bushmanland
- LSA coastal shell middens
  - Melkbosstrand, Yzerfontein, Saldanha Bay, Paternoster, Dwarskersbos, Infanta, Knysna, Namaqualand
- LSA burials
  - Melkbosstrand, Saldanha Bay, Namaqualand, Knysna
- Historical sites
  - Franschhoek (farmstead and well), Waterfront (fort, dump and well), Noordhoek (cottage), variety of small excavations in central Cape Town and surrounding suburbs
- Historic burial grounds
  - Green Point (Prestwich Street), V&A Waterfront (Marina Residential), Paarl

14. APPENDIX 2 – Palaeontological study



LICHTENBURG GAME BREEDING CENTRE
Lichtenburg
Kieserville
Boikhutso
Aerodrome
Ga-Motlata
GaRamodingwana
LICHTENBURG
COLIGNY
Bethal Training College
Skaapplaas
Corsendae
Grootpan
Hollaagte
Witpan
Welgevonden
Sterkfontein
Doornhoek
Varkfontein
Syferpan
Platvlei
Goedgedacht
Grootvlei
Omega
Concordia
Misbegrip
Holgat
Uitkyk
Annieplaas
Rooipoort
Goedvooruitzicht
Rietgat
Rietpan
Welwefontein
Graslaagte
Aslaagte
Elandsfontein
Boskoppie
Scherpoort
Sonsako
Houthaalboomen
Houthaaldooms
Samekoms
Witstinkhoutboom
Rooipan
Vlakpan
Klipbankfontein
Manana
Brakpan
Olienhoutpan
Goedehoop
Rietfontein
GaRakgwedi
Kaalfontein
Putfontein
Gouwspan
Lucky Find

2626

PALAEONTOLOGICAL HERITAGE COMMENT: RECOMMENDED EXEMPTION FROM FURTHER PALAEONTOLOGICAL SPECIALIST STUDIES

Proposed Kwa-Nozici Minerals (Pty) Ltd small-scale alluvial diamond and manganese mining project on Farm 361 JP, near Lichtenburg, North West

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June 2016

1. PROJECT OUTLINE

The company Kwa-Nozici Minerals (Pty) Ltd is proposing to undertake small-scale mining of alluvial diamonds and manganese on a small (5 ha) site on Portions 1 and 35 of Farm 361 JP, near Welverdiend Village, *c*. 21 km north of Lichtenburg, North West Province (Fig. 1). The site comprises flat-lying agricultural lands with very limited bedrock exposure.

The present desktop palaeontological heritage comment contributes to a Heritage Assessment for the project that is being co-ordinated by Dr Jayson Orton of ASHA Consulting (Pty) Ltd (Address: 6A Scarborough Road, Muizenberg, 7945. E-mail: jayson@asha-consulting.co.za. Tel: 021 788 8425. Cell: 083 272 3225).

2. GEOLOGICAL CONTEXT

The proposed diamond mining operation (*c*. 25 57 49 S, 26 11 18 E) will be situated in flat-lying, gravel-strewn agricultural terrain at an elevation of around 1520 m amsl. Bedrock exposure is very limited in this region (Fig. 2).

The geology of the study area is shown on 1: 250 000 sheet 2526 Rustenburg (Fig. 3) Council for Geoscience, Pretoria) for which a brief sheet explanation has been published by Walraven (1981). The development footprint overlies Precambrian (Proterozoic) dolomites and associated marine sedimentary rocks that are assigned to the **Malmani Subgroup** (**Chuniespoort Group**) within the **Transvaal Supergroup** (Eriksson & Altermann 1998, Eriksson *et al.* 2006). The 2 km-thick Malmani Subgroup succession consists of a series of formations of stromatolitic and oolitic carbonates (limestones and dolomites), cherts and black carbonaceous shales. These marine sediments were laid down in a range of supratidal, intertidal and subtidal settings over a major epicontinental carbonate platform in Late Archaean to Early Proterozoic times, roughly 2.55 to 2.50 Ga (billion years ago). The bedrock unit represented at the study site is the **Monte Christo Formation** that comprises some 300-500 m of breccias as well as stromatolitic and oolitic platform carbonates, including cherty dolomites. The Malmani carbonates in the study area have been subject to karstic (solution) weathering processes with near-surface concentration of insoluble materials (chert, ferromanganese minerals *etc*) through secondary precipitation and downwasting.

The diamond deposits in the Lichtenburg area are associated with weathered, kaolinitised **alluvial or eluvial (residual) gravels** of Late Cretaceous or younger Tertiary age that may have been associated with south-flowing tributaries of the palaeo-Harts drainage system across the Cargonian palaeo-highlands (De Wit 1981, De Wit *et al.* 2000, Partridge *et al.* 2006, *cf* Dollar 1998). According to the first authors, these gravels occur as surface stringers or inside karstic hollows (sinkholes) within the underlying dolomitic bedrocks. The sinkholes as well as secondary manganese ores in the region may be related to an extensive ancient (Late Cretaceous) African erosion surface. The basal productive Older Gravels consist mainly of downwasted angular clasts of chert and vein quartz within a kaolinitic matrix. This facies is overlain by similar but reddish gravels comprising chert, agate, vein quartz and rare diamonds. The Older Gravels are largely of non-fluvial origin and may be of Late Cretaceous age. They are unconformably overlain by greyish to reddish-brown, locally cross-bedded and diamondiferous Younger Gravels of fluvial origin. Surface gravels in the study region are dominated by cherty and dolomitic clasts downwasted from the Malmani dolomites. Whitish areas seen on satellite images just to the northwest of the study site probably indicate surface exposures of pedogenic calcrete overlying the dolomitic bedrocks.

Figure 1: Google earth© satellite image showing the location (yellow marker) of the proposed Kwa-Nozici Minerals (Pty) Ltd small-scale diamond and manganese mining site on Portions 1 and 35 of Farm 361 JP, near Welverdiend Village, *c*. 21 km north of Lichtenburg, North West Province.

Figure 2: Flat, gravel-strewn terrain within the study area on Farm 361 JP. Note paucity of bedrock exposure (Image kindly supplied by Dr J. Orton of ASHA Consulting (Pty) Ltd).

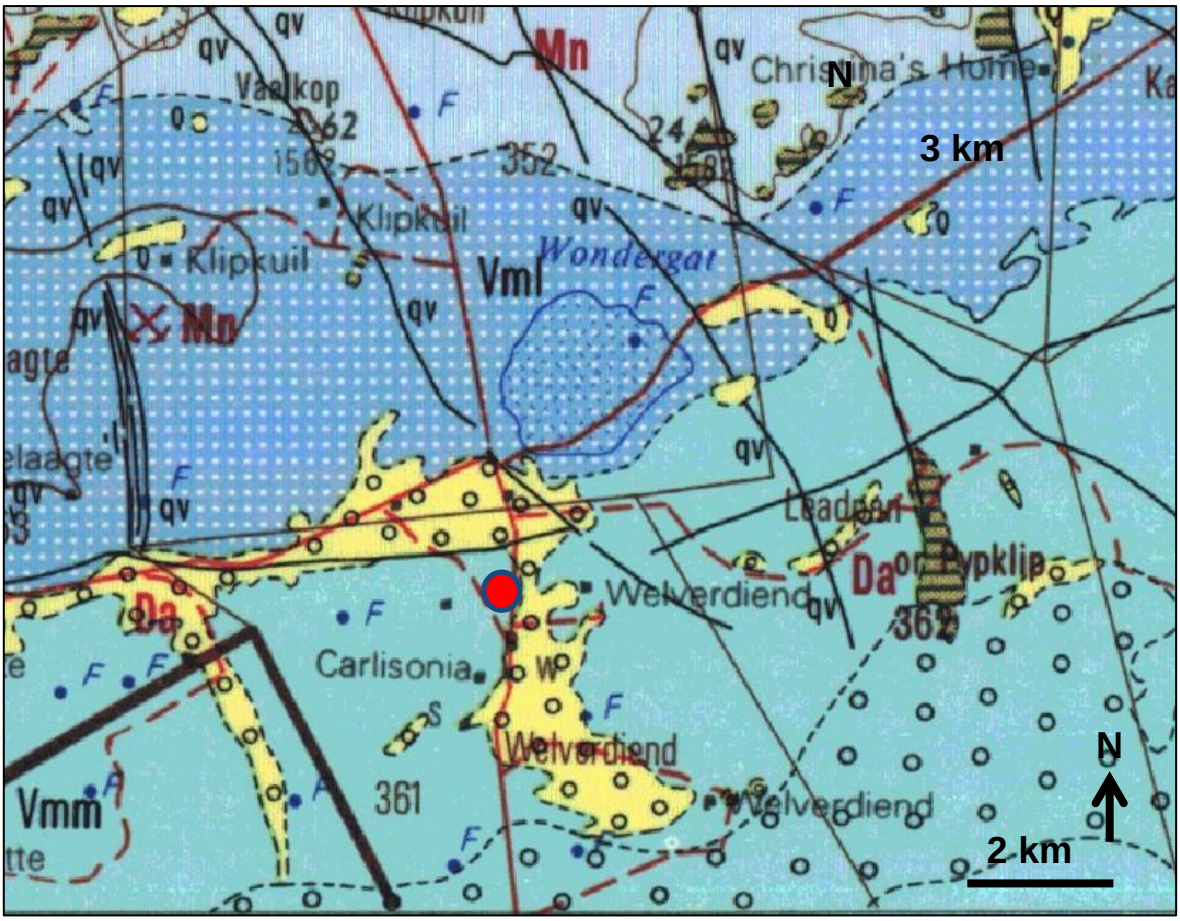

Figure 3: Extract from 1: 250 000 geological map 2526 Rustenburg (Council for Geoscience, Pretoria) showing the approximate location (red dot) of the Kwa-Nozici Minerals (Pty) Ltd small-scale diamond and manganese mining site on Portions 1 and 35 of Farm 361 JP, near Welverdiend Village, *c*. 21 km north of Lichtenburg, North West Province. The bedrock geology in the region comprises cherty dolomites and banded cherts and dolomites of the Precambrian Monte Christo Formation (Malmani Subgroup, Chuniespoort Group, Transvaal Supergroup) (Vmm, blue-green) that are locally stromatolitic. They are overlain in this region by surface gravels of alluvial or eluvial origin (pale yellow with dots). Da = alluvial diamonds. Mn = manganese ores.

3. PALAEONTOLOGICAL HERITAGE

The Malmani Subgroup platform carbonates of the Transvaal Basin, including the Monte Christo Formation, host a variety of stromatolites (microbial laminites), ranging from supratidal mats to intertidal columns and large subtidal domes. These biogenic structures are of biostratigraphic as well as palaeoecological interest; for example, the successive Malmani dolomite formations are in part differentiated by their stromatolite biotas (*e.g.* Truswell and Eriksson 1972, 1973, and 1975, Schopf 2006 and Eriksson *et al.* 2006, among others). Microbial filaments and unicells have been reported from stromatolites of the Transvaal Supergroup.

The non-fluvial, karstic-infill gravels as well as younger fluvial gravels are generally of low palaeontological sensitivity. Fossil pollens and petrified woods of Late Cretaceous age have been recorded from a sinkhole on Farm Grasfontein west of Bakerville, to the northwest of Lichtenburg, however (De Wit 1981, De Wit *et al.* 2000; *cf* also De Wit *et al.* 2009). Small bedrock exposures of Malmani dolomites on Farm 361 JP reveal horizons small-scale stromatolitic domes (Fig. 4).

Figure 4: Limited bedrock exposure of Malmani Subgroup dolomites within study area on Farm 361 JP showing horizon of small-scale domical stromatolites (GPS for scale) (Image kindly supplied by Dr J. Orton of ASHA Consulting (Pty) Ltd).

4. CONCLUSIONS

It is unlikely that significant impacts on exceptional, scientifically-important stromatolitic bedrocks within the Precambrian (Malmani Subgroup) bedrocks will occur during diamond mining, which will focus on the overlying diamond-bearing gravels and near-surface manganese ores. The karst-infill gravels are generally of low palaeontological sensitivity, although rare petrified wood material might occur here.

The proposed mining development is considered unlikely to entail significant impacts on palaeontological heritage. Pending the potential exposure of new fossil remains (*e.g.* petrified wood, mammalian bones and teeth) during excavation, no further specialist palaeontological studies or mitigation are recommended for this project.

In the case of any significant chance fossil finds during mining operation, these should be safeguarded - preferably *in situ* - and reported by the ECO as soon as possible to the South African Heritage Resources Agency, SAHRA (Contact details: SAHRA. P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502. Email: cscheermeyer@sahra.org.za), so that appropriate mitigation by a professional palaeontologist can be considered. Such mitigation usually involves the judicious sampling, collection and recording of fossils as well as of relevant contextual data concerning the surrounding sedimentary matrix. The palaeontologist concerned would need to apply beforehand for a collection permit from SAHRA. These recommendations should be incorporated into the Environmental Management Plan (EMP) for this mining development.

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6. QUALIFICATIONS & EXPERIENCE OF THE AUTHOR

Dr John Almond has an Honours Degree in Natural Sciences (Zoology) as well as a PhD in Palaeontology from the University of Cambridge, UK. He has been awarded post-doctoral research fellowships at Cambridge University and in Germany, and has carried out palaeontological research in Europe, North America, the Middle East as well as North and South Africa. For eight years he was a scientific officer (palaeontologist) for the Geological Survey / Council for Geoscience in the RSA. His current palaeontological research focuses on fossil record of the Precambrian - Cambrian boundary and the Cape Supergroup of South Africa. He has recently written palaeontological reviews for several 1: 250 000 geological maps published by the Council for Geoscience and has contributed educational material on fossils and evolution for new school textbooks in the RSA.

Since 2002 Dr Almond has also carried out palaeontological impact assessments for developments and conservation areas in the Western, Eastern and Northern Cape, Limpopo, Mpumalanga, Kwazulu-Natal, Gauteng, Free State and North West Province under the aegis of his Cape Town-based company *Natura Viva* cc. He has been a long-standing member of the Archaeology, Palaeontology and Meteorites Committee for Heritage Western Cape (HWC) and an advisor on palaeontological conservation and management issues for the Palaeontological Society of South Africa (PSSA), HWC and SAHRA. He is currently compiling technical reports on the provincial palaeontological heritage of Western, Northern and Eastern Cape for SAHRA and HWC. Dr Almond is an accredited member of PSSA and APHP (Association of Professional Heritage Practitioners – Western Cape).

Declaration of Independence

I, John E. Almond, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed development project, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.

Dr John E. Almond
Palaeontologist
***Natura Viva* cc**

KWA-NOZICI MINERALS (PTY) LTD SMALL SCALE DIAMOND AND MANGANESE MINING

Hydrogeological Specialist Study

Prepared for:

CSIR
our future through science

Environmental Management Services

Prepared by:

UMVOTO

Final Draft

June 2016

UMVOTO
Earth ● Water ● Science ● Life

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UMVOTO AFRICA (PTY) LTD SPECIALIST DECLARATION

We, Dylan Blake and David Colquhoun McGibbon (both of Umvoto Africa (Pty) Ltd), as the appointed independent hydrogeological specialists, in terms of the National Environmental Management Act (NEMA) (No. 107 of 1998) 2014 Environmental Impact Assessment (EIA) Regulations (No. R. 982), hereby declare that we:

- Act as independent hydrogeological specialists in this application;
- Perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- Regard the information contained in this report as it relates to our specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA and the 2014 EIA Regulations;
- That there are no circumstances that may compromise our objectivity in performing such work;
- Have hydrogeological and geological expertise in conducting this hydrogeological specialist report relevant to this application (see attached CVs in Appendix A), including knowledge of the NEMA, 2014 EIA Regulations and any guidelines that have relevance to the proposed activity;
- Will comply with the NEMA, 2014 EIA Regulations and all other applicable legislation;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity;
- Have no vested interest in the proposed activity proceeding;
- Undertake to disclose to the applicant and the competent authority all material information in our possession that reasonably has or may have the potential of influencing:
    - any decision to be taken with respect to the application by the competent authority; and
    - the objectivity of any report, plan or document to be prepared by ourselves for submission to the competent authority;
- All the particulars furnished by us in this specialist input/study are true and correct; and
- Realise that a false declaration is an offence in terms of Regulation 48 of the 2014 EIA Regulations and is punishable in terms of Section 24F of the NEMA.

Signature of the Specialist

Name: Dylan Blake

Qualification: BSc (Honours) Geology

UA Position: Associate / Principal Geologist

Date: 20 June 2016

Signature of the Specialist

Name: David Colquhoun McGibbon

Qualification: MSc Geology

UA Position: Trainee Geologist / Hydrogeologist

Date: 20 June 2016

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Ms Babalwa Mqokeli
Environmental Management Services (EMS)
CSIR Stellenbosch

20 June 2016
Our Ref: 866/1/1/2016
BMqokeli@csir.co.za

Dear Ms Mqokeli

KWA-NOZICI MINERALS SMALL SCALE DIAMOND AND MANGANESE MINING
HYDROGEOLOGICAL SPECIALIST STUDY

INTRODUCTION

Umvoto Africa (Pty) Ltd was commissioned by Ms Babalwa Mqokeli of the Council for Scientific and Industrial Research (CSIR) Environmental Management Services (EMS) in Stellenbosch to undertake a hydrogeological specialist study for a basic assessment of the proposed small scale diamond and manganese mining by Kwa-Nozici Minerals (Pty) Ltd near Carlisonia, located ~20 km north of Lichtenburg in the North West Province. The study aims to determine the geological and hydrogeological setting of the area as well as any potential contamination impacts posed by the proposed small scale diamond and manganese mining activities, and possible mitigation thereof. Umvoto Africa proposed the following:

A preliminary desktop study was undertaken comprising of:

1. Analysis of available 1:50 000 topographical, climate, drainage/surface water, land use and digital elevation model (DEM) data in order to describe the hydroclimatological and physical setting of the site;
2. Analysis of the 1:250 000 Rustenburg 2526 geological map, 1:500 000 Johannesburg 2526 hydrogeological map, available DEMs, Google Earth/satellite imagery and any existing geological/hydrogeological/EIA/geotechnical/consulting reports of the surrounding area, to determine the geological and hydrogeological setting of the site;
3. Analysis of available Department of Water and Sanitation (DWS) datasets, namely the National Groundwater Archive (NGA), Water Management System (WMS) and Water Authorisation and Registration Management System (WARMS). The data from these records assisted in the planning of a basic field hydrocensus, and provided an idea of the hydrogeological conditions in the vicinity of the site.
4. Analysis of potential contaminants arising from small scale mining at the site, and the identification of potential risk to pollution receptors (i.e. contaminant source);
5. Identification of potential pollution receptors (groundwater users, groundwater bodies, environmentally sensitive areas) (i.e. potential receptors).

A day and a half long site investigation was proposed to verify information collated during the desktop groundwater assessment, and involved:

1. Identification of receptors, including boreholes, groundwater discharge points (e.g. springs and seeps) and connectivity of site to any surface water sources e.g. rivers or wetlands (i.e. potential groundwater-surface water interaction);
2. Basic hydrocensus: groundwater point type (borehole, spring, seep etc.) data (within similar geological and hydrogeological conditions ~1-2 km from the proposed mining site), such as the XYZ co-ordinates of the point, hydrochemistry (electrical conductivity, pH and temperature), and water levels, yields, pumping rates etc. (for boreholes, if available) will be collected;
3. Hydrogeological and contamination potential reconnaissance determining site-specific parameters.

Assumptions include that there are no unidentified aquifers present, with all analysis based on available data, information and specialist knowledge. Limitations to the specialist study include that no invasive in-situ site investigations (i.e. trial pitting, drilling, testing, detailed hydrochemical sampling, hydrogeological modelling etc.) were undertaken, and that no mine works programme is currently available (indicating the exact mining methodology to be used on site, potential equipment and materials to be used, infrastructure layout, areas and depth to be excavated, and the exact amount and quality of water required for any mining processes). The above findings are presented in this specialist report, along with recommended mitigation measures for any potential impacts related to mining activities.

LOCALITY

The proposed Kwa-Nozici Minerals small scale diamond and manganese mining operation is located on 5 hectares (ha) of the Farm 361 JP (Portions 1 and 35) located near Welverdiend Village and Carlisonia, ~20 km north of Lichtenburg (Ditsobotla Local Municipality [LM], Ngaka Modiri Molema District Municipality [DM], North West) (see **Figure 1** and **Figure 2**). The topography of the proposed 5 ha Kwa-Nozici Minerals mine is flat, with elevations ranging between ~1522-1525 meters above mean sea level (mamsl) (see **Figure 3**).

The proposed Kwa-Nozici Minerals mine falls on the catchment boundary/watershed between the D41A and C31A quaternary catchments in the west and east respectively, of the Vaal Water Management Area (WMA). The main rivers within the D41A and C31A quaternary catchments are the Molopo River (flowing northwestwards into the Orange River) and Harts River (flowing southwestwards into the Vaal River) respectively, although the headwaters of both rivers are ~15 km west and south of the proposed mining area respectively. Carlisonia, situated ~1 km south of the proposed mine, forms part of the Matikiring-Carlisonia Cluster in terms of water supply management, and relies solely on groundwater for its supply of water (Department of Water Affairs [DWA], 2010a).

The proposed Kwa-Nozici Minerals mine is situated in a semi-arid area, with a mean annual precipitation (MAP) of ~500-600 mm/annum (falling mostly during mid-summer) (see **Table 1**). The average midday temperatures range between 18°C in June (winter) to 30°C in January (summer), with a mean annual evaporation (MAE) of ~1850-1950 mm/a (see **Table 1**). The area was first inhabited during a diamond rush in 1926, but is now dominated by the production of maize, cattle and cement. Alluvial diamonds are still mined in the nearby vicinity at Bakerville (see African Diamond AB [2015]) and Carlisonia.

Table 1 **Summarised GRDM 2010 and WR2005 values for the C31A and D41A quaternary catchments within the Vaal WMA.**

Quaternary Catchment	Total Area (km^2)	MAP (mm/a)	MAE (mm/a)	Recharge (mm/a)	Current Groundwater Use (hm^3/a)	Exploitation Potential (hm^3/a)
C31A	1402	577	1860	24.91	4.80	23
D41A	4322	509	1950	21.04	12.86	55

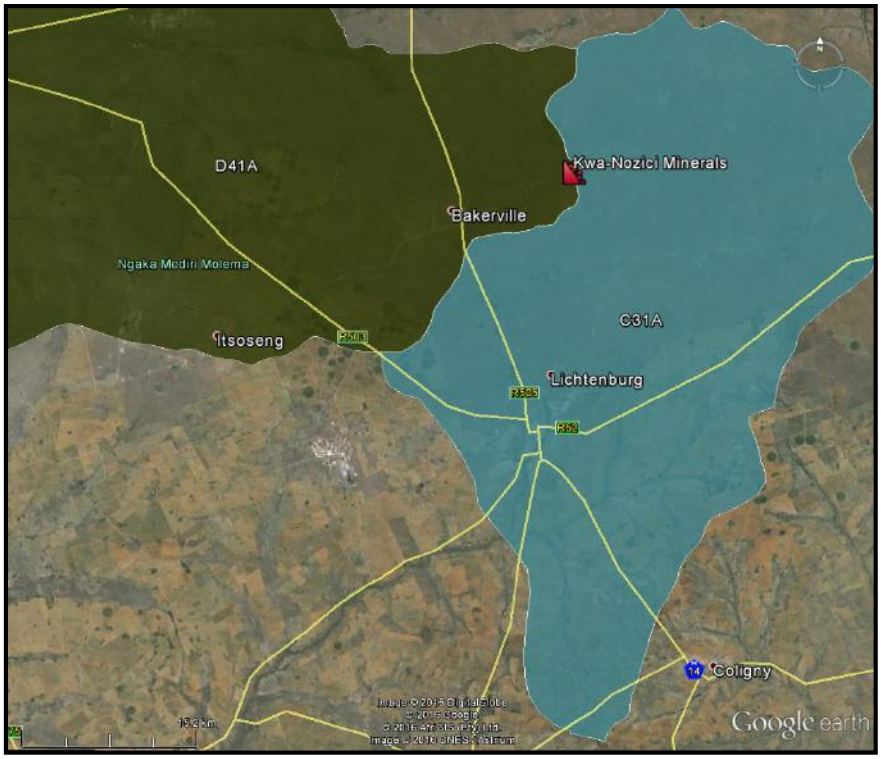

Figure 1 **The proposed Kwa-Nozici Minerals diamond and manganese mine (represented by the red icon), situated on the catchment boundary/watershed of the C31A and D41A quaternary catchments (Ditsobotla LM, North West).**

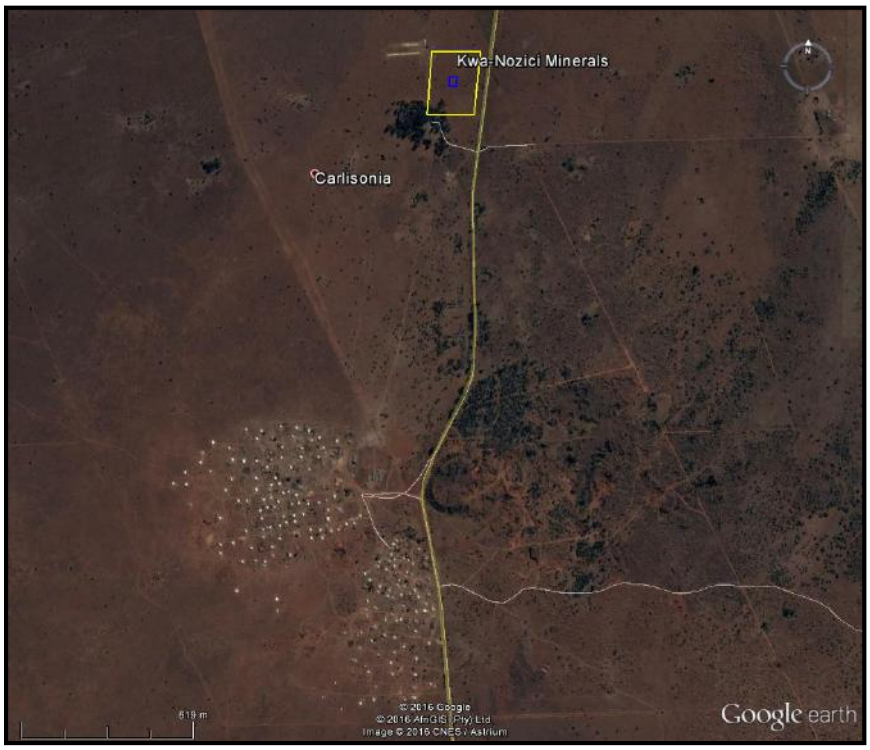

Figure 2 **Locality of the proposed Kwa-Nozici Minerals diamond and manganese mine (represented by the yellow polygon) and camp/processing area (according to the Background Information Document [BID], represented by the blue polygon), near the village of Carlisonia.**

Figure 3 **Flat topography of the proposed Kwa-Nozici Minerals diamond and manganese mine. Photograph taken of the southern portion of the proposed mining area, where the borehole is located (in amongst the trees), and where they aim to establish a camp/processing area.**

GEOLOGY

The Chuniespoort Group (situated within the Transvaal Basin of the Transvaal Supergroup), and specifically the Neoarchaean (~2600-2500 million years old [Ma]) dolomites of the Malmani Subgroup, dominates the region surrounding the proposed Kwa-Nozici Mineral diamond and manganese mine. The chert-rich dolomites (i.e. magnesium-rich calcium carbonate rock) of the Monte Christo Formation, which falls within the Malmani Subgroup, underlie the proposed mine (see **Figure 4**) and dip shallowly (<10°) to the north.

The depositional environment of the Malmani Subgroup is interpreted to have been a stable shallow marine platform and basin e.g. something akin to the present day Great Barrier Reef, and has been subdivided into the following formations (oldest to youngest) (see **Table 2**): Oaktree, Monte Christo, Lyttelton, Eccles and Frisco Formations (see Button [1976] and Eriksson and Truswell [1974] for more detailed descriptions of the various formations).

The ~10-200 m thick Oaktree Formation forms the base of the Malmani Subgroup and consists of carbonaceous shales, stromatolitic dolomites and locally developed quartzites (Button [1976] and Eriksson and Truswell [1974]). The Monte Christo Formation (which underlies the proposed mine) is ~300-500 m thick and consists of chert-rich dolomite and oolitic (Button [1976] and Eriksson and Truswell [1974]).

The remaining Malmani Subgroup formations that overlie the Monte Christo Formation occur north of the proposed mine. The Lyttelton Formation immediately overlies the Monte Christo Formation ~1.5 km north of the proposed mine, consists of 100-200 m of shales, quartzites and stromatolitic dolomites (Button [1976] and Eriksson and Truswell [1974]), and is rich in iron and manganese (Taylor 1983). This is overlain by the 600 m thick cherty dolomites of the Eccles Formation (Button [1976] and Eriksson and Truswell [1974]). The Frisco Formation forms the top of the Malmani Subgroup and consists of 400 m of stromatolitic dolomites (Button [1976] and Eriksson and Truswell [1974]).

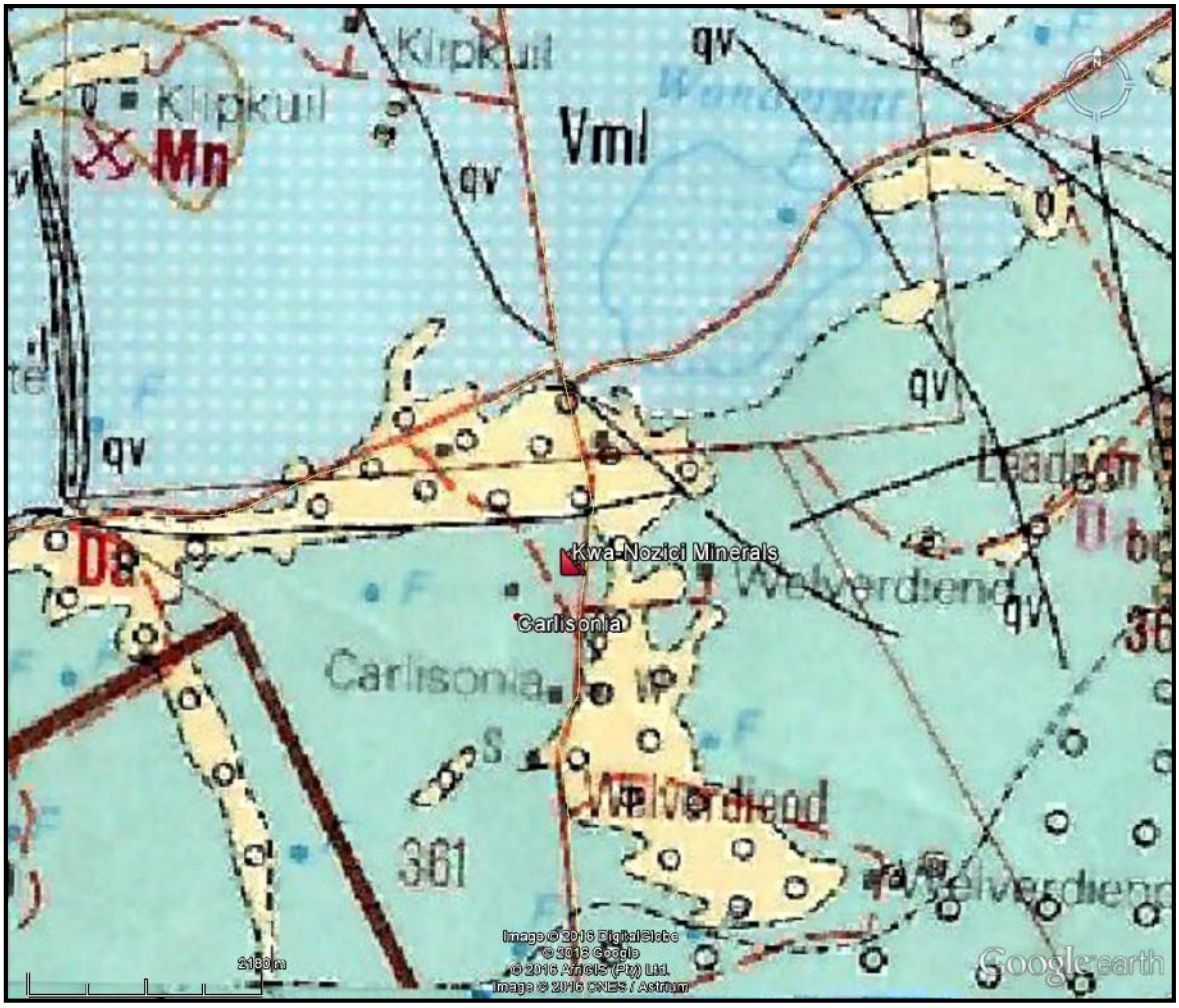

Figure 4 **Geology (from the 2526 Rustenburg 1:250 000 geological map) of the area underlying and surrounding the proposed Kwa-Nozici Minerals diamond and manganese mine (red icon indicates the location of the proposed mine). The teal (including dotted and solid) area represents the dolomitic Monte Christo Formation (Vmm), the blue dotted area represents the dolomitic Lyttelton Formation (Vml), and the yellow dotted areas represent overlying Quaternary (sometimes diamondiferous) gravels and surface sediment (Q). Red Mn and Da symbols represent manganese and alluvial diamond mines within the Lyttelton and Monte Christo Formations respectively.**

Table 2 **Stratigraphy of units in the vicinity of the proposed Kwa-Nozici Minerals diamond and manganese mine (with the blue highlighted Monte Christo Formation, which underlies the proposed mine).**

Supergroup	Group	Subgroup	Formation	Map Symbol
-	-	-	undifferentiated Quaternary gravels and surface sediment	Q
Transvaal	Chuniespoort	Malmani	Frisco	Vmf
			Eccles	Vme
			Lyttelton	Vml
			Monte Christo	Vmm
			Oaktree	Vmo

Quaternary (~2.5 Ma to Recent) surface sediment, soil and sometimes diamondiferous (i.e. diamond-bearing) alluvial (river-sourced) gravels overlie the Malmani Subgroup in the vicinity of the proposed mine. In the Lichtenburg area diamondiferous alluvial gravels were deposited on the irregular bedrock of the Malmani Subgroup dolomites (and specifically Lyttelton and Monte Christo Formations) (see Wilson et al. [2006] and Marshall and Norton [2009] for a detailed overview of diamondiferous gravel deposits and the sources of theses alluvial diamonds in the Lichtenburg and Ventersdorp region). Over time karstification (i.e. dissolution of carbonate material by surface and/or groundwater) has resulted in sinkholes forming within the dolomites, which in turn have been filled with (sometimes diamondiferous) alluvial gravels when surface water transporting alluvial diamonds drained over the sinkholes in the past – these are known as "potholes" or "runs", with some extending as deep as 70 meters below ground level (mbgl; e.g. the deep freshwater diving spot Wondergat, ~4 km northeast of the proposed mine). These diamondiferous potholes can often form positive topographic expressions because of the hard overlying gravels protecting the underlying strata from being eroded, whilst the rest of the dolomitic material is denuded/eroded.

Residual manganese deposits originate from the weathering of manganese-rich dolomites (as present in the Lyttelton Formation), and the accumulation of manganese-rich material as manganese oxide minerals (e.g. nsutite, pyrolusite and psilomelane) (Astrup and Tsikosi, 1998). Weathering of iron and manganese-rich sandstone and clay beds within the overlying Karoo Supergroup, which were deposited within lacustrine (lake) deposits in karstic depressions of the underlying Malmani Subgroup, may also be a source of manganese in the greater Lichtenburg region (Astrup and Tsikosi, 1998).

HYDROGEOLOGY

Dolomitic Karst Aquifers

Dolomite is a magnesium-rich calcium carbonate rock that can dissolve in the presence of water combined with carbon dioxide (i.e. carbonic acid, H_2CO_3), which generally happens naturally as part of weathering processes (DWA, 2009). This dissolution weathering can result in subsurface solution cavities/cave systems and surface sinkholes/dolines forming, with the resulting dissolution landscape being known as "karst" terrain (DWA, 2009). Any local or regional fault or fracture systems can further enhance dissolution and karst development. These subsurface dissolution systems form excellent secondary porosity features along which strong flowing groundwater can occur, often forming high-yielding karst aquifer systems (provided sufficient recharge is present). The Malmani Subgroup in the vicinity of the proposed diamond and manganese mine forms such a fractured dolomitic karst aquifer, with potential yields of ~5-20 litres/second (l/s) or ~0.15-0.5 million cubic metres per annum (hm^3/a) per borehole, which is significantly higher than most other rock formations (see **Figure 5**). Wetlands, pans, springs, sinkholes and a lack of surface drainage may also be indicative of subsurface groundwater bearing solution cavities (Taylor, 1983). Subsidence above major water conduits results in the accumulation of chert breccia rubble covered by red soil, which is characteristically found adjacent to ENE-WSW trending dykes in the Lichtenburg area (Taylor, 1983). Generally the dolomite karst aquifers are unconfined to semi-confined, with compartmentalisation by dolerite dykes occurring (although no known dykes are observed in the vicinity of the mine).

Due to partial dissolution of the dolomitic rock material, dolomite aquifers commonly experience surface geotechnical problems such as sinkhole/doline formation, representing a local safety risk. Sinkhole development can occur naturally along dykes, rivers, fractures/fault zones and above subsurface dissolution cavities, but also can be caused by unmanaged and uncontrolled abstraction and/or dewatering of dolomite aquifers (more than 5-10 m of drawdown), as well as the uncontrolled flow of acid mine drainage (DWAF [2006a] and Howard et al. [2002]). It is recommended that the "Guideline for the Assessment, Planning and Management of Groundwater Resources within Dolomitic Areas in South Africa" (DWAF, 2006a) is closely followed during the establishment and mining of the site, along with other documents referred to in DWA (2009).

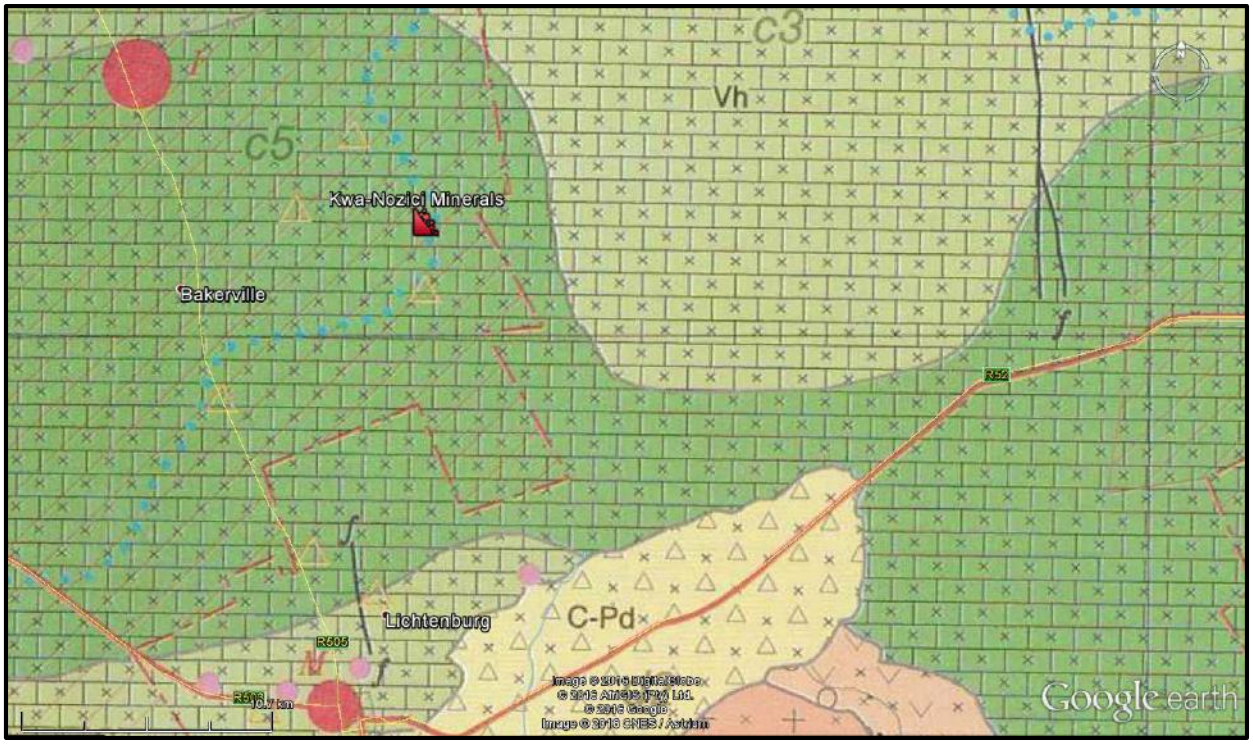

Figure 5 **Hydrogeology (from the 2526 Johannesburg 1:500 000 hydrogeological map) of the area underlying and surrounding the proposed Kwa-Nozici Minerals diamond and manganese mine. According to the map, the proposed mine is situated on aquifer "c5" (green squares), which is classified as a carbonate karst aquifer with median borehole yields of >5 l/s. Pink dots represent springs with yields of >5 l/s (~15 km northwest and south of the proposed mine), whereas yellow triangles represent groundwater quality monitoring points. Red circles northwest and southwest of the proposed mine represent groundwater abstraction of 5-10 hm^3/a for irrigation and 2-5 hm^3/a for municipal supply respectively.**

Aquifer Properties and Groundwater Use

The transmissivity of the Monte Christo Formation dolomitic karst aquifer in the Bakerville area (10 km west of the proposed mine) is variable (due to the heterogeneous nature of karst aquifers caused by dissolution features), and ranges between 260-3200 m^2/day (PMA, 1995). The most transmissive areas are expectedly associated with fractures, faults and cavities, whereas solid, unfractured and undissolved dolomite can be dry (DWAF, 2006b). As with transmissivity, storage is highly variable due to the heterogeneous nature of the dolomites and ranges between 1-5 % (Bredenkamp, 1995), whereas the specific capacity of the Bakerville boreholes varies between ~20-40 l/s per m of drawdown (PMA, 1995).

DWS NGA yield data from recorded boreholes within ~5 km of the proposed mine ranges from ~0.4-20 l/s (average yield of ~8 l/s), with boreholes depths of ~10-80 mbgl (average depth of ~38 mbgl) and rest water levels (RWL) of ~10-44 mbgl (average RWL of ~24 mbgl, correlating with average water levels of 20-25 mbgl for the area from the North West groundwater map) (see **Table 3**, **Figure 6** and **Figure 7**). The variation in yield is likely the result of some boreholes intersecting high-yielding karst features, with lower yielding borehole intersecting more solid, undissolved dolomite. General groundwater flow in the vicinity of the proposed mine is likely in both a NW (northern half) and S-SE (southern half) direction, based on NGA RWLs and the fact that proposed mine is situated on a drainage divide (highly dependent on underlying karst conditions however). DWS WARMS data within ~10 km of the proposed mine indicates registered volumes of ~183-630 000 m^3/a, with a total groundwater abstraction of ~1.68 million m^3/a in the vicinity of the mine (see **Table 4** and **Figure 8**). No recorded NGA boreholes, or WARMS water use registrations/licences, are present within the boundaries of the proposed mine.

Based on the Matikiring-Carlisonia Cluster/Scheme, the villages of Matikiring and Carlisonia currently abstract 0.0093 million m^3/a of groundwater, which is projected to increase to 0.124 million m^3/a by 2030 (DWA, 2010a). The available yield of the aquifer in the immediate area of these villages is predicted at ~1.9 million m^3/a, while the potential exploitable groundwater for the whole C31A and D41A quaternary catchments is ~23 million m^3/a and 55 million m^3/a (see **Table 1**), which indicates that there is significant groundwater available for growth and further development in the region (DWA, 2010a).

Table 3 DWS NGA borehole data within a ~5 km radius of the proposed Kwa-Nozici Minerals diamond and manganese mine.

BH ID	Latitude	Longitude	Farm Name	Quaternary Catchment	Discharge (Q) Date	Q (l/s)	Field Chemistry Date	EC (mS/m)	pH	BH Depth (mbgl)	BH Diameter (mm)	Rest Water Level (RWL) Date	RWL (mbgl)
35570	-25.91727	26.17884	KLIPKUIL	C31A	-	-	-	-	-	64	152	-	-
2526CC00011	-25.92283	26.15828	KLIPKUIL	D41A	-	-	-	-	-	28	152	-	-
2526CC00030	-25.95958	26.13483	RUIGTELAAGTE	D41A	12-May-75	1.82	-	-	-	40	-	15-Dec-04	13.98
2526CC00063	-25.95115	26.13494	RUIGTELAAGTE	D41A	-	-	-	-	-	-	-	-	-
2526CC00125	-25.93353	26.20930	KLIPKUIL	C31A	-	-	-	-	-	20.24	152	29-Jun-88	10.24
2526CC00126	-25.94698	26.19411	KLIPKUIL	C31A	-	-	-	-	-	-	-	-	-
2526CC00129	-25.93254	26.20800	KLIPKUIL	C31A	-	-	-	-	-	-	-	-	-
2526CC00130	-25.91726	26.16828	KLIPKUIL	D41A	-	-	-	-	-	-	-	-	-
2526CC00133	-25.95893	26.17355	KLIPKUIL	D41A	-	-	28-Jun-88	39	-	33.23	152	28-Jun-88	23.23
2526CC00134	-25.92893	26.17744	KLIPKUIL	D41A	-	-	-	-	-	36.13	152	29-Jun-88	26.13
2526CC00135	-25.91393	26.19494	KLIPKUIL	C31A	-	-	-	-	-	53.55	152	29-Jun-88	43.55
2526CC00141	-25.91504	26.16994	KLIPKUIL	C31A	-	-	-	-	-	-	-	-	-
2526CC00143	-25.91921	26.16994	KLIPKUIL	D41A	-	-	-	-	-	30.81	152	-	-
2526CC00154	-25.97060	26.14244	RUIGTELAAGTE	D41A	-	-	-	-	-	31.46	152	29-Jun-88	21.46
2526CC00155	-25.96032	26.14550	RUIGTELAAGTE	D41A	-	-	-	-	-	23.1	152	29-Jun-88	13.1
2526CC00156	-25.96087	26.14272	RUIGTELAAGTE	D41A	-	-	-	-	-	-	-	-	-
2526CC00157	-25.97004	26.14300	RUIGTELAAGTE	D41A	-	-	-	-	-	-	-	-	-
2526CC00159	-25.95476	26.14828	RUIGTELAAGTE	D41A	-	-	-	-	-	26.89	152	29-Jun-88	16.89
2526CC00160	-25.96865	26.14911	RUIGTELAAGTE	D41A	-	-	-	-	-	-	-	-	-
2526CC00161	-25.96921	26.17467	WELVERDIEND	D41A	-	-	28-Jun-88	47	-	34.34	152	28-Jun-88	24.34
2526CC00162	-25.99295	26.20042	WELVERDIEND	C31A	-	-	-	-	-	35	152	21-Jan-04	20.12
2526CC00163	-25.97698	26.19161	WELVERDIEND	C31A	-	-	-	-	-	-	-	13-Jul-88	29.07
2526CC00164	-25.96401	26.20135	WELVERDIEND	C31A	-	-	-	-	-	41.3	152	21-Jan-04	29.81
2526CC00165	-25.97421	26.20272	WELVERDIEND	C31A	-	-	-	-	-	-	-	-	-
2526CC00166	-25.99497	26.18458	WELVERDIEND	C31A	-	-	-	-	-	35	152	21-Jan-04	23.67
2526CC00167	-25.96032	26.16355	WELVERDIEND	D41A	-	-	-	-	-	30.25	152	28-Jun-88	20.25
2526CC00236	-25.95727	26.23328	CHRISTINAS HOME	C31A	-	-	-	-	-	-	152	2-Aug-68	34.64
2526CC00241	-25.95227	26.23634	CHRISTINAS HOME	C31A	-	-	-	-	-	-	152	-	-
2526CC00271	-25.92671	26.20807	TREKDRIFT	C31A	16-Feb-95	0.38	-	-	-	80	165	15-Feb-95	30
2526CC00309	-25.96024	26.15275	RUIGTELAAGTE	D41A	-	-	-	-	-	11	165	-	-
2526CC00346	-25.96727	26.15245	RUIGTELAAGTE	D41A	-	-	-	-	-	37	152	-	-
2526CC00347	-25.96728	26.15245	RUIGTELAAGTE	D41A	-	-	-	-	-	17	152	-	-
2526CC00348	-25.96728	26.15246	RUIGTELAAGTE	D41A	-	-	-	-	-	14	152	-	-
2526CC00349	-25.96729	26.15246	RUIGTELAAGTE	D41A	-	-	-	-	-	30	152	-	-
2526CC00350	-25.96729	26.15247	RUIGTELAAGTE	D41A	-	-	-	-	-	43	152	-	-
2526CC00366	-25.96041	26.15292	RUIGTELAAGTE	D41A	-	-	-	-	-	17	165	-	-
2526CC00388	-25.97616	26.18245	WELVERDIEND	D41A	28-Jul-95	18	-	-	-	67	203	-	-
2526CC00389	-25.98116	26.18606	WELVERDIEND	C31A	29-Jul-95	12.2	-	-	-	82	203	-	-
2526CC00393	-25.98116	26.18328	WELVERDIEND	D41A	-	-	15-Oct-15	94.9	7.46	80	152	-	-
2526CC00475	-25.97653	26.18495	WELVERDIEND	D41A	-	-	-	-	-	-	-	-	-
2526CC00480	-25.95225	26.17455	KLIPKUIL	D41A	-	-	-	-	-	-	-	-	-
2526CC00482	-25.95918	26.21009	PYPKLIP	C31A	-	-	-	-	-	35	152	23-Jan-04	25.12
2526CC00483	-25.99278	26.22731	WELVERDIEND	C31A	-	-	-	-	-	35	152	21-Jan-04	23.96
2526CC00484	-25.97853	26.19357	WELVERDIEND	C31A	-	-	-	-	-	-	-	-	-
Average						***8.1***	***-***	***60.3***	***7.5***	***38.3***	***-***	***-***	***23.9***

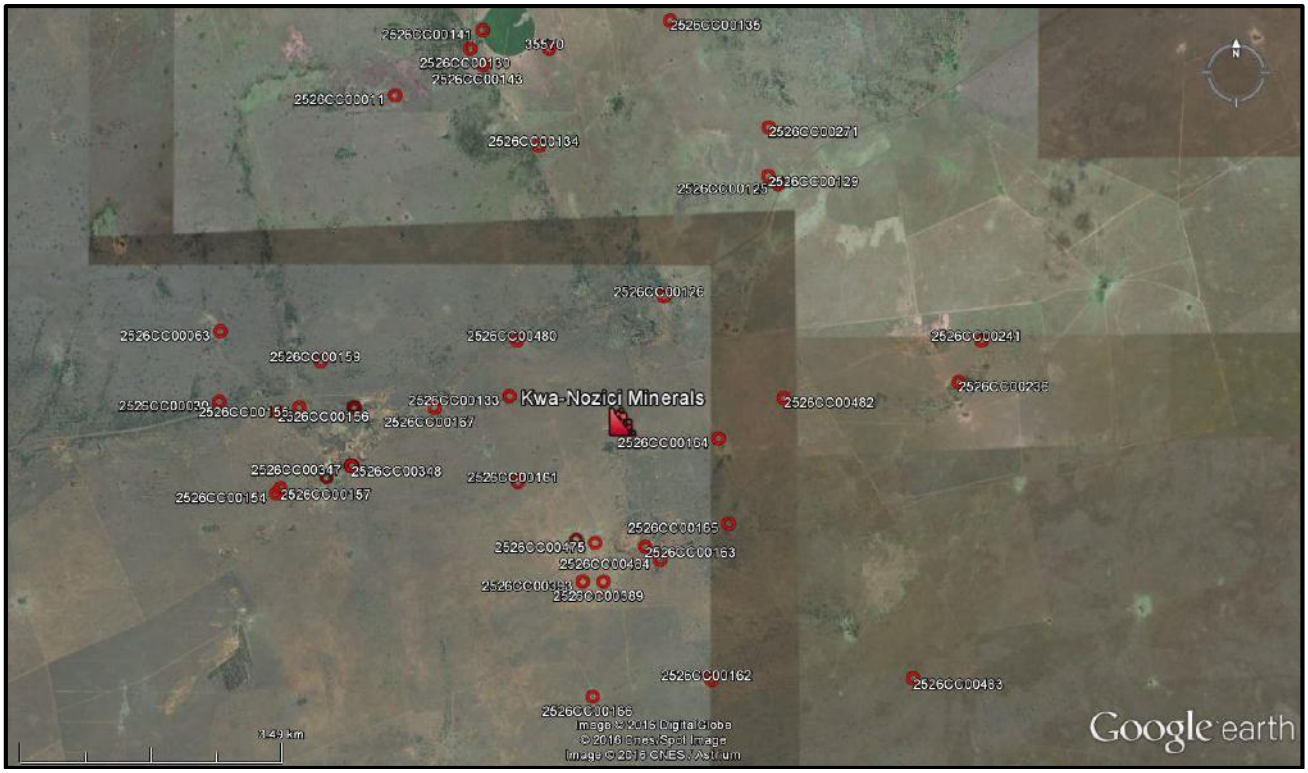

Figure 6 **DWS NGA boreholes (red circles) within a ~5 km radius of the proposed Kwa-Nozici Minerals diamond and manganese mine (red marker).**

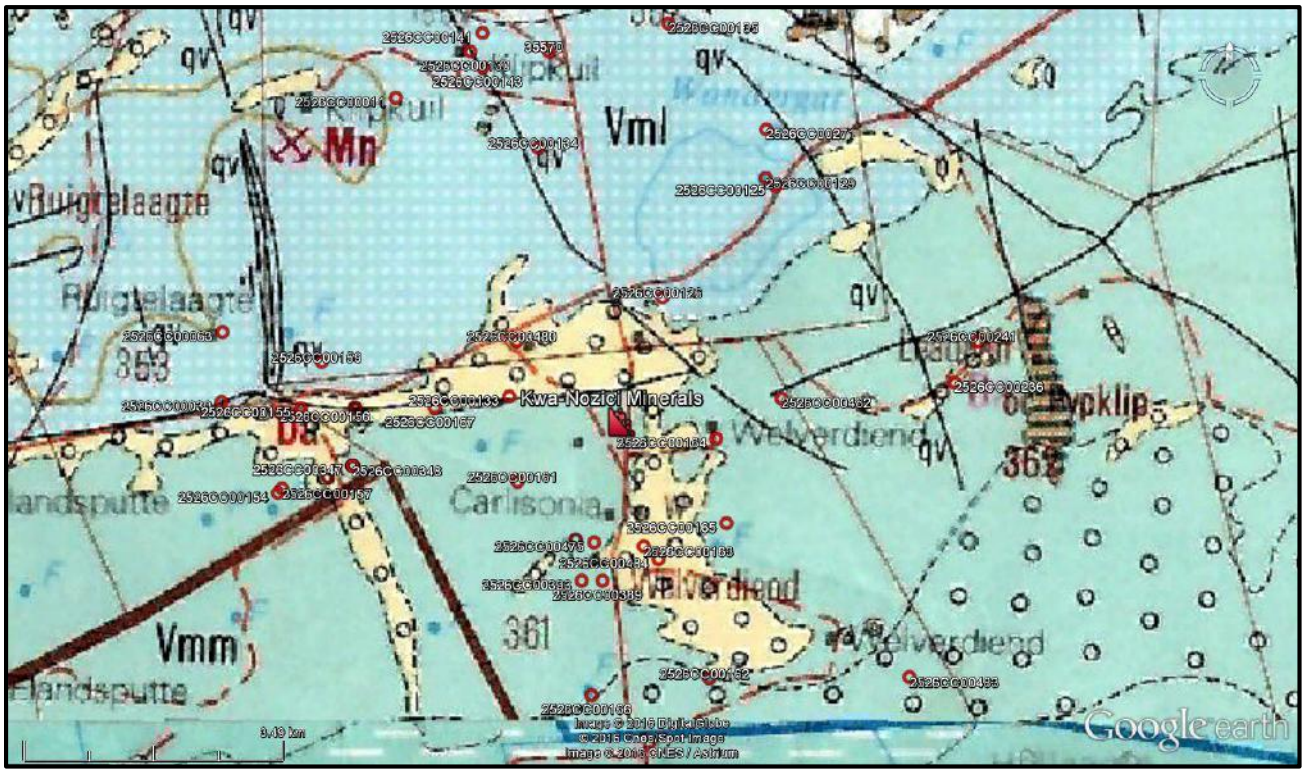

Figure 7 **DWS NGA boreholes (red circles) within a ~5 km radius of the proposed Kwa-Nozici Minerals diamond and manganese mine (red marker), overlaid on the 2526 Rustenburg 1:250 000 geological map.**

Table 4 DWS WARMS borehole data within a 10 km radius of the proposed Kwa-Nozici diamond and manganese mine.

Register No.	Latitude	Longitude	Quaternary Catchment	Water Use Sector	Resource Type	Registered Volume (m^3/a)
26015115	-25.905600	26.156200	D41A	AGRICULTURE: IRRIGATION	BOREHOLE	235200
26015384	-25.855800	26.165400	D41A	AGRICULTURE: IRRIGATION	BOREHOLE	9720
26015428	-25.868000	26.103900	D41A	AGRICULTURE: IRRIGATION	BOREHOLE	65700
26017337	-26.027784	26.300821	C31A	AGRICULTURE: IRRIGATION	BOREHOLE	568500
26046109	-25.973400	26.071000	D41A	MINING	BOREHOLE	183
26050004	-26.027315	26.176443	C31A	AGRICULTURE: IRRIGATION	BOREHOLE	632160
26055857	-26.042694	26.134889	C31A	AGRICULTURE: IRRIGATION	BOREHOLE	130020
26061868	-25.986100	26.137700	D41A	MINING	BOREHOLE	35100
Total						***1676583***

Figure 8 DWS WARMS boreholes (purple circles) within a ~10 km radius of the proposed Kwa-Nozici Minerals diamond and manganese mine (red marker).

Groundwater Quality

Groundwater quality is relatively good within the North West, with 60% of groundwater samples falling within drinking water limits (Howard et al., 2002). On a regional 1:500 000 hydrogeological scale the karst aquifers in the vicinity of the proposed mine have electrical conductivities (ECs) of ~0-70 milliSiemens per metre (mS/m), which is well below the SANS 241:2015 drinking water quality EC limit of 170 mS/m. It is noted however that groundwater in the province is prone to salinization through irrigation due to the semi-arid climatic conditions, relatively low rainfall and high evapotranspiration (Howard et al., 2002). The geological and hydrogeological features responsible for dolomites being such good aquifers (as described above, namely unconfined to semi-confined in nature, and surface to depth dissolution features with high transmissivities and yields) also results in them being highly vulnerable to anthropogenic contamination.

Groundwater quality in the Monte Christo Formation dolomites in the area surrounding the proposed mine is good but hard (i.e. elevated alkalinity, calcium and magnesium concentrations, which is expected from dolomitic aquifers). DWS WMS groundwater samples within ~5 km of the proposed mine (see **Figure 9** and **Figure 10**) were compared to the SANS 241:2015 drinking water quality limits (see **Table 5**), with groundwater being generally suitable for potable and industrial use.

Table 5 **DWS WMS hydrochemical data, a) macrochemistry and b) dissolved trace metals, from boreholes within a ~5 km radius of the proposed Kwa-Nozici Mineral diamond and manganese mine. The samples are compared to the SANS 241:2015 drinking water standard, with samples that do not meet the standard being highlighted in red. Macrochemical constituents are measured in milligrams per litre (mg/l), with the exception of pH and electrical conductivity (mS/m). Trace metals are measured in micrograms (µg/l).**

a)

Sample ID	Latitude	Longitude	Quaternary Catchment	Sample Date	pH	EC	TAL	Ca	Mg	Na	K	Si	Cl	F	NH4	NO3	PO4	SO4
2526CC00125	-25.93293	26.20963	C31A	23-Jan-04	7.94	67.30	246.09	55.95	34.10	21.12	26.57	8.45	52.83	0.10	0.015	3.77	0.149	8.67
2526CC00162	-25.99235	26.20075	C31A	21-Jan-04	8.35	122.10	274.99	68.43	66.60	80.81	17.15	7.54	184.32	0.10	0.046	15.46	0.012	34.59
2526CC00164	-25.96341	26.20168	C31A	21-Jan-04	8.14	59.40	287.99	68.07	39.04	6.39	0.83	8.44	13.62	0.10	0.015	4.88	0.012	3.00
2526CC00166	-25.99437	26.18491	C31A	21-Jan-04	8.12	51.70	252.83	43.44	35.06	12.36	0.73	5.85	6.37	0.10	0.043	1.12	0.012	14.72
2526CC00393	-25.98167	26.18917	C31A	20-Sep-02	8.05	58.20	295.16	63.44	35.64	2.52	0.50	7.54	5.00	0.11	0.054	1.78	0.023	9.59
2526CC00393	-25.98167	26.18917	C31A	6-Apr-06	8.49	53.80	286.31	60.97	35.08	3.26	0.74	8.08	4.45	0.23	0.020	1.90	0.006	2.00
2526CC00393	-25.98167	26.18917	C31A	27-Sep-12	8.18	60.40	277.22	72.54	31.70	-	2.83	9.94	-	0.39	0.025	6.38	0.005	3.01
2526CC00475	-25.97593	26.18528	D41A	20-Jan-04	8.08	54.30	294.67	63.35	35.32	5.34	0.66	8.09	2.50	0.10	0.015	2.11	0.012	7.67
2526CC00480	-25.95165	26.17488	D41A	15-Jan-04	8.37	43.70	223.82	46.34	26.68	4.06	0.56	6.97	2.50	0.10	0.015	1.53	0.012	8.98
2526CC00483	-25.99218	26.22764	C31A	21-Jan-04	8.24	50.30	238.46	33.76	40.46	4.85	0.69	8.88	7.66	0.10	0.015	4.07	0.012	3.00
2526CC00484	-25.97793	26.19390	C31A	20-Jan-04	8.24	55.40	294.49	64.57	35.68	5.01	0.60	7.74	2.50	0.10	0.015	2.14	0.012	3.00
KLIPKUIL 11103	-25.92361	26.15278	D41A	1-Sep-76	8.11	40.30	171.70	41.70	24.30	1.00	0.73	4.85	3.10	0.05	0.060	7.65	0.003	2.00
KLIPKUIL 11112	-25.92917	26.17639	D41A	1-Sep-76	7.95	32.50	165.60	34.20	19.70	1.00	0.64	8.30	1.50	0.05	0.040	0.33	0.003	2.00
KLIPKUIL 11117	-25.93333	26.20833	C31A	14-Sep-76	8.15	55.00	257.00	59.30	33.50	2.80	0.40	8.58	11.90	0.05	0.020	3.23	0.007	2.00
KLIPKUIL 11363	-25.95139	26.14583	D41A	16-Sep-76	7.85	52.10	252.10	52.60	34.80	2.40	0.45	8.71	8.10	0.05	0.100	0.81	0.007	2.00
KLIPKUIL 11364	-25.94583	26.19444	C31A	16-Sep-76	8.07	29.30	136.60	20.40	22.40	2.80	0.73	7.48	3.50	0.17	0.020	1.38	0.018	2.00
KLIPKUIL 4178	-25.95833	26.17389	D41A	28-Jun-88	7.75	44.30	215.60	50.50	29.50	1.00	0.74	6.91	5.80	0.05	0.020	3.14	0.008	2.00
KLIPKUIL ZQMBM26	-25.92222	26.15861	D41A	25-May-94	8.02	46.50	229.60	50.30	29.80	2.60	0.15	5.62	4.70	0.23	0.020	4.40	0.012	6.70
RUIGTELAAGTE 11115	-25.97222	26.14306	D41A	15-Sep-76	7.94	36.50	172.10	36.40	22.10	3.70	0.88	7.46	1.50	0.05	0.020	3.03	0.007	2.00
RUIGTELAAGTE 11121	-25.95139	26.14306	D41A	16-Sep-76	7.85	50.40	255.50	55.70	31.00	1.00	0.42	5.95	3.10	0.15	0.080	0.84	0.018	2.00
WELVERDIEND 11861	-25.96667	26.17222	D41A	28-Oct-76	7.90	50.60	252.20	51.30	33.40	3.40	0.69	8.49	7.70	0.05	0.020	2.32	0.018	2.00
WELVERDIEND 11862	-25.96222	26.19111	D41A	28-Oct-76	7.93	50.90	262.50	51.80	34.50	2.80	1.01	7.38	6.00	0.11	0.020	1.04	0.011	2.00
WELVERDIEND 11863	-25.97778	26.18444	D41A	28-Oct-76	7.89	51.20	266.60	50.30	35.40	2.60	0.76	8.09	9.30	0.05	0.020	1.25	0.011	2.00
WELVERDIEND 4174	-25.96861	26.17500	D41A	28-Jun-88	7.50	57.20	274.30	62.40	36.30	2.50	0.51	8.60	3.60	0.05	0.020	1.46	0.005	2.00
Average					***8.05***	***53.06***	***245.14***	***52.41***	***33.42***	***7.62***	***2.50***	***7.66***	***15.28***	***0.11***	***0.03***	***3.17***	***0.02***	***5.37***

b)

Sample ID	Latitude	Longitude	Quaternary Catchment	Date	Al	As	B	Ba	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Sr	V	Zn
2526CC00393	-25.98167	26.18917	C31A	20-Sep-02	26	64	6	7	4	3	6	3	1	12	8	36	29	14	12
2526CC00393	-25.98167	26.18917	C31A	6-Apr-06	35	103	6	4	5	9	6	22	2	16	4	54	36	3	946
2526CC00480	-25.95165	26.17488	D41A	15-Jan-04	91	64	13	7	5	8	22	64	31	19	16	63	24	11	7
2526CC00484	-25.97793	26.19390	C31A	20-Jan-04	91	64	13	7	5	8	22	48	6	19	16	63	28	11	62
Average					***61***	***74***	***10***	***6***	***5***	***7***	***14***	***34***	***10***	***17***	***11***	***54***	***29***	***10***	***257***

Existing hydrochemical concerns include:

- Slightly elevated nitrate (NO_3) concentrations (although below the SANS 241:2015 drinking water quality limit of 11 mg/l), with the exception of 2526CC00162 (15.46 mg/l) – the presence of nitrates is likely from the use of nitrate and/or livestock manure fertilizer, or human and/or animal waste contamination entering the dolomite aquifers at surface;
- Elevated concentrations of arsenic (As), cadmium (Cd) and lead (Pb) at three boreholes (2526CC00393, 2526CC00480 and 2526CC00484 – the presence of these heavy metals is potentially due to the use of livestock manure fertilizer, human and/or animal waste contamination, and/or the oxidation and mobilisation of metal mineralisation within the dolomites exposed at surface naturally or through mining (with exposed trace metals becoming mobile and being released into the aquifer system);
- Naturally elevated calcium (Ca), magnesium (Mg) and total alkalinity (TAL; and associated hardness) concentrations, which can lead to the scaling and carbonate salt encrustation of any water reticulation infrastructure and equipment that may make use of the groundwater.

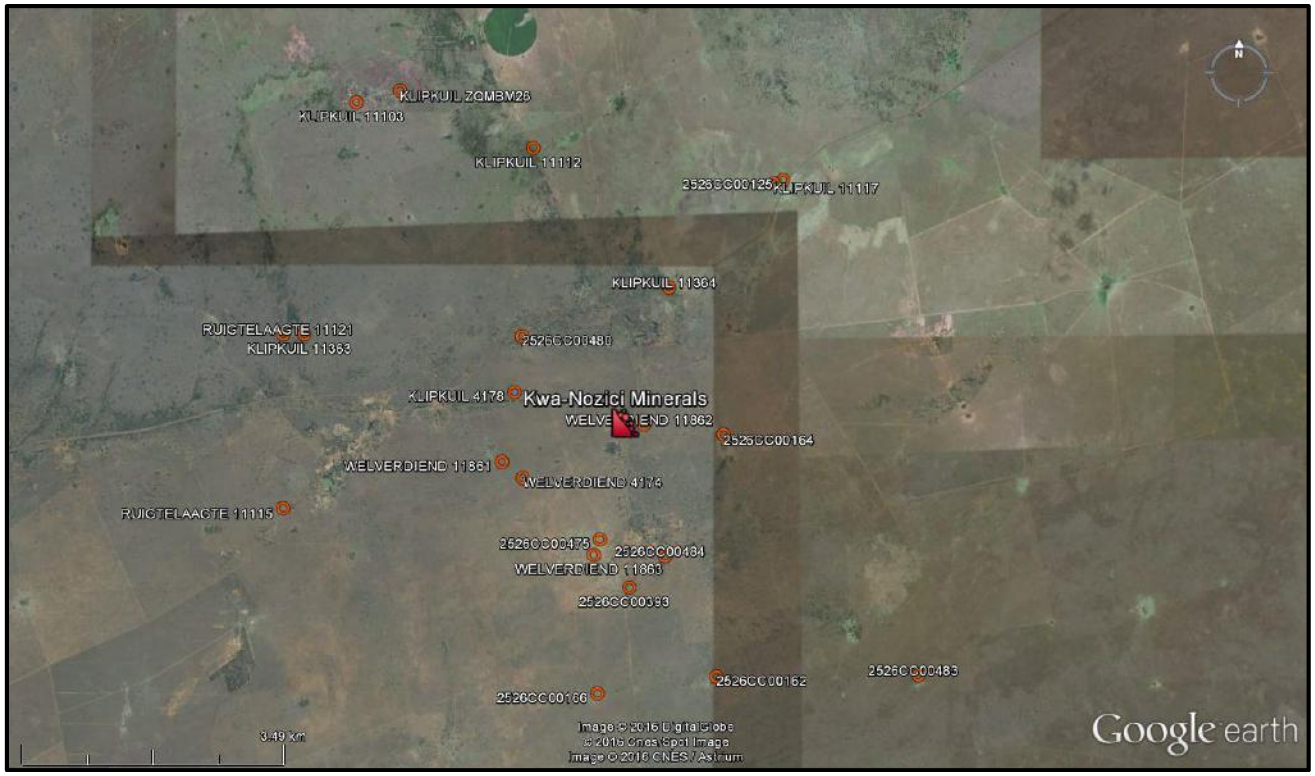

Figure 9 **DWS WMS boreholes (orange circles) within a ~5 km radius of the proposed Kwa-Nozici Minerals diamond and manganese mine (red marker).**

Figure 10 **DWS WMS boreholes (orange circles) within a ~5 km radius of the proposed Kwa-Nozici Minerals diamond and manganese mine (red marker), overlaid on the 2526 Rustenburg 1:250 000 geological map.**

FIELD HYDROCENSUS

A hydrocensus and site visit by an Umvoto Africa staff member took place from the 7th to 9th June 2016 (winter, at the end of a prolonged El Nino induced drought, which might result in lowered groundwater levels) (see **Table 6** and **Figure 11**). Six boreholes in the vicinity of the proposed mine were visited (based on the desktop analysis of available NGA data), with two of them been blocked with rocks or dry (see BH 1 and BH 5 in **Table 6**). The RWL of BH 2, that the proposed mine intends to utilise up to 10 000 l/day from (~0.35 l/s pumping rate based on an 8 hour pumping day), is 24.12 mbgl and meant to be high yielding according to the owner Ms Lily Phillips. The two Carlisonia community boreholes supply the entire village and are said to be high yielding. A small scale active diamond mine located next to the Carlisonia village uses approximately 35 000 l/day (~1.2 l/s pumping rate based on an 8 hour pumping day) from its borehole (2526CC00163) and has a RWL of 12 mbgl (see BH 6 in **Figure 11**). EC of the measured boreholes ranged from ~35-55 mS/m, meeting the SANS 241:2015 drinking water standard.

Table 6 **Boreholes within a ~2 km radius of the proposed Kwa-Nozici Minerals diamond and manganese mine visited during the field hydrocensus.**

Borehole	Latitude	Longitude	RWL (mbgl)	Yield (l/s)	EC (mS/m)	pH	Comments
BH 1	25.96497	26.18740	-	-	-	-	Borehole blocked with rocks at 1.5 mbgl
BH 2	25.96554	26.18765	24.12	-	37.6	-	Located on the proposed Kwa-Nozici Minerals mine, to be used for mining (~10 000 l/day)
BH 3 (2526CC00475)	25.97645	26.18488	-	-	-	-	Carlisonia village north water supply borehole, reportedly high yielding
BH 4 (2526CC00393)	25.98148	26.18388	-	-	53.2	7.4	Carlisonia village south water supply borehole, reportedly high yielding
BH 5 (2526CC00484)	25.97847	26.19352	-	-	-	-	Blocked with rocks at 25.3 mbgl
BH 6 (2526CC00163)	25.97692	26.19093	~12	-	52.5	7.5	Active mine borehole using 35 000 l/day

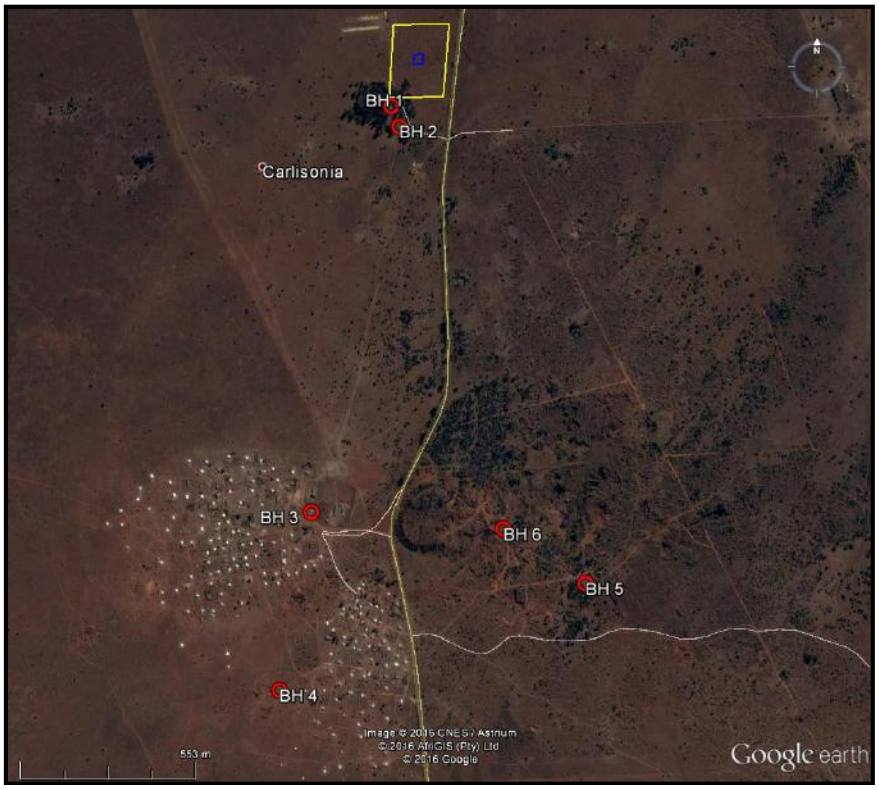

Figure 11 **Boreholes within a ~2 km radius of the proposed Kwa-Nozici Minerals diamond and manganese mine (yellow polygon) visited during the June 2016 field hydrocensus.**

SMALL SCALE DIAMOND AND MANGANESE MINING METHOD

The Department of Minerals Resources (DMR) has in recent years promoted small scale/artisanal mining because of its ability to create jobs, and also generate wealth for poorer communities whom have no other means of supporting themselves (Naidoo-Vermaak, 2006). Artisanal alluvial diamond mining, which mainly involves the recovery of alluvial diamonds found in fluvial deposits or potholes (which are common in the Lichtenburg area), is described as a small scale operation with less than 600 000 tonnes of earth mined per annum (Naidoo-Vermaak, 2006). It is characterised by the use of low-end technology, and labour intensive and unskilled operations, with mining generally being undertaken using pick and shovels or with basic digging, extraction and sifting/sorting equipment. Similar methods will likely be used to extract and sort mineralised surface manganese deposits or material, although no information is currently available whether the manganese ore will be processed and beneficiated on-site, or transported as raw material to clients for beneficiation elsewhere.

The proposed Kwa-Nozici Minerals diamond and manganese mine aims to use basic equipment for mining, consisting of a JLB excavator for digging, collection/storage bins, conveyer belt, sifter/sorter, and 12 foot pan (for washing), although none of this has been finalised as part of a mine works programme (see **Figure 12**). A small tailings dam facility might also be required. The proposed mine plans to build a camp/processing area in the central portion of the concession (see blue polygon in **Figure 11**), although this might be shifted southwards to be situated near BH 2 according to Ms Lily Phillips (although the borehole itself falls outside of the proposed mine's concession however). The proposed mine plans to start mining the southern portion of the concession, and then progress northwards.

Figure 12 Example of the basic machinery used for small scale diamond mining near Carlisonia.

POTENTIAL HYDROGEOLOGICAL IMPACTS

Environmental impacts are often associated with small scale mining because of the lack of money to execute sound environmental practices, and also a lack of knowledge regarding potential negative impacts from low-end technology mining practices (Naidoo-Vermaak, 2006).

Potential hydrogeological impacts include (based on general small scale mining methods, as no defined/detailed mining work programme is currently available):

- Groundwater Quality – Unconfined dolomite aquifers, especially in the presence of surface to depth karst dissolution voids and cavities with increased hydraulic conductivity and transmissivity, are highly vulnerable to anthropogenic surface contamination hazards such as:
    - machinery fuel leaks and oil spills (hydrocarbons);
    - acid mine drainage (AMD) and mobilised trace metals, if mineralised dolomite is exposed to the atmosphere in tailings piles, mining pits and trenches, and filled during rainfall recharge events resulting in ponding and infiltration;
    - infiltration of possible AMD water and trace metals into the aquifer from tailings dams, if present and unlined (also potential tailings dam leakage during large rainfall/flooding events); and
    - sewage leaks from staff buildings or portable toilets on-site (nitrates, microbiological contamination and trace metals).

  Due to the small scale nature and size of the proposed mining activity (and therefore small amounts of potential contaminants involved, although this is also highly dependent on the extent of any mineralisation present within the dolomites), the actual contamination hazard at a local scale is likely to be low, resulting in a low risk of groundwater contamination (despite the high vulnerability of the underlying dolomite aquifers). However this contamination risk to the entire dolomitic aquifer system may increase to moderate at a regional level, when taking into account numerous other small scale mining operations in the surrounding area (if unregulated from an environmental perspective). Potential contamination receptors, other than the entire Monte Christo Formation dolomitic aquifer underlying the mine area, include the Carlisonia water supply boreholes ~1-2 km south of the proposed mine, and surrounding irrigation boreholes in the nearby vicinity (closest potential irrigation boreholes ~1 km east and west of the proposed mining site, based on NGA records).

- Groundwater Quantity – The proposed mine plans to use groundwater from a nearby borehole, at volumes of up to 10 000 l/day (10 m^3/day / 3650 m^3/a, or ~0.35 l/s pumping rate based on an 8 hour pumping day). Due to the extensive groundwater resources available in the immediate area (likely to be ~1-2 million m^3/a), the abstraction of ~3650 m^3/a for mining is highly unlikely to have an impact on available groundwater resources and water levels in the area, even during drought conditions. The risk of mining to groundwater quantity can therefore be defined as very low.

- Groundwater Recharge – Mining operations may influence groundwater recharge in both a positive and negative sense. Tailings dams, open mine diggings and trenches may increase recharge into the aquifer locally artificially, via the ponding of surface water. These same tailings dams, diggings and trenches may however alter runoff flow, negatively reducing recharge in other parts of the aquifer locally. Mine vehicles used may compact the aquifer surface reducing recharge locally as well. Due to the small extent of the proposed mining operation, the risk of significantly negatively altering groundwater recharge into the aquifer is considered very low.

- Groundwater Dewatering – It is expected that the proposed mining will take place above the highest encountered groundwater water levels in the area (~10-12 mbgl, with the closest borehole to the proposed mine having a RWL of ~24 mbgl), therefore the risk of groundwater dewatering through mining is considered very low.

- Sinkhole Development – Due to the low volumes expected to be abstracted and unlikely reduction in water levels, the risk of sinkhole development via karst collapse from lowered water levels is considered very low. Local zones of increased recharge via tailings dams, diggings and trenches, in association with potential AMD may result in the development of new karst features below the mine however, which might result in a low to moderate local risk of surface subsidence features.

- Surface Water Impacts – No surface drainage or rivers are present within the immediate vicinity of the proposed mine, with the headwaters of the Molopo and Harts Rivers being ~15 km from the mine area (along with the closest related high yielding discharge springs). Any leaks or flow from tailings dams etc. will also likely infiltrate into the surrounding dolomite aquifer (see above), with any contamination likely to be attenuated and diluted before reaching regional discharge springs. Surface water impacts are therefore considered very low risk.

RECOMMENDATIONS AND MITIGATION MEASURES

By monitoring and regulating small scale mining, the potential hydrogeological impacts to the receiving environment and be reduced. The following mitigation measures and future studies is recommended:

- Pre-Mining Studies – The following essential additional studies should be undertaken prior to any mining at the proposed Kwa-Nozici Minerals mine
    - Mineral Resource Assessment – Determination of where various potential diamondiferous potholes are within the proposed mining area, as well as the extent of manganese mineralisation, through detailed geological mapping, geophysics and mineralogical analysis (see African Diamond AB [2015] for an example of a nearby alluvial diamond resource assessment). This will affect where mining is to take place within the concession as well as the associated mine design and mine works programme (e.g. length of trenches and diggings, depth of trenching, size of tailings dam facility if required etc.), and therefore what the severity of potential hydrogeological impacts may be.
    - Geotechnical Assessment – Due to the risk of sinkhole development in karst dolomitic terranes, detailed geotechnical assessments should be taken prior to mining to determine any high risk zones that should be avoided during mining.
    - Mine Design and Mine Works Programme – Essential in determining the risk of various hydrogeological impacts/hazards to a greater degree of confidence.
- Groundwater Monitoring – A groundwater monitoring network (both quality and quantity) should be established in association with the DWS and surrounding small scale diamond mines in the Carlisonia area. This is to determine and monitor any potential impacts on groundwater quantity (reduced yields and declining water levels) and quality (acidity, hydrocarbons, trace metals, microbiology etc.) from the proposed mining. This should include:
    - Monitoring of water levels and abstraction volumes from the proposed BH 2 abstraction borehole at Kwa-Nozici Minerals pre-, during the duration of, and post-mining, through the installation of a flow meter and water level datalogger (to be implemented by Kwa-Nozici Minerals, and a requirement of any groundwater registration/WUL).
    - Monitoring of water levels and abstraction volumes from the two Carlisonia village abstraction boreholes pre-, during the duration of, and post-mining, through the installation of a flow meter and water level datalogger (to be implemented by the DWS if not already currently done).
    - Monitoring of water levels and abstraction volumes from any other nearby mine abstraction boreholes pre-, during the duration of, and post-mining, through the installation of a flow meter and water level datalogger (to be implemented by the other mine owners and regulated by DWS if not already currently done).
    - Collection of baseline hydrochemistry samples for analysis from BH 2 at the proposed Kwa-Nozici Minerals mine, from the two Carlisonia abstraction boreholes, and from the nearest farming irrigation borehole to the northwest of the proposed mine. This hydrochemical sampling and analysis is to be repeated at least bi-annually during mine

operation, and annually after mine closure. Hydrochemical constituents to be analysed should include, but not be restricted to the following:

- Macrochemistry – pH, EC, total dissolved solids (TDS), chemical oxygen demand (COD), dissolved organic carbon (DOC), alkalinity, hardness, calcium, magnesium, sodium, potassium, chloride, fluoride, sulphate, phosphate, ammonia, nitrate, nitrite, total petroleum hydrocarbons, oils and grease
- Dissolved metals – aluminium, iron, manganese, copper, cobalt, chromium, nickel, arsenic, lead, zinc, selenium, vanadium, titanium, silver, lithium, beryllium, boron, strontium, molybdenum, cadmium, tin, antimony, barium, mercury, thallium, uranium
- Microbiology – Total coliforms and E. coli

- Groundwater Quality – A variety of mitigation measures to reduce the impacts of potential groundwater contamination are as follows:
  - Portable toilets must be set up correctly and regularly emptied to prevent any leaks and potential contamination of the aquifer.
  - Fuel needs to be stored in a specified lined area to prevent any chance of contamination to the soil and aquifer, and office rubbish to be disposed of in a regional landfill site.
  - Mining equipment is regularly maintained to prevent any fuel or oil leaks.
  - Correct lining of any tailings dam facilities, as well as ensuring correct dam wall heights, in order to prevent infiltration of potential contaminants and overflow respectively.
  - Tailings piles should be lined covered, to reduce exposure to the atmosphere and prevent infiltration of potential contaminants.
  - Funnelling of all drainage from mining operations to tailings dam facilities via lined channels with bund walls and swales, in order to reduce infiltration of potential AMD water into the aquifer.
  - Concurrent rehabilitation of diggings and trenches once excavated zones are complete through re-filling with excavated material to existing surface levels and re-vegetation at surface, in order to prevent the exposure of any mineralised zones within the dolomite to the atmosphere and reduce the potential development of AMD, and subsequent infiltration into the aquifer.
- Groundwater Registration and Water Use Licensing – Section 21 (attached below) of the National Water Act (No. 36 of 1998) defines what "water use" is, and therefore deals with what would require a WUL from the regulatory authorities (namely DWS).

21. For the purposes of this Act, water use includes -
(a) taking water from a water resource;
(b) storing water;
(c) impeding or diverting the flow of water in a watercourse;
(d) engaging in a stream flow reduction activity contemplated in section 36;
(e) engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);
(f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
(g) disposing of waste in a manner which may detrimentally impact on a water resource;
(h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
(i) altering the bed, banks, course or characteristics of a watercourse;
(j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
(k) using water for recreational purposes.

Section 21 (a) and (b) deal with taking water from a resource and storing it. Groundwater use, i.e. Section 21 (a), for domestic use and non-commercial use (called Schedule 1 use), is excluded from this requirement. To lower the administrative burden on the DWS, the Minister can declare a General Authorisation (GA) for any water use, subject to limits and conditions. Although water use under the GA is not required to be licenced, it must still be registered with the DWS (if abstraction over 10 m^3 occurs on any given day). Any water use that exceeds the GA limits, with the exception of Schedule 1, requires a WUL. The current GA for Section 21 (a) groundwater abstraction for the D41A quaternary catchment (within which the proposed BH 2 abstraction borehole and Kwa-Nozici Minerals mine are situated) is 75 m^3/ha/a for groundwater abstraction. This equates to a GA of ~5 000 m^3/a for the farm portion where groundwater abstraction and mining is proposed (75 m^3/ha/a x ~70 ha). The required mine operation volume of ~3 650 m^3/a falls within the GA of the farm portion, and therefore a Section 21(a) WUL will not be required by the mine (provided the borehole where abstraction occurs from occurs on the same farm portion where mining is to take place). Although Section 21 (a) water use under the GA is not required to be licenced, it must still be registered with the DWS. Borehole details (geographic position, construction, geology etc.) are also required to be registered on the DWS NGA.

It is unlikely water will be stored in dams on-site if abstracted (and any tailings dams will be small volume dams), so Section 21 (b) would not apply. Sections 21 (c), (d) and (i) deal with impending, diverting, altering or reducing stream flow in surface watercourses. These sections may apply to the proposed Kwa-Nozici Minerals mine, depending on:

- the definition of what a surface watercourse is and whether watercourses and/or wetlands are present within the mining concession (to be determined by a hydrology expert); and
- whether mining and associated activities will occur within these defined watercourses or wetlands.

Sections 21 (e) to (h) deals with discharging waste in a water resource, which may apply to the proposed mine, if tailings dam facilities are constructed, or there is potential for mine wastewater to infiltrate into the underlying dolomite aquifer, and a WUL may be required in this instance. Section 21 (k) refers to using water for recreational activities and Section 21 (j) is the activity that includes dewatering for mining purposes, which both do not apply to the proposed mine (providing trenching and digging is to occur above the groundwater table with respect to the latter).

If the proposed mining development is authorised then the mitigation measures and recommendations as captured in this report should be followed, in order to ensure groundwater quality and quantity of the underlying Monte Christo Formation dolomitic aquifer is not impacted severely, and the surrounding community of Carlisonia and local farmers who make use of groundwater are not adversely affected.

Yours sincerely

Dylan Blake
Associate / Principal Geologist Pr.Sci.Nat
Umvoto Africa (Pty) Ltd

David Colquhoun McGibbon
Trainee Geologist Cand.Sci.Nat
Umvoto Africa (Pty) Ltd

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Department of Water Affairs and Forestry (DWAF). (2006b). Vaal River System: Large Bulk Supply Reconciliation Strategy. Groundwater Assessment: Dolomite Aquifers. DMM Development Consultants, Golder Associates Africa, SRK, WRP Consulting Engineers and Zitholele Consulting on behalf of DWAF. DWAF Report Number: P RSA C000/00/4406/06, Pretoria, 64pp.

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APPENDIX A: HYDROGEOLOGICAL SPECIALIST CVs

UMVOTO AFRICA

Dylan Blake

Full Name	Dylan Blake
Position/Profession	Associate-Principal Geologist / Earth Scientist
Year of Birth	1983
Experience	10 years
Nationality	South African (ID No: 830911 5006 089)

LANGUAGES

	Read	Write	Speak
English	Fluent	Fluent	Fluent
Afrikaans	Fair	Fair	Fair

TERTIARY EDUCATION

2006	BSc (Hons) Geology (Cum Laude)	University of KwaZulu-Natal
2003	BSc Geology and Environmental Science (Summa Cum Laude)	University of Natal

PROFESSIONAL ASSOCIATIONS

Registered	SACNASP Professional Natural Scientist 400048/13 (Geological Science, Earth Science, Environmental Science)
Member	Geological Society of South Africa (Main Society - 964917, Groundwater Division - 273)
Member	Water Institute of Southern Africa (Member - 24109, Young Water Professional)
Reviewer	UNEP GEO-6 Africa Regional Assessment Reviewer
Member	Golden Key International Honours Society

PROFESSIONAL AWARDS

Runner-up / Special Mention	WISA Excellence in Water Research Award for Outstanding Young Researcher, 2010
Honours Award	Third best Geology Honours thesis in South Africa, 2006
Honours Scholarship	UKZN Honours Scholarship, 2004
Rosenbach Scholarship	Placed first among University of Natal undergraduate students, 2003
Prestige Scholarship	Placed second amongst University of Natal undergraduate students, 2002
Brenda Gourley Scholarship	Placed third amongst University of Natal undergraduate students, 2001

PAPERS AND PUBLICATIONS

Conference Papers and Presentations:	25+
Journals / Books:	7
Consulting Reports:	100+

PROFESSIONAL DEVELOPMENT COURSES

2016	Growing Companies Through High-Performance Boards Governance Workshop (Sirdar)
2016	Accident Prevention, Collision Avoidance and Skid Control (Killarney Training Centre)
2011	4 x 4 Off Road Training (SANOTA/GearUp 4x4)
2010	Thinking, Innovation & Problem Solving Skills (TIPS) (Synnovation)

OVERVIEW OF EXPERIENCE

2016 - present	Umvoto Africa (Pty) Ltd	Associate / Principal Geologist
2014 - 2016	Umvoto Africa (Pty) Ltd	Senior Geologist

2007 - 2014	Umvoto Africa (Pty) Ltd	Geologist
2006 - 2007	Council for Geoscience (Marine Geoscience Unit)	Research Assistant
2004 - 2006	University of KwaZulu-Natal	Tutor / Demonstrator

KEY SKILLS

Dylan Blake received 42 distinctions during the course of his undergraduate and Honours degree studies in Geology and Environmental Science at the University of KwaZulu-Natal, where he specialised in coastal and marine geology. During this time he undertook work in the fields of geological and geomorphological field mapping, sediment analysis, differential GPS surveying and transmitted and reflected light microscopy, as well as becoming familiar with many of the standard geological analysis software packages and GIS tools, and report writing requirements.

Since joining Umvoto in 2007, Dylan has become proficient in hydrogeological desktop (DWS NGA, WARMS and WMS data) and field monitoring data collection and analysis, groundwater assessments, South African environmental/resource legislation (NWA, NEMA, NEMA: ICM, MPRDA etc.) and groundwater use licensing, and rotary/core drilling supervision/contract management. He has significant experience in Table Mountain Group and Sandveld/Bredasdorp Group stratigraphic analysis, and structural modelling and fractured rock reservoir estimates of the Peninsula and Skurweberg Formation aquifers. Dylan has sited high yielding boreholes in structurally complex regions of the Table Mountain and Bokkeveld Groups, and has undertaken numerous groundwater assessments for farms, towns, schools, solar facilities and municipalities across the Western and Eastern Cape (including Villiersdorp and Voorstekraal, farms near McGregor, Wellington, Queenstown and George, and numerous other towns as part of the Southern All Towns Reconciliation Strategy Study), North West and Limpopo (including the Bela-Bela, Modimolle and Mookgophong Local Municipalities for the Magalies Water to Waterberg project) provinces. He has an extensive knowledge of the geology and hydrogeology of South Africa, Ethiopia and Namibia, having grown up and studied in KZN, worked for the past 5 years in the Western and Eastern Cape, and having frequently travelled to the northern provinces of South Africa, Ethiopia and Namibia as part of various geological field trips and hydrogeological projects.

His knowledge of coastal zone dynamics, sedimentary formations, environments and processes along the South African coastline has introduced additional expertise to the company, and he has undertaken large-scale coastal hazard assessments for the City of Cape Town and Provincial Government of the Western Cape. He has also worked on various mineral exploration and disaster risk reduction projects and initiatives, assisting the remote sensing team with geological and structural interpretations, and has a personal interest in the potential effects of shale gas exploitation on water resources. Dylan is currently completing his MSc in Geology, is involved in mentoring and training junior staff and interns at Umvoto Africa, and has also trained government officials in basic hydrogeology. He received the young male runner-up and special mention for Excellence in Water Research Award for Young Researcher from the Water Institute for Southern Africa in 2010. Dylan is a member of the Geological Society of South Africa and Water Institute for Southern Africa, and is a registered professional natural scientist with the South African Council for Natural Scientific Professionals.

EXPERIENCE

Hydrogeology

2016	Private Client: Rusthof LSEN School Groundwater Assessment Hydrogeological assessment, borehole siting and project management.
2016	Private Client: Hermanus Golf Club Groundwater Development Sub-contractor (drilling and testing) management and supervision.
2016	Private Client: Tokai Estate Groundwater Development Hydrogeological assessment, borehole siting and project management.
2015 – present	City of Cape Town Landfill Site Monitoring Borehole Infrastructure Assessment Project manager for the assessment and upgrade of groundwater monitoring borehole infrastructure at landfill sites within the City of Cape Town municipal area.
2015 – present	Private Client: Middelberg 12/643 Water Use Licence Project management and completion of a complex water use licence application for a

	farm in the Stanford area.
2015 – present	Private Client: Quaggaskloof Hydrogeological and Geothermal Assessment Project management and hydrogeological assessment: Desktop and fieldwork for a hydrogeological assessment of a proposed eco-estate at Quaggaskloof, next to Brandvlei Dam (Western Cape).
2015	Private Client: Verlorenvalley Borehole Siting Project management and reporting: A hydrogeological and geological study on Verlorenvalley Farm near Touws River (Western Cape), to determine groundwater potential including determination and siting of boreholes, and provision of licencing recommendations.
2015	Private Client: Jan Fouries Kraal Groundwater Assessment and Borehole Siting Project management and reporting: A hydrogeological and geological study on Jan Fouries Kraal Farm in Calitzdorp (Western Cape), to determine groundwater potential including determination and siting of boreholes, and provision of licencing recommendations.
2014 – present	AMDA Developments: Solar Facility Groundwater Assessments Hydrogeological investigations and hydrocensuses for proposed solar facilities in Beaufort West (Western Cape), Reivilo (North West), Vryburg (North West) and Kenhardt (Northern Cape).
2014 – present	Circum Minerals Potash Ltd: Danakil Potash Project Hydrogeology Study Hydrogeological investigation and project management for groundwater supply to proposed potash mining in the Danakil Depression, Ethiopia.
2014 – present	Private Client: Philippi Horticultural Area Silica Sand Prospecting Hydrogeological Specialist Studies Groundwater specialist studies for an environmental management plan for silica sand prospecting in the Philippi Horticultural Area.
2014	WorleyParsons RSA: ASIDI Schools Groundwater Assessments Hydrogeological investigations and hydrocensuses for primary schools at Bonnievale, Swellendam and Philippi (Cape Town)
2014	Water Research Commission: Trace Metal Contamination of South African Aquifers WRC funded study on the potential of trace metal contamination of aquifers from phosphate fertilizers, specifically focusing on cadmium contamination.
2013 – 2014	Private Client: Propet SA Borehole Siting, drilling and pumping test supervision of a borehole at Propet SA in Table View, Cape Town.
2013 – 2014	Private Client: Takkap Farm Groundwater Assessment Project management and reporting: A hydrogeological and geological study on Takkap Farm in McGregor (Western Cape), to determine groundwater potential including determination and siting of boreholes, and provision of licencing recommendations.
2013	Aurecon/Department of Public Works: Groote Schuur Estate Upgrade Hydrogeological Assessment Project management and reporting: A hydrocensus and hydrogeological study of Groote Schuur Estate in Cape Town.
2007 – present	Oudtshoorn Municipality: Deep Artesian Groundwater Exploration for Oudtshoorn Supply (DAGEOS) Geological, structural and hydrogeological mapping of Table Mountain Group aquifer systems. Undertaking of reserve determination and licence application. Aquifer surface and storage modelling, using GIS software, focusing on stratigraphic analysis, structural modelling and fractured rock reservoir estimates. Logging of TMG core from Paardepoort borehole (460 m) and new exploratory Blossoms boreholes (1000 m+). Contract and on-site management of exploratory borehole drilling at Blossoms.
2007 – present	City of Cape Town: Table Mountain Group Aquifer Feasibility Study and Pilot Project Geological, structural and hydrogeological mapping of Table Mountain Group aquifer systems. Aquifer surface and storage modelling, using GIS software, focusing on stratigraphic analysis, structural modelling and fractured rock reservoir estimates. Undertook preparation of Excel-based balanced cross-sections to update the Peninsula and Skurweberg Formation aquifer yield estimates. Logging of TMG core from Wemmershoek (1050 m), Steenbras (750 m) and Nuweberg (1600 m). Assistance with development of ecological monitoring protocol, and on-site management of exploratory core borehole drilling.
2007 – present	Overstrand Municipality: Water Source Development and Management Plan for the

	Greater Hermanus Area Geological, structural and hydrogeological mapping of Table Mountain Group aquifer systems. Responsible for storage modelling and collection of routine geological, hydrological and hydrochemical monitoring data and processing. Geophyiscal analysis. Contract and on-site management of deep production borehole drilling and rehabilitation.
2007 – present	Overstrand Municipality: Stanford Aquifer Development Geological and hydrogeological mapping of Bredasdorp Group aquifer systems. Responsible for collection of routine geological, hydrogeological and hydrochemical monitoring data and processing. Geophysical analysis. Contract and on-site management of production borehole drilling.
2012 – present	Department of Water Affairs: Determination of Resource Quality Objectives in the Olifants-Doorn Water Management Area Geological and hydrogeological desktop investigation for prioritisation of areas for RQO development within the Olifants-Doorn WMA.
2013	City of Cape Town/Arcus Gibb: Sir Lowry's Pass River Stormwater Infiltration Potential and Contamination Risk Assessment Managed and undertook a stormwater infiltration potential and contamination risk assessment for the Sir Lowry's Pass River catchment, which assisted in the development of a detailed stormwater asset management plan.
2011 – 2012	City of Cape Town/Arcus Gibb: City of Cape Town Eastern Catchments Stormwater Infiltration Potential and Contamination Risk Assessment Managed and undertook a stormwater infiltration potential and contamination risk assessment for the eastern catchments (Mitchell's Plain, Khayelitsha, Durbanville, Kuils River, Somerset West and Gordon's Bay areas), which assisted in the development of a high-level stormwater asset management plan.
2012	Private Client: Lakewood Village Borehole Siting Siting, drilling and pumping test supervision of a borehole at Lakewood Village in Hermanus. Provision of licencing recommendations.
2011 - 2012	Private Clients: Thaba Tholo Groundwater Assessment / Bonniebrook Farm Groundwater Assessments / Knuy Farm Weir Siting Project management and reporting: A hydrogeological and geological study on Thaba Tholo farm in Limpopo and Bonniebrook Farm in Stanford, to determine groundwater potential including determination and siting of boreholes, and provision of licencing recommendations. Analysis of surface-groundwater interactions at Knuy Farm in Ladismith, and siting of a new river weir.
2011	City of Cape Town: Installation of Groundwater Monitoring Boreholes at Solid Waste Disposal Sites Hydrogeological mapping, siting and design of monitoring boreholes for the Athlone Refuse Transfer Station and Kraaifontein Waste Management Facility
2008 – 2011	Department of Water Affairs: Development of Reconciliation Strategies for Selected Towns in the Southern Sub-Regions Assessment of current groundwater resources and determination of possible groundwater augmentation options.
2010 - 2011	Private Client: Steenboksvlakte Groundwater Assessment Project management and reporting: A hydrogeological and geological study on a Steenboksvlakte farm to determine groundwater potential including determination and siting of boreholes.
2007 – 2010	Department of Water Affairs and Forestry: The Assessment of Water Availability in the Berg Catchment Area by means of Water Resource Related Models Aquifer surface and storage modelling, using GIS software, focusing on stratigraphic analysis, structural modelling and fractured rock reservoir estimates. Undertook preparation of Excel-based balanced cross-sections to update the Peninsula and Skurweberg Formation aquifer yield estimates.
2010	BKS Consulting Engineers: Assessment of Possible Groundwater Seepage on Trunk Road 22 (Gouda to Wolseley) Desktop study and site investigation into possible seepage on trunk road near Wolseley.
2010	Mandalay Farms, Woodville, Southern Cape: Groundwater resource assessment Groundwater resource assessment for a private farm near George.
2010	Du Toit Group: Groundwater Assessment for Skaapkraal Farms

	Desktop groundwater assessment using NGDB and WARMS databases and completion of hydrocensus for licencing at a farm near Malmesbury.
2010	Property Pro Development: Groundwater Assessment for Morgenson, Klipkraal, Kransfontein and Res Van Plase Farms Desktop review of farm groundwater resources in the Eastern Cape and Free State.
2009	Gwaing Nature Estates: Desktop Study into Groundwater Potential for Leeuwenfontein Farm. Undertook major part of desktop groundwater study and report writing for a farm near Wellington.
2008 – 2009	Overstrand Municipality: Waste Site Closure Monitoring Boreholes Rotary percussion and rotary mud drilling supervision for three 20-30 m boreholes within Quaternary sediment at Gansbaai landfill site.
2008	Theewaterskloof Municipality: Voorstekraal and Villiersdorp Boreholes Geological, structural and hydrogeological mapping of Table Mountain Group aquifer systems. Hydrocensus, geophysics and borehole siting for Villiersdorp and Voorstekraal.
2008	PD Naidoo & Associates/DWAF: Magalies Water to Waterberg Feasibility Study Groundwater resource assessment for the Bela-Bela, Modimolle and Mookgophong Local Municipalities in the Waterberg District Municipality, Limpopo Province.
2007 – 2008	Hondekloof Nickel: Groundwater Exploration and Development for Mining Operations in Namaqualand Groundwater hydrocensus and structural and geological interpretation for preliminary borehole siting in southern Namaqualand. Rotary percussion drilling supervision and rock chip logging for two 150 m boreholes in gneissic terrane in Kliprand.

Geology

2016	Private Clients: South Peninsula Geological Assessments Geological and coastal hazard assessments for coastal properties in the South Peninsula, Cape Town
2013	Oshkosh Energy & Minerals: Proposed Sand Mining of Portion 6 Elandsfontyn Farm 349 Geology and hydrogeology specialist for mine works programme, environmental scoping and EIA for sand mining along the west coast of the Western Cape.
2012	CSIR/Tullow Ethiopia: South Omo Block ESIA Geology and hydrogeology specialist study as part of a larger environmental and social impact assessment for onshore exploration drilling in southern Ethiopia.
2010	Private Client: Opinion on Advasol's Southern Cape Gas Exploration Rights Desktop geological and hydrogeological study and opinion on Advasol's Environmental Management Plan for proposed gas exploration in the southern Cape.
2010	Private Client: Oudekraal Baseline Assessment Geology, hydrogeology and coastal processes specialist study as part of a baseline assessment for proposed development at Oudekraal, Cape Town.
2008	Sasol Gas: MSP Seismic Investigation Desktop and remote sensing geological and structural assessment for the Mozambique to South Africa gas pipeline.
2007	Private Client: Diamond Exploration in NE Angola Desktop and remote sensing geological assessment for diamond exploration within the Camatué Concession, Lunda Norte Province (northeast Angola).
2007	Private Client: Vredenburg Sands Resource Estimation Desktop resource assessment for sand mining in the Vredenburg area.

Disaster Risk Reduction

2010 – 2014	Water Research Commission: Investigating the Social Vulnerability of People and their Livelihoods and their Response to Water Infrastructure Development of a risk-based methodology to assess social vulnerability in the context of water infrastructure and hydrometeorological hazards, focusing on the village of Tsengiwe in the Eastern Cape as a case study.

2012	Rand Water EMS: Research Project to Investigate Acid Water Plumes, Decants and Intersects with Rand Water's Potable Water Pipelines, and Environmental Mitigation Thereof Desktop geological and hydrogeological input into, and development of a risk assessment tool to analyse the risk of Rand Water's pipelines to AMD.
2010 – 2012	Department of Environmental Affairs & Development Planning Western Cape: Sea Level Rise and Flood Risk Assessment Literature review, data collection, development of modelling and risk assessment methodology for study into the effect of sea level rise in vulnerable areas on the Western Cape coastline (West Coast, Overberg and Eden District Municipalities), and assessment of flood risk.
2009	Aurecon/City of Cape Town: Disaster Risk Assessment Undertook investigations and reporting for hazards relating to hydrogeological, coastal zone and geological processes for the City of Cape Town.
2008	World Bank: Situation Analysis of Disaster Risk Reduction Policies and Practices Assisted in the review of DRR policies and programmes in Malawi.
2007	UN/ISDR and Commonwealth Secretariat: Publication Assisted with editing of a booklet entitled "Sustainable Disaster Risk Reduction in Africa: Mainstreaming Gender Concerns in the Hyogo Framework for Action" and a book chapter titled "Integrating sustainable development into national frameworks: Policy approaches for key sectors in small states".

COURSES AND WORKSHOPS

Attended

2014	Application of Remote Sensing in Geological Mapping and Mineral Exploration (University of Witwatersrand School of Geosciences) Dr Roy Miller Symposium Damara Belt Excursion (GSN) Unconventional Gas: Just the Facts Symposium (GSSA-Groundwater Division/WISA-Mine Water Division/WRC)
2013	WRC Wat-Indaba: Unconventional Gas Drilling (WRC)
2012	1st SA-GEO Symposium (NEOSS/DST); Shale Gas Southern Africa (Vital Training)
2011	SUN Department of Civil Engineering, Stellenbosch: Setbacks 2: Development of Coastal Setback Lines
2010	SUN Department of Civil Engineering, Stellenbosch: Setback Lines for Coastal Developments
2010	University of Cape Town, Cape Town: 1st Shale Gas Workshop and GASH-SA Launch (presented by Africa Earth Observatory Network)
2009	Institute for Water Studies – University of the Western Cape, Cape Town: International Geophysics Short Course (presented by UNESCO Chair in Hydrogeology)
2009	Institute for Water Studies – University of the Western Cape, Cape Town: International Short Course on Fractured Rock Aquifer Assessment (presented by UNESCO Chair in Hydrogeology)
2008	SA Institute for Engineering and Environmental Geologists, Cape Town: Geotechnical Soil Profiling and Core Logging Course
2008	Geological Society of South Africa, Cape Town: Drilling Methods and Techniques in Exploration and Mining Course
2007	Department of Water Affairs and Forestry (DWAF), Cape Town: Groundwater Resources Directed Measures Training Course

CONFERENCES AND SEMINARS

Presentations

1. Blake, D. (2015). Cadmium contamination of groundwater in South Africa – The potential hazard of phosphate fertilizers. 14th South African Groundwater Division Conference, Muldersdrift, South Africa, 2015.
2. Blake, D., Hartnady, C. J. H., McGibbon, D. C., Hartnady, M. I. H. and Molzen, G. A. (2015). Oudtshoorn Groundwater Project: Exploratory drilling results from the Blossoms Wellfield. Poster

exhibited at the 14th South African Groundwater Division Conference, Muldersdrift, South Africa, 2015.

3. McGibbon, D. C., Hartnady, C. J. H., Riemann, K. and Blake, D. (2015). Flow test analysis and monitoring of the deep confined Peninsula Aquifer in Blossoms (Oudtshoorn), Western Cape, South Africa. 14th South African Groundwater Division Conference, Muldersdrift, South Africa, 2015.
4. Blake, D. (2015). Natural coastal hazards along the South African coastline: Lecture 1 – Sea level change and associated coastal threats. University of Cape Town Summer School, January 2015.
5. Blake, D. (2015). Natural coastal hazards along the South African coastline: Lecture 2 – Tsunami risk in South Africa. University of Cape Town Summer School, January 2015.
6. Blake, D. (2014). Groundwater potential of the Swartland region. Malmesbury Agricultural Society – Dairy Study Group Annual General Meeting, Malmesbury, South Africa, June 2014.
7. Riemann, K., Blake, D. and Lee, P. (2014). Groundwater Development and Management. Module 6 to 8 of the Training on Integrated Water Resource Management: Continuation of the All Towns Reconciliation Strategy Study, 26 to 29 May 2014.
8. Hay, E. R., Blake, D. and Hartnady, C. J. H. (2013). A future Oudtshoorn groundwater heritage trail. Geoheritage Conference, Oudtshoorn, South Africa, 2013.
9. Blake, D., Hartnady, C. J. H. and Riemann, K. Groundwater exploration at Nuweberg near Grabouw, for the City of Cape Town Table Mountain Group Aquifer Project. 3rd Regional Conference of the Southern African Young Water Professionals, Stellenbosch, South Africa, 2013.
10. Blake, D. and Hartnady, C. J. H. (2013). Shale gas exploration in South Africa and possible future groundwater quality and quantity issues. Shale Gas Southern Africa, Cape Town, South Africa, 2013.
11. Hartnady, C. J. H. and Blake, D. (2012). Karoo shale gas development: Environmental impacts and geophysical risks. Geological Society of South Africa Energy Options Conference, Johannesburg, South Africa, 2012.
12. Blake, D., Hartnady, C. J. H., Isaacs, G. and Chimboza, N. (2012). Rapid qualitative sea level rise risk assessment for coastal district municipalities of the Western Cape, South Africa. 1st SA-GEO Symposium, Cape Town, South Africa, 2012.
13. Blake, D. and Hartnady, C. J. H. (2011a). Shale gas exploration in South Africa and possible future groundwater quality and quantity issues. Geosynthesis, Cape Town, South Africa, 2011.
14. Blake, D. and Hartnady, C. J. H. (2011b). Shale gas exploration in South Africa and possible future groundwater quality and quantity issues. 12th South African Groundwater Division Conference, Pretoria, South Africa, 2011.
15. Blake, D., Hartnady, C. J. H. and Riemann, K. (2011a). Exploratory drilling results from the Table Mountain Group aquifers, southwestern Cape, South Africa. 23rd Colloquium of African Geology, Johannesburg, South Africa, 2011.
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Other

1. Blake, D. (2006). Beach dynamics along the Durban Bight coastline, KwaZulu-Natal. Unpublished Honours thesis. University of KwaZulu-Natal, Durban, 96pp.

UMVOTO AFRICA

David McGibbon

Full Name	David Colquhoun McGibbon
Profession	Trainee Geologist / Hydrogeologist
Year of Birth	1988
Experience	2 Years
Nationality	South African (Passport No: 8804235076087)

LANGUAGES	**Read**	**Write**	**Speak**
English	Fluent	Fluent	Fluent
Afrikaans	Fluent	Fluent	Fluent

TERTIARY EDUCATION

2013 - 2014	M Sc (Structural Geology) University of Cape Town
2012 - 2012	B Sc (Hons) (Applied Geology) University of Stellenbosch
2008 - 2011	B Sc (Earth Science) University of Stellenbosch

PROFESSIONAL ASSOCIATIONS

Registered	SACNASP, Cand Nat Sci 100219/14 (Earth Science)
Member	Geological Society of South Africa (Main Society, Groundwater Division)
Member	Golden Key International Honours Society

PROFESSIONAL DEVELOPMENT COURSES

Accident Prevention, Collision Avoidance and Skid Control (Killarney Training Centre)
The Application of Remote Sensing in Geologic Mapping and Mineral Exploration (Dr.Tsehaie Woldai)

OVERVIEW OF EXPERIENCE

2014 - Present	Umvoto Africa (Pty) Ltd, Trainee Geologist/Hydrogeologist
2013 – 2014	University of Cape Town – Tutor/Demonstrator
2011 - 2012	University of Stellenbosch – Tutor/Demonstrator

KEY SKILLS

David McGibbon received 13 distinctions during the course of his undergraduate and Honours degree studies in Geology at the University of Stellenbosch, where he specialised in structural geology and mapping. He completed three months of fieldwork in Antarctica for his MSc which he was awarded in early 2014. During this time he undertook work in the fields of geological and structural field mapping, geochemistry, differential GPS surveying and transmitted and reflected light microscopy, as well as becoming familiar with many of the standard geological/hydrogeological analysis software packages (Illustrator, Datamine, ERDAS, SgeMS, PhreeqC, AQTESOLV, AquaChem, FC programme) and GIS tools (Arc GIS and Goodle Earth), and report writing requirements. Since joining Umvoto in 2014 he has gained experience in hydrogeological field monitoring, percussion drilling and core drilling supervision, contract supervision, undertaking hydrocensuses, ECO and drilling report writting, Carbon 14 sampling, tenders and proposals, groundwater assessments, pumping test analysis and sustainable yield determination. He is currently being trained in hydrogeology under the supervision of Dr. Chris Hartnady.

EXPERIENCE

2016 **Private Client: Rusthof LSEN School Groundwater Assessment**
Hydrogeological assessment, borehole siting and project management.

2016 **Private Client: Hermanus Golf Club Groundwater Development**

Pumping test analysis.

2016 **Private Client: Tokai Estate Groundwater Development**
Hydrogeological assessment and borehole siting.

2015 - present **Private Client: Quaggaskloof Hydrogeological and Geothermal Assessment**
Desktop and fieldwork for a hydrogeological assessment of a proposed eco-estate at Quaggaskloof, next to Brandvlei Dam (Western Cape).

2015 **Private Client: Midnight Storm Water License Middelberg Farm**
Hydrogeological and geological study for the water license application.

2015 **WWF: Review of Water Stewardship Webtool**
Reviewing the webtool designed by the WWF for water stewardship.

2015 **Private Client: Comments on Regulations Published under Government Notice R466 (Shale Gas Fracking)**
Reviewing the fracking regulations for South Africa.

2015 **Private Client: Danakil Potash Project – Groundwater Modelling and Water Resource Analysis**
Pumping test analysis, water balance determination and sustainable yield determination of exploration boreholes in the Danakil Depression for a Water Resource Evaluation for a proposed potash mine.

2015 **Private Client: Jan Fouries Kraal Groundwater Assessment and Borehole Siting**
Mapping and reporting: A hydrogeological and geological study on Jan Fouries Kraal Farm in Calitzdorp (Western Cape), to determine groundwater potential including determination and siting of boreholes, and provision of licencing recommendations

2014 – present **Oudtshoorn Municipality: Deep Artesian Groundwater Exploration for Oudtshoorn Supply (DAGEOS)**
Geological, structural and hydrogeological mapping of Table Mountain Group aquifer systems. Analysis of flow test data to estimate aquifer dynamics, such as recovery predictions. Logging of TMG chips from C1d3 borehole (525 m). Contract and on-site management of exploratory borehole drilling at Blossoms.

2014 – 2015 **AE-AMD Renewable Energy: Solar Facility Groundwater Assessments**
Hydrogeological investigations and hydrocensuses for proposed solar facilities in Reivilo (North West). Pumping test analysis and sustainable yield determination.

2014 – present **Department of Water Affairs and Sanitation: Support to the Continuation of the Water Reconciliation Strategy for the Western Cape Water Supply System**
Cape Flats Aquifer Urban Groundwater Management Strategy development and analysising potential point and non-point sources of pollution in the Berg River Catchment.

2008 – 2013 **University field work and mapping**
MSc field work in Antarctica for three months and Hons field work near Yzerfontein for one month. Field trips during university to Aggeneys, Cape Columbine and Laingsburg. Demonstrator for 3rd year field trips to Aggeneys and Nous Wells (2013), Nuy Valley (2013) and Yzerfontein (2012). Demonstrator for practicals in 2013 for: structural geology to 2nd and 3rd years, UCT, geography environmental science to 1st years, UCT.

2011 **Bloy Resource Evalutaion located in George, South Africa**
Resource evaluation internship

Consulting Reports

1. Blake, D. and McGibbon, D. C. (2016). Rusthof LSEN School Groundwater Assessment and Borehole Siting. Prepared by Umvoto Africa (Pty) Ltd for Hatch Goba (Pty) Ltd. Report No. 859/03/01/2016 (February 2016), 16pp.

2. Blake, D. and McGibbon, D. C. (2016). Faircape Tokai Groundwater Development. Phase 1 Groundwater Assessment and Borehole Siting. Prepared by Umvoto Africa (Pty) Ltd for Faircape Group Holdings (Pty) Ltd). Report No. 857/01/01/2016 (February 2016), 26pp.
3. Blake, D., Hay, E. R., Riemann, K., Molzen, G. A., McGibbon, D. C., Towers, L., Adler, A., Nolakana, L. and Lee, P. (2015). Middelberg 12/643 Water Use Licence Application – Water Use Licence Application. Prepared by Umvoto Africa (Pty) Ltd for Middelberg H2O (Pty) Ltd. Report No. 828/01/01/2015 (December 2015), 56pp.
4. McGibbon, D. C. and Blake, D. (2015). Outeniqua Mountain Geological Update. Prepared by Umvoto Africa (Pty) Ltd for Oudtshoorn Municipality, Report No. 603/F1.7/2/2015 (July 2015), 8pp.
5. McGibbon, D. C. and Blake, D. (2015). Interim Monitoring Report October 2014 to March 2015. Prepared by Umvoto Africa (Pty) Ltd for Oudtshoorn Municipality, Report No. 603/2.2/1/2015 (August 2015), 8pp.
6. Hartnady, C. J. H., Blake, D., Hartnady, M. I. H., Botha, F. S., Hay, E. R., Nolokana, L., McGibbon, D. C., Riemann, K., Lourens, J. B. Lourens and Kuhudzai, A. (2015). Danakil Potash Project – Groundwater Modelling and Water Resource Analysis. Prepared by Umvoto Africa (Pty) Ltd for Circum Minerals Ltd (July 2015), 117pp.
7. McGibbon, D. C., Blake, D. and Hartnady, C. J. H. (2015). Monitoring Report 2011 – 2014 Update. Prepared by Umvoto Africa (Pty) Ltd for Oudtshoorn Municipality, Report No. 603/2.2/1/2014 (August 2015), 64pp.
8. McGibbon, D. C. and Hartnady, C. J. H. (2015). Pumping Test Report 2014. Prepared by Umvoto Africa (Pty) Ltd for Oudtshoorn Municipality, Report No. 603/2.2/2/2014 (August 2015), 96pp.
9. Hartnady, C. J. H., Blake, D., Hartnady, M. I. H., Botha, F. S., Hay, E. R., Nolokana, L., McGibbon, D. C., Riemann, K., Lourens, J. B. Lourens and Kuhudzai, A. (2015). Danakil Potash Project – Groundwater Modelling and Water Resource Analysis. Prepared by Umvoto Africa (Pty) Ltd for Circum Minerals Ltd, Report No. 838/06-08/01/2015 (July 2015), 117pp.
10. McGibbon, D. C. and Blake, D. (2015). Jan Fouries Kraal Farm Groundwater Assessment and Borehole Siting. Prepared by Umvoto Africa (Pty) Ltd on behalf of Mr Gerrie Mathee (Uhuru Guest Farm) (July 2015), 21pp.
11. McGibbon, D. C. and Blake, D. (2015). Brakfontein Solar Facility Phase 2 Pumping Test and Hydrochemical Analysis Report. Prepared by Umvoto Africa (Pty) Ltd on behalf of AE-AMD Renewable Energy (Pty) Ltd (June 2015), 17pp.
12. Lee. P., McGibbon. D., Mazibuko. S., Hay. R. and Blake. D., 2014. Klip River Monitoring for Alien Vegetation Control. Oudtshoorn Groundwater Project WCR 17. Prepared for Oudtshoorn Local Municipality.
13. McGibbon, D. C. and Blake, D. (2014). Brakfontein Solar Facility Hydrogeological Assessment: Phase 1 Desktop Groundwater Resource Assessment. Prepared by Umvoto Africa (Pty) Ltd on behalf of AE-AMD Renewable Energy (Pty) Ltd (November 2014), 14pp.

Conferences and Seminars

Presentations

1. McGibbon, D. C. (2015). Flow test analysis and monitoring of the deep confined Peninsula aquifer in Blossoms (Oudtshoorn), Western Cape, South Africa. 4th South African Young Water Professional and 1st African Young Water Professional Conference, Council for Scientific and Industrial research (CSIR), Pretoria, South Africa, 2015.
2. Hay, R., McGibbon, D. C., Botha, F. (2015). Cape Flats and False Bay – Opportunity to Change. IMESA Conference, Cape Town, South Africa, 2015.
3. McGibbon, D. C. (2015). Flow test analysis and monitoring of the deep confined Peninsula aquifer in Blossoms (Oudtshoorn), Western Cape, South Africa. 14th South African Groundwater Division Conference, Muldersdrift, South Africa, 2015.
4. Blake, D., Hartnady, C. J. H., McGibbon, D. C., Hartnady, M. I. H. and Molzen, G. A. (2015). Oudtshoorn Groundwater Project: Exploratory drilling results from the Blossoms Wellfield. Poster exhibited at the 14th South African Groundwater Division Conference, Muldersdrift, South Africa, 2015.

APPENDIX E

Permit(s)/License(s)

Contents

- *Water Use General Authorisation Registration Letter*

water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Provincial Operations: North West , Cnr Dr. James Moroka Drive and Sekame Road, Megacity Shopping Centre, Unit no. 99, Ground Floor,Private Bag x5, Mmabatho, 2735; Tel (018) 387 9500, Fax: (018) 392 2998 / 384 0913, www.dwa.gov.za

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e-mail: theunissenc@dwa.gov.za

2016-02-05

Mrs LC Phillips
17 Skilpad Street
Meyerton
1961

For Attention : **LC Phillips** **Ref No :**

RE: **Kwa-Nozici Minerals (Pty) Ltd - GA - Registration Forms (DW756, DW760, DW901, DW788, DW784 forms) + R114 - ptn 48 (p/p 19), Welverdiend 361 JP**

This office acknowledges the receipt of your application documents regards to the above-mentioned on 5 February 2016 **(Task T86/2016).** The office responsible for this area is : **Mr Clement Makwela** and can be contacted at (018) 387-9500 / 083-407-0879.

Comments would be forwarded in due time.

Thank you

Ms C. THEUNISSEN
CHIEF ADMIN CLERK