KONGIWE
ENVIRONMENTAL SCIENCE & ENGINEERING

APPENDIX D10:

HERITAGE IMPACT ASSESSMENT

Heritage Impact Assessment

Umsimbithi eMakhazeni Mining Project

Proposed Umsimbithi eMakhazeni Mining Project near Belfast, Mpumalanga Province

Issue Date:	4 December 2017
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Client:	Kongiwe Environmental Services
PGS Project No:	262 HIA

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DECLARATION OF INDEPENDENCE

This report has been compiled by PGS Heritage (Pty) Ltd, an appointed Heritage Specialist for Kongiwe Environmental (Pty) Ltd. The views stipulated in this report are purely objective and no other interests are displayed during the decision-making processes discussed in the Heritage Impact Assessment.

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EXPLANATION OF ABBREVIATIONS USED IN THIS DOCUMENT

ABBREVIATIONS	DESCRIPTION
AIA	Archaeological Impact Assessment
ASAPA	Association of Southern African Professional Archaeologists
BEA	Basic Environmental Assessment
CMP	Conservation Management Plan
CRM	Cultural Resource Management
EIA	Environmental Impact Assessment
EMPR	Environmental Management Programme Report
EP	Equator Principles
EPFI	Equator Principles Financial Institutions
ESA	Early Stone Age
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESR	Environmental Scoping Report
GHG	Greenhouse Gas
GPS	Global Positioning System
HIA	Heritage Impact Assessment
HSR	Heritage Scoping Report
IFC	International Finance Corporation
LIA	Late Iron Age
LSA	Later Stone Age
MPRDA	Minerals and Petroleum Resources Development Act
MSA	Middle Stone Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
OECD	Organisation for Economic Co-operation and Development
PGS	PGS Heritage
PHRA	Provincial Heritage Resources Authority
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System

Terminology and Abbreviations

Archaeological resources

i. 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;
ii. 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 a 10m buffer area;
iii. 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 in the Maritimes Zones Act, 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;
iv. features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

Cultural significance

This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

Development

This means any physical intervention, excavation or action other than those caused by natural forces, which may according to the heritage agency result in a change to the nature, appearance or physical nature of a place or influence its stability & future well-being, including:

i. construction, alteration, demolition, removal or change in use of a place or a structure at a place;
ii. carrying out any works on or over or under a place;
iii. subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
iv. constructing or putting up for display signs or boards;
v. any change to the natural or existing condition or topography of land; and
vi. any removal or destruction of trees, or removal of vegetation or topsoil

Facies

Any subgroup of elements within an industry or main culture tradition that is distinguished from the whole on the basis of some aspect of appearance or composition.

Fossil

Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Heritage

That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).

Heritage resources

This means any place or object of cultural significance

Later Stone Age

The archaeology of the last 20 000 years, associated with fully modern people.

Late Iron Age (Early Farming Communities)

The archaeology of the last 1000 years up to the 1800's associated with ironworking and farming activities such as herding and agriculture.

Middle Stone Age

The archaeology of the Stone Age, dating to between 20 000-300 000 years ago, associated with early modern humans.

Palaeontology

Any fossilised remains or fossil trace of animals or plants which lived in the geological past and any site which contains such fossilised remains or trace.

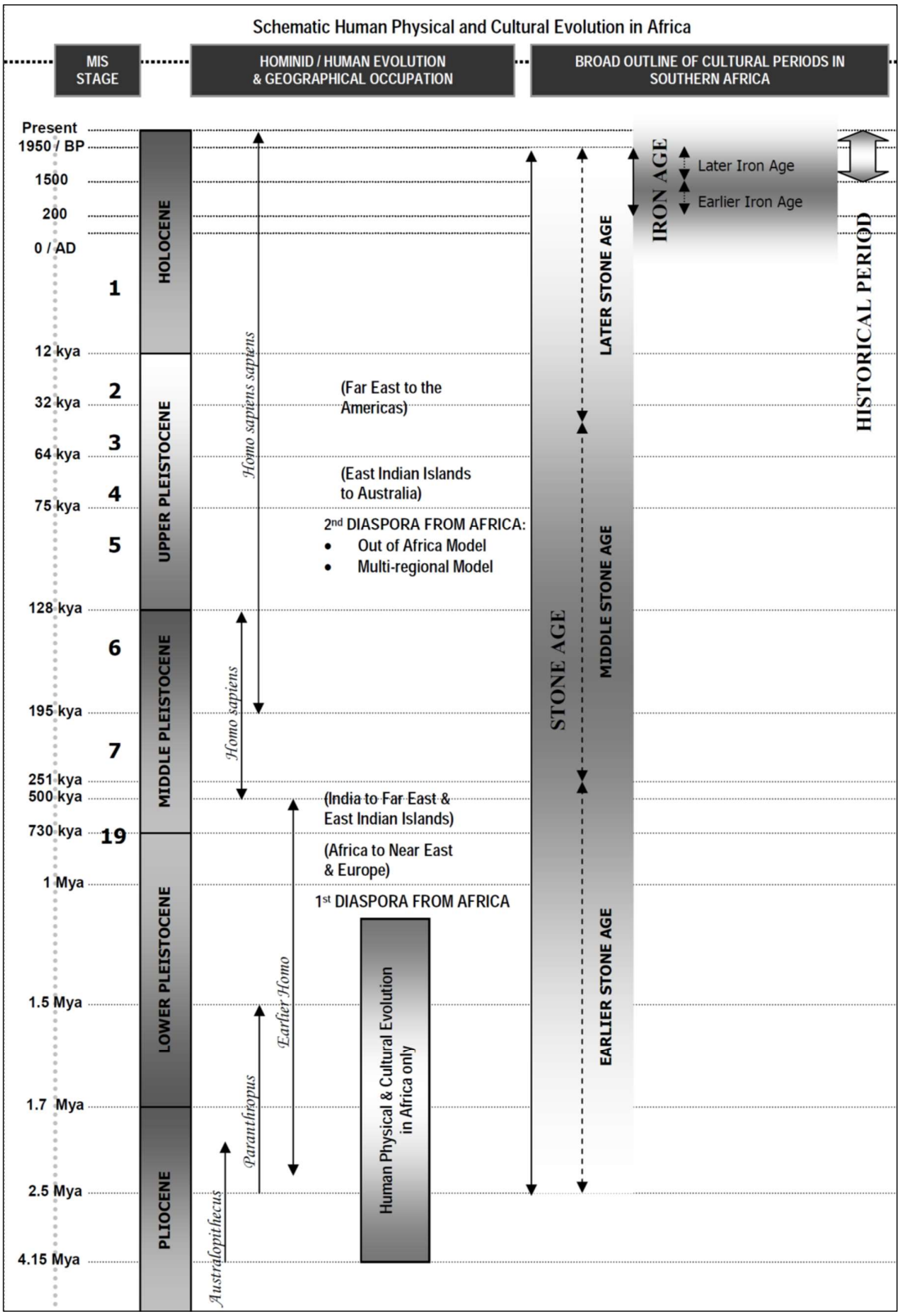

Figure 1 – Human and Cultural Time line in Africa (Morris, 2008)

EXECUTIVE SUMMARY

PGS Heritage (Pty) Ltd (PGS) was appointed by Kongiwe Environmental (Pty) Ltd (Kongiwe) to undertake a Heritage Impact Assessment (HIA) which forms part of the Environmental Impact Assessment (EIA) for the proposed Umsimbithi eMakhazeni Mining Project near Belfast, Mpumalanga Province.

The Heritage Scoping Report has shown that the proposed project may have heritage resources present in the study area. This has been confirmed through archival research and evaluation of aerial photography and topographical maps of the study area, as well as the fieldwork undertaken for this HIA report.

Evaluation of aerial photography has indicated the following areas that may be sensitive from a heritage perspective. The analysis of the studies conducted in the area assisted in the development of the following landform type to heritage find matrix in **Table 1**. The stakeholder engagement process had identified only one grave, located on the farm Leeuwbank. This identified grave will be followed up during the fieldwork phase of the HIA. Other burial grounds and graves were identified during the HIA fieldwork.

Table 1: Landform type to heritage find matrix

LANDFORM TYPE	HERITAGE TYPE
Crest and foot hill	LSA and MSA scatters, LIA settlements
Crest of small hills	Small LSA sites – scatters of stone artefacts, ostrich eggshell, pottery and beads
Watering holes/pans	LSA sites, LIA settlements
Farmsteads	Historical archaeological material
Ridges and drainage lines	LSA sites, LIA settlements
Forested areas	LIA sites

The fieldwork for the HIA identified 28 heritage resources with different heritage significance ratings. The public participation process further identified one infant burial near Pit BE (**029**). These sites consist of 20 Burial sites (with approximately 200 burials in total), one archaeological site and seven historic structures. Of these 28 resources, only 13 with heritage significance (**006,**

007, 008, 009, 012, 014, 015, 016, 018, 019, 025, 027, 028) will be directly impacted by the project activities.

The impact significance before mitigation on the heritage resources varies between HIGH negative (**All sites except 018**) and MEDIUM negative (**018**). Implementation of the recommended mitigation measures will reduce this impact rating to LOW negative (**For all sites except 014**) or MEDIUM negative in the case of **014**.

The management and mitigation measures as described in Section 7 of this report have been developed to minimise the project impact on heritage resources.

It is the author's considered opinion that overall impact on heritage resources **after** the implementation of the recommended mitigation measures is acceptably low and that the project can be approved from a heritage perspective.

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1 INTRODUCTION

PGS Heritage (Pty) Ltd (PGS) was appointed by Kongiwe Environmental (Pty) Ltd (Kongiwe) to undertake a Heritage Impact Assessment (HIA) which forms part of the Environmental Impact Assessment (EIA) for the proposed Umsimbithi eMakhazeni Mining Project near Belfast, Mpumalanga Province.

1.1 Scope of the Study

The aim of the study is to identify possible heritage sites and finds that may occur in the proposed development area. The HIA aims to inform the Environmental Assessment Practitioner (EAP) in the development of a comprehensive EIA and Environmental Management Plan (EMP) to assist the developer in managing the identified heritage resources in a responsible manner to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999) (NHRA).

1.2 Specialist Qualifications

This HIA was compiled by PGS Heritage, the staff of which has a combined experience of nearly 70 years in the heritage consulting industry and extensive experience in managing the HIA process.

Jessica Angel, the author of this report, holds a Master's degree in Archaeology and is registered as a Professional Archaeologist with the Association of Southern African Professional Archaeologists (ASAPA).

Wouter Fourie, the Project Manager, is registered as a Professional Archaeologist with ASAPA and has CRM accreditation within the said organisation, as well as being accredited as a Professional Heritage Practitioner with the Association of Professional Heritage Practitioners – Western Cape (APHP).

1.3 Assumptions and Limitations

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for

this, including the subterranean nature of some archaeological sites and the current dense vegetation cover. As such, should any heritage features and/or objects not included in the present inventory be located or observed, a heritage specialist must be contacted immediately.

Such observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well. If any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply as set out below.

1.4 Legislative Context

The identification, evaluation and assessment of any cultural heritage site, artefact or find in the South African context is required and governed by the following legislation:

i. National Environmental Management Act (NEMA) Act 107 of 1998
ii. National Heritage Resources Act (NHRA) Act 25 of 1999
iii. Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002

The following sections in each Act refer directly to the identification, evaluation and assessment of cultural heritage resources.

i. National Environmental Management Act (NEMA) Act 107 of 1998
    a. Basic Environmental Assessment (BEA) – Section (23)(2)(d)
    b. Environmental Scoping Report (ESR) – Section (29)(1)(d)
    c. Environmental Impacts Assessment (EIA) – Section (32)(2)(d)
    d. Environmental Management Programme(EMPr) – Section (34)(b)
ii. National Heritage Resources Act (NHRA) Act 25 of 1999
    a. Protection of Heritage Resources – Sections 34 to 36; and
    b. Heritage Resources Management – Section 38
iii. Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
    a. Section 39(3)

The NHRA stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34-36 provides general protection to heritage

resources such as structures older than 60 years, archaeological and palaeontological resources and burial grounds and graves.

The NHRA is utilized as the basis for the identification, evaluation and management of heritage resources and, in the case of CRM those resources specifically impacted on by development as stipulated in Section 38(1) of NHRA, and those developments administered through NEMA and MPRDA legislation (s38(8)). In the latter cases, the feedback from the relevant heritage resources authority is required by the State and Provincial Departments managing these Acts before any authorizations are granted for development. The last few years have seen a significant change towards the inclusion of heritage assessments as a major component of Environmental Impacts Processes required by NEMA and MPRDA. This change requires us to evaluate the Section of these Acts relevant to heritage (Fourie, 2008).

The NEMA 23(2)(b) states that an integrated environmental management plan should, "…*identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage*".

A study of subsections (23)(2)(d), (29)(1)(d), (32)(2)(d) and (34)(b) and their requirements in the NEMA reveals the compulsory inclusion of the identification of cultural resources, the evaluation of the impacts of the proposed activity on these resources, the identification of alternatives and the management procedures for such cultural resources for each of the documents noted in the Environmental Regulations (Fourie, 2008).

1.5 International Requirements

The regulatory aspects dealt with above relate solely to the in-house South African laws and regulations and would usually be the only requirements for an application for a Mining Right. However, it may be that international financing is required for a large-scale project, in which case Project Finance Advisory Services, Project Finance, Project-Related Corporate Loans or Bridging Loans may be required. In such a case, the applicant for international financing will need to comply with the requirements of the International Finance Corporation (IFC) Performance Standards and the Equator Principles observed by most large international financial institutions. Summaries of these requirements are set out below.

1.5.1 The International Finance Corporation

The IFC Performance Standards are an international benchmark for identifying and managing environmental and social risk and have been adopted by many organizations as a key component of their environmental and social risk management. IFC's Environmental, Health, and Safety (EHS) Guidelines provide technical guidelines with general and industry-specific examples of good international industry practice to meet IFC's Performance Standards (PS).

In many countries, the scope and intent of the IFC Performance Standards is addressed or partially addressed in the country's environmental and social regulatory framework. The IFC Performance Standards encompass eight topics of which PS 7 and PS 8 have direct relevance to heritage resources:

i. PS 1 - Environmental and Social Assessment and Management System;
ii. PS 2 - Labour and Working Conditions;
iii. PS 3 - Pollution Prevention and Abatement;
iv. PS 4 - Community Health, Safety and Security;
v. PS 5 - Land Acquisition and Involuntary Resettlement;
vi. PS 6 - Biodiversity Conservation and Sustainable Natural Resource Management;
vii. PS 7 - Indigenous Peoples;
viii. PS 8 - Cultural Heritage

Table 2 provides a listing of the relevant sections pertaining to cultural heritage.

Table 2 :Sections of IFC Standards relevant to heritage resources and their management

GUIDELINE	**RELEVANT CHAPTER**	**DESCRIPTION OF THE REQUIREMENT**
International Finance Corporations (IFC) Performance Standard	Standard (PS) 5 – Paragraph 3	Minimization and avoidance of impacts from project related activities.
	Standard (PS) 5 – Paragraph 10 (Community Engagement) (2012).	Engagement with affected communities and the disclosure of relevant information of the relocation process.

GUIDELINE	RELEVANT CHAPTER	DESCRIPTION OF THE REQUIREMENT
	Standard (PS) 5 – Paragraph 20	Respecting the social and cultural institutions of the displaced persons and any host communities.
	Standard (PS) 8 – Paragraph 9 (Consultation) (2012).	The need for consultation with affected communities to identify cultural heritage of importance and involve affected communities and involve the relevant national or local regulatory authorities in the decision-making processes.
	Standard (PS) 8 – Paragraph 12 (Removal of Non-Replicable Cultural Heritage) (2012).	The removal of cultural heritage must only be considered when no other alternative is available.

The IFC's Performance Standards offer a framework for understanding and managing environmental and social risks for high profile, complex, international or potentially high impact projects. The financial institution is required to verify, as part of its environmental and social due diligence process, that the commercial client/investee complies with the IFC Performance Standards. To do so, the financial institution needs to be knowledgeable about the environmental and social laws of the country in which it operates and compare these regulatory requirements against those of the IFC Performance Standards to identify gaps. A good understanding of both sets of requirements, as well as potential gaps, ensures that the financial institution will effectively identify and assess the key environmental and social risks and impacts that might be associated with a financial transaction.

If non-compliances with the IFC Performance Standards are identified, and depending on the severity of the issue, the financial institution can require the commercial client/investee to develop a corrective action plan for addressing the issue within a reasonable timeframe and stipulate this as a condition of the financial transaction with the commercial client/investee.

The IFC Performance Standards help IFC and its clients to manage and improve their environmental and social performance through an outcomes-based approach and provide a

solid base from which clients may increase the sustainability of their business operations. The desired outcomes are described in the objectives of each Performance Standard, followed by specific requirements to help clients achieve these outcomes through means that are appropriate to the nature and scale of the project and commensurate with the level of environmental and social risks (likelihood of harm) and impacts.

1.5.2 Equator Principles

The Equator Principles (EP) is a risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in projects and is primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making.

The EP apply globally, to all industry sectors and to four financial products –

1) Project Finance Advisory Services;
2) Project Finance;
3) Project-Related Corporate Loans; and
4) Bridge Loans. The relevant thresholds and criteria for applications are described in detail in the Scope section of the EP.

Equator Principles Financial Institutions (EPFI) commit to implementing the EP in their internal environmental and social policies, procedures and standards for financing projects and will not provide Project Finance or Project-Related Corporate Loans to projects where the client will not, or is unable to, comply with the EP.

The EP have greatly increased the attention and focus on social/community standards and responsibility, including robust standards for indigenous peoples, labour standards, and consultation with locally affected communities within the Project Finance market. They have also promoted convergence around common environmental and social standards. Multilateral development banks, including the European Bank for Reconstruction & Development, and export credit agencies through the Organisation for Economic Co-operation and Development (OECD) Common Approaches are increasingly drawing on the same standards as the EP.

The EP have also helped spur the development of other responsible environmental and social management practices in the financial sector and banking industry (for example, Carbon Principles in the US, Climate Principles worldwide) and have provided a platform for engagement with a

broad range of interested stakeholders, including non-governmental organisations (NGOs), clients and industry bodies.

The EP consist of 10 Principles, outlined below:

i. Principle 1: Review and Categorisation

When a Project is proposed for financing, the EPFI will, as part of its internal environmental and social review and due diligence, categorise it based on the magnitude of its potential environmental and social risks and impacts. Such screening is based on the environmental and social categorisation process of the International Finance Corporation (IFC).

Using categorisation, the EPFI's environmental and social due diligence is commensurate with the nature, scale and stage of the Project, and with the level of environmental and social risks and impacts.

The categories are:

Category A – Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented;

Category B – Projects with potential limited adverse environmental and social risks and/or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures; and

Category C – Projects with minimal or no adverse environmental and social risks and/or impacts

ii. Principle 2: Environmental and Social Assessment

For all Category A and Category B Projects, the EPFI will require the client to conduct an Assessment process to address, to the EPFI's satisfaction, the relevant environmental and social risks and impacts of the proposed Project. The Assessment Documentation should propose measures to manage impacts in a manner relevant and appropriate to the nature and scale of the proposed Project. One or more specialised studies may also need to be undertaken for the Assessment Documentation. It may, in some cases, be appropriate for the client to complement its Assessment Documentation with specific human rights due diligence.

For all Projects, in all locations, when combined Scope 1 and Scope 2 Emissions are expected to be more than 100,000 tonnes of CO2 equivalent annually, an alternatives analysis will be conducted to evaluate less Greenhouse Gas (GHG) intensive alternatives.

iii. Principle 3: Applicable Environmental and Social Standards

The Assessment process should, in the first instance, address compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues.

EPFIs operate in diverse markets: some with robust environmental and social governance, legislation systems and institutional capacity designed to protect their people and the natural environment; and some with evolving technical and institutional capacity to manage environmental and social issues.

The EPFI will require that the Assessment process evaluates compliance with the applicable standards for what are known as Designated Countries (the First World countries with robust regulatory systems), where the Assessment process evaluates compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues; and Non-Designated Countries, where the Assessment process evaluates compliance with the then applicable IFC Performance Standards

iv. Principle 4: Environmental and Social Management System and Equator Principles Action Plan

For all Category A and Category B Projects, the EPFI will require the client to develop or maintain an Environmental and Social Management System (ESMS). Further, an Environmental and Social Management Plan (ESMP) will be prepared by the client to address issues raised in the Assessment process and incorporate actions required to comply with the applicable standards. Where the applicable standards are not met to the EPFI's satisfaction, the client and the EPFI will agree an Equator Principles Action Plan (AP). The Equator Principles AP is intended to outline gaps and commitments to meet EPFI requirements in line with the applicable standards.

v. Principle 5: Stakeholder Engagement

For all Category A and Category B Projects, the EPFI will require the client to demonstrate effective Stakeholder Engagement as an ongoing process in a structured and culturally appropriate manner with Affected Communities and, where relevant, Other Stakeholders. For Projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation process. The engagement process should be free from external manipulation, interference, coercion and intimidation. The client will take account of, and document, the results of the Stakeholder Engagement process, including any actions agreed resulting from such process. For Projects with environmental or social risks and adverse impacts, disclosure should occur early in the Assessment process, in any event before the Project construction commences, and on an ongoing basis. EPFIs recognise that indigenous peoples may represent vulnerable segments of project-affected communities. Projects affecting indigenous peoples are subject to a more rigorous process of Informed Consultation and Participation.

vi. Principle 6: Grievance Mechanism

For all Category A and, as appropriate, Category B Projects, the EPFI will require the client, as part of the ESMS, to establish a grievance mechanism designed to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance. The grievance mechanism will seek to resolve concerns promptly, using an understandable and transparent consultative process that is culturally appropriate, readily accessible, at no cost, and without retribution to the party that originated the issue or concern. The mechanism should not impede access to judicial or administrative remedies. The client will inform the Affected Communities about the mechanism in the course of the Stakeholder Engagement process.

vii. Principle 7: Independent Review: Project Finance

For all Category A and, as appropriate, Category B Projects an Independent Environmental and Social Consultant, not directly associated with the client, will carry out an Independent Review of the Assessment Documentation including the ESMPs, the ESMS, and the Stakeholder Engagement process documentation in order to assist the EPFI's due diligence, and assess Equator Principles compliance.

Project-Related Corporate Loans

An Independent Review by an Independent Environmental and Social Consultant is required for Projects with potential high-risk impacts including, but not limited to, any of the following adverse impacts on indigenous peoples, Critical Habitat impacts, Significant cultural heritage impacts and Large-scale resettlement.

In other Category A, and as appropriate Category B, Project-Related Corporate Loans, the EPFI may determine whether an Independent Review is appropriate or if internal review by the EPFI is sufficient. This may take into account the due diligence performed by a multilateral or bilateral financial institution or an OECD Export Credit Agency, if relevant.

viii. Principle 8: Covenants

An important strength of the Equator Principles is the incorporation of covenants linked to compliance. For all Projects, the client will covenant in the financing documentation to comply with all relevant host country environmental and social laws, regulations and permits in all material respects.

Furthermore, for all Category A and Category B Projects, the client will covenant the financial documentation:

a) to comply with the ESMPs and Equator Principles AP (where applicable) during the construction and operation of the Project in all material respects;

b) to provide periodic reports in a format agreed with the EPFI (with the frequency of these reports proportionate to the severity of impacts, or as required by law, but not less than annually), prepared by in-house staff or third-party experts, that document compliance with the ESMPs and Equator Principles AP (where applicable), and provide representation of compliance with relevant local, state and host country environmental and social laws, regulations and permits; and

c) to decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan.

d) Where a client is not in compliance with its environmental and social covenants, the EPFI will work with the client on remedial actions to bring the Project back into compliance to the extent feasible. If the client fails to re-establish compliance within an agreed grace period, the EPFI reserves the right to exercise remedies, as considered appropriate.

ix. Principle 9: Independent Monitoring and Reporting Project Finance

To assess Project compliance with the Equator Principles and ensure ongoing monitoring and reporting after Financial Close and over the life of the loan, the EPFI will, for all Category A and, as appropriate, Category B Projects, require the appointment of an Independent Environmental and Social Consultant, or require that the client retain qualified and experienced external experts to verify its monitoring information which would be shared with the EPFI.

Project-Related Corporate Loans

For Projects where an Independent Review is required under Principle 7, the EPFI will require the appointment of an Independent Environmental and Social Consultant after Financial Close, or require that the client retain qualified and experienced external experts to verify its monitoring information which would be shared with the EPFI.

x. Principle 10: Reporting and Transparency Client Reporting Requirements

The following client reporting requirements are in addition to the disclosure requirements in Principle 5.

For all Category A and, as appropriate, Category B Projects:

The client will ensure that, at a minimum, a summary of the ESIA is accessible and available online.

The client will publicly report GHG emission levels (combined Scope 1 and Scope 2 Emissions) during the operational phase for Projects emitting over 100,000 tonnes of CO2 equivalent annually.

EPFI Reporting Requirements

The EPFI will report publicly, at least annually, on transactions that have reached Financial Close and on its Equator Principles implementation processes and experience, taking into account appropriate confidentiality considerations.

There are two important Attachments to the Equator Principles: Annexure A dealing with Climate Change: Alternatives Analysis, Quantification and Reporting of Greenhouse Gas Emissions; and Annexure B dealing with Minimum Reporting Requirements on:

- Data and Implementation Reporting
- Project Finance Advisory Services Data
- Bridge Loans Data
- Implementation Reporting
- Project Name Reporting for Project Finance

2 SITE LOCATION AND DESCRIPTION

2.1 Locality

The project is located within the Emakhazeni Local Municipality in the Nkangala District Municipality of the Mpumalanga Province, South Africa. The proposed Umsimbithi eMakhazeni Mining Project is situated approximately 56 kilometres east of Middelburg. The project proposes the establishment of a colliery located on a large number of properties which are situated on either side of the N4, stretching from 5 km to 30 km west of eMkahazeni (see map, **Figure 2**).

Umsimbithi Mining (Pty) Ltd, the applicant, holds a Prospecting Right, MP 58 PR, for portions of the following farms:

- Bergendal 378 JT
- Bergendal 981 JT
- Driefontein 377 JT
- De Goedehoop 515 JT
- Steynsplaats 360 JT
- Forelwater 410 JT
- Majamela 973 JT
- Tweefontein 357 JT
- Weltevreden 381 JT
- Wemmershuis 379 JT

- Bospoort 399 JS
- Driefontein 398 JS
- Elandsfontein 433 JS
- Elandsfontein 1204 JS;
- Kleinfontein 432 JT
- Klippan 452 JS;
- Leeuwbank 427 JS
- Leeuwfontein 431 JS
- Paardekraal 422 JS
- Teutfontein 407 JS
- Glen Coburn 1213 JS;
- Wonderfontein 428 JS
- Rietvalley 387 JS;
- Bospoort 1208 JS.

However, the application for a mining right will be confined to portions of the farms Weltevreden 381 JT, Rietvalley 387 JS, Leeuwbank 427 JS, Leeuwfontein 431 JS, Paardekraal 422 JS, Wonderfontein 428 JS and Bospoort 1208 JS.

There are several other mining operations in the area, including Umsimbithi's Wonderfontein Colliery, as well as other Greenfields coal projects, such as the Belfast Project (Exxaro) and Weltevreden (Northern Coal). There are also prospecting projects in various stages of development in the area near the proposed Umsimbithi eMakhazeni Mining Project.

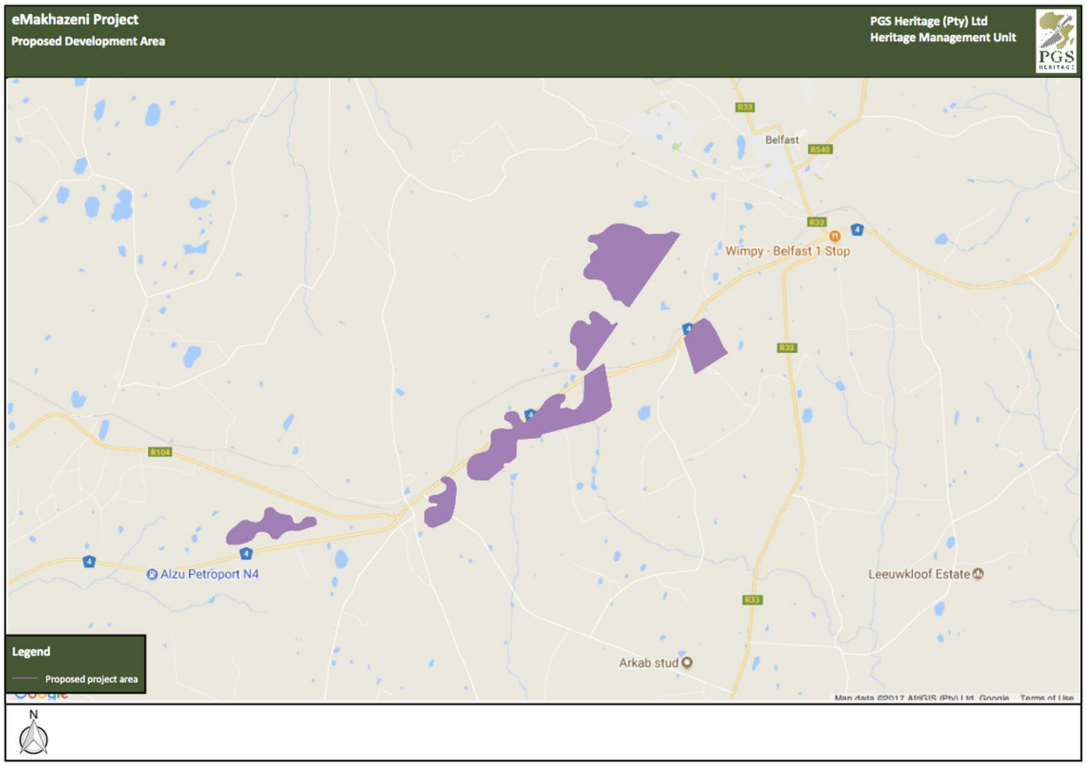


Figure 2 – The proposed development area within its local context.

2.2 Project Background

Umsimbithi Mining (Pty) Ltd (Umsimbithi), proposes to develop a new coal mining project on the Eastern Basin Coalfield, Mpumalanga Province, Republic of South Africa. The proposed Project is to be known as the Umsimbithi eMakhazeni Mining Project and will combine both open pit and underground operations.

The open pit operations are proposed to be mined using the rollover truck and shovel method, allowing for concurrent rehabilitation. There will also be underground sections accessed through the high wall of the open pits. The underground sections will be mined using the board-and-pillar method. Both the open pits and the underground mining operations may potentially be outsourced to specialist contractors. Crushing plants and a coal-washing plant will be constructed as part of the project.

It is estimated that the mine will produce approximately 74 million tonnes of coal during the Life of Mine (LoM). The coal will be supplied to Eskom and/or other domestic coal consumers. The LoM is more than 25 years. The mines will be opened in phases, one leading into the next. Trucks

will take the coal from the mines to a central washing plant if beneficiation is required, or directly to Eskom or other consumers. At full production, the project is expected to employ approximately 500 people, with most of the labour coming from the eMakhazeni Local Municipality and the surrounding areas. All employment will take place in line with all the relevant legislation, codes and statutes.

The following infrastructure will be built:

- Offices, workshops, change houses, storehouses, warehouses;
- Internal roads and haul roads, fuel storage facilities;
- Open pits, underground sections, crushing circuits, a wash plant, conveyors;
- Water supply networks, storm water networks, pollution control dams, raw water dams, effluent dams, water treatment works; and
- Topsoil stockpiles, discard dumps, and Run of Mine (ROM) stockpiles.

Water will be sourced from boreholes and recycled from the opencast pits and pollution control dams. Potable water will be sourced from eMakhazeni Local Municipality or ground water sources. The water usage strategy for the colliery is being designed to operate as a closed water system and most of the water on site is to be recycled. Electricity for the project is to be supplied by Eskom.

3 ASSESSMENT METHODOLOGY

The section below outlines the assessment methodologies utilised in the study.

3.1 Methodology for Assessing Heritage Site significance

This HIA report was compiled by PGS for the proposed Umsimbithi eMakhazeni Mining Project. The applicable maps, tables and figures are included, as stipulated in the NHRA (no 25 of 1999) and the National Environmental Management Act (NEMA) (No. 107 of 1998). The HIA process consists of three steps:

Step I – Literature Review and initial site analysis (completed in the **Heritage Scoping Report**): The background information to the field survey relies greatly on the Heritage Background Research which was undertaken through archival research and evaluation of aerial photography and topographical maps of the study area.

HIA Report

Step II – Physical Survey: A physical survey was conducted on foot through the proposed project area by two qualified heritage specialist/s (10-13th October), aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

Step III – The final step involves the recording and documentation of relevant heritage resources identified in the physical survey, the assessment of these resources in terms of the HIA criteria and report writing, as well as mapping and constructive recommendations.

The significance of heritage sites is based on four main criteria:

- Site integrity (i.e. primary vs. secondary context),
- Amount of deposit, range of features (e.g., stonewalling, stone tools and enclosures),
- Density of scatter (dispersed scatter)
    - Low - <10/50m2
    - Medium - 10-50/50m2
    - High - >50/50m2
- Uniqueness; and
- Potential to answer present research questions.

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be expressed as follows:

A - No further action necessary;

B - Mapping of the site and controlled sampling required;

C - No-go or relocate development activity position;

D - Preserve site, or extensive data collection and mapping of the site; and

E - Preserve site.

Impacts on these sites by the development will be evaluated as follows:

3.1.1 Site Significance

Site significance classification standards prescribed by the SAHRA (2006) and approved by the ASAPA for the Southern African Development Community (SADC) region, were used for the purpose of this report.

Table 3: Site significance classification standards as prescribed by SAHRA.

FIELD RATING	GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
National Significance (NS)	Grade 1	-	Conservation; National Site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High Significance	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High Significance	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)	-	High / Medium Significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium Significance	Recording before destruction
Generally Protected C (GP.A)	-	Low Significance	Destruction

3.2 Methodology used in determining the significance of environmental impacts

The impact significance rating process serves two purposes: firstly, it helps to highlight the critical impacts requiring consideration in the management and approval process; secondly, it shows the primary impact characteristics, as defined above, used to evaluate impact significance.

The impact significance rating system is presented in **Table 4** and involves three parts:

Part A: Define impact consequence using the three primary impact characteristics of magnitude, spatial scale/ population and duration;

Part B: Use the matrix to determine a rating for impact consequence based on the definitions identified in Part A; and

Part C: Use the matrix to determine the impact significance rating, which is a function of the impact consequence rating (from **Part B**) and the probability of occurrence.

Table 4: Significance Rating Methodology

PART A: DEFINING CONSEQUENCE IN TERMS OF MAGNITUDE, DURATION AND SPATIAL SCALE ***Use these definitions to define the consequence in Part B***		
Impact characteristics	**Definition**	**Criteria**
MAGNITUDE	Major -	Substantial deterioration or harm to receptors; receiving environment has an inherent value to stakeholders; receptors of impact are of conservation importance; or identified threshold often exceeded
	Moderate -	Moderate/measurable deterioration or harm to receptors; receiving environment moderately sensitive; or identified threshold occasionally exceeded
	Minor -	Minor deterioration (nuisance or minor deterioration) or harm to receptors; change to receiving environment not measurable; or identified threshold never exceeded
	Minor +	Minor improvement; change not measurable; or threshold never exceeded
	Moderate +	Moderate improvement; within or better than the threshold; or no observed reaction
	Major +	Substantial improvement; within or better than the threshold; or favourable publicity
SPATIAL SCALE OR POPULATION	Site or local	Site specific or confined to the immediate project area
	Regional	May be defined in various ways, e.g. cadastral, catchment, topographic
	National/ International	Nationally or beyond
DURATION	Short term	Up to 18 months.
	Medium term	18 months to 5 years

	Long term	Longer than 5 years			
PART B: DETERMINING CONSEQUENCE RATING ***Rate consequence based on definition of magnitude, spatial extent and duration***					
			SPATIAL SCALE/ POPULATION		
			Site or Local	**Regional**	**National/ international**
MAGNITUDE					
Minor	**DURATION**	**Long term**	Medium	Medium	High
		Medium term	Low	Low	Medium
		Short term	Low	Low	Medium
Moderate	**DURATION**	**Long term**	Medium	High	High
		Medium term	Medium	Medium	High
		Short term	Low	Medium	Medium
Major	**DURATION**	**Long term**	High	High	High
		Medium term	Medium	Medium	High
		Short term	Medium	Medium	High
PART C: DETERMINING SIGNIFICANCE RATING ***Rate significance based on consequence and probability***					
			CONSEQUENCE		
			Low	**Medium**	**High**
PROBABILITY (of exposure to impacts)		**Definite**	Medium	Medium	High
		Possible	Low	Medium	High
		Unlikely	Low	Low	Medium

4 DESKTOP STUDY FINDINGS

4.1 Historic Overview of Study Area and Surrounding Landscape

4.1.1 Archaeological Background

The province of Mpumalanga is known to be rich in archaeological sites that tell the story of humans and their predecessors in the region going back some 1,7 million years (Delius & Hay, 2009). The pre-colonial period is divided broadly into the Stone Age and the Iron Age.

The Stone Age refers to the earliest people of South Africa who relied mainly on stone for their tools and were hunter-gatherers. This period is divided into the Earlier, Middle and Later Stone Age:

- *Earlier Stone Age:* The period from ± 2.5 million yrs. - ± 250 000 yrs. ago. Acheulean stone tools are dominant.
- *Middle Stone Age*: Various stone tool industries in SA dating from ± 250 000 yrs. – 40 000 yrs. before present.
- *Later Stone Age:* The period from ± 40 000 yrs. before present to the period of contact with either Iron Age farmers or European colonists. (Delius & Hay, 2009; Morris, 2008)

The Iron Age as a whole represents the spread of Bantu-speaking people whose way of life was pastoral-agricultural and includes both the Pre-Historic and Historic periods. As indicated by the name, this period is distinguished by the knowledge of extraction and use of various metals, mainly iron. Similarly to the Stone Age, it can also be divided into three periods:

- *The Early Iron Age:* Most of the first millennium AD.
- *The Middle Iron Age*: 10th to 13th centuries AD
- *The Late Iron Age:* 14th century to colonial period. (Delius & Hay, 2009; Morris, 2008)

The archaeological literature does not contain much information on the Stone Age archaeology of this area, since this period has not been researched extensively in Mpumalanga (Esterhuysen & Smith, 2007). However, it is clear from the general archaeological record that the larger Mpumalanga region has been inhabited by humans since Earlier Stone Age (ESA) times. Although no Stone Age sites are known from the immediate vicinity of the study area, there are some sites recorded in the greater region (Esterhuysen & Smith, 2007). Examples of such sites are noted below.

Stone Age Sites

An Earlier Stone Age (ESA) site is located at Maleoskop near Groblersdal. Concentrations of ESA stone tools were found in erosion gullies along the Rietspruit (Esterhuysen & Smith, 2007). Evidence for the Middle Stone Age (MSA) period has been excavated from Bushman Rock Shelter, situated on the farm Klipfonteinhoek in the Ohrigstad District. The MSA layers indicated that the cave was visited repeatedly over a long period, between approximately 40 000 years ago and 27 000 years Before Present (Esterhuysen & Smith, 2007). Two Later Stone Age (LSA) sites were found at the farm Honingklip near Badplaas in the Carolina District, (Esterhuysen & Smith, 2007).

Iron Age Sites

Early Iron Age

Early farming communities moved into the Mpumalanga area around AD 500. These early farmers used metal tools and pottery and lived in fairly permanent agricultural villages. The most well-known EIA site in the area is the Lydenburg Heads site in the Sterkstroom Valley. A brief account of the discovery is provided by Esterhuysen and Smith (2007):

In 1957 a young boy, Ludwig von Bezing, found some strangely shaped pieces of pottery on his father's farm near Lydenburg, which seemed like pieces of human masks. Over the next few years he collected more fragments as well as other artefacts, including pot shards, iron and copper beads, ostrich eggshell beads, and millstones. Whilst studying at the University of Cape Town, he brought the fragments to the attention of Ray Inskeep, Professor of Archaeology. Inskeep then excavated the site and supervised the masks' reconstruction. Known as the Lydenburg Heads, they immediately became famous, partly because of their rarity and intriguing appearance, and partly because they reveal aspects of past cultural and ritual practices. They are on permanent display at the South African Museum in Cape Town. The heads have been carbon-dated to about AD 500. Similar pottery heads dating to the same period have been found near the KwaZulu-Natal coast.

Figure 3 – Lydenburg Heads (Iziko Museum; from Delius, 2009)

Late Iron Age

Late Farmer societies developed extensive stone settlements around Lydenburg, Badfontein, Sekhukhuneland, Roossenekal and Steelpoort (Delius & Hay, 2009). The greater Belfast area specifically, is known for its large complexes of LIA stonewalling. Although there was some early research on the stone ruins in the general region of the then-named eastern Transvaal, systematic investigation of the ruins only began in the last decade (Collett, 1982). Evers (1975) and Mason (1968) both undertook surveys of aerial photographs from the general area and identified a vast number of such settlements between Lydenburg and Machadodorp. Evers noted that settlements are not evenly distributed over the area, largely for topographical reasons (1975). These settlements typically consisted of three interrelated elements: homesteads, with cattle kraals surrounded by enclosures for human habitation; stone-edged paths or roadways, probably for movement of cattle; and stone terraces, for agricultural cultivation. Most of the homesteads were built in symmetrical patterns, some of which were reproduced in rock engravings found close to these settlements (Delius and Hay; 2009).

With regard to dating, the beginning of the Late Iron Age in this region is obscure. At the time of Evers' article there were no sites known that were intermediate in age between the Early Iron Age sites and the later stone-walled sites. However, since elsewhere in the then-named Transvaal and

Orange Free State, stone-walled building appeared to start around A.D. 1450-1500, this was thought to be true in this region as well (Evers, 1975).

Rock Engravings

An article by Maggs (1995), explains that these agriculturist engravings are mainly dominated by depictions of ground plans representing the shape of settlements people built and lived in. Virtually all known engraved sites are in the vicinity of Late Iron Age settlements and it is now known that such engravings are much more common than was previously thought. Fieldwork in several such regions has produced many formerly unrecorded sites within the limited areas searched. Therefore, Maggs recommended that future fieldwork on the stone-built settlements should incorporate an examination of neighbouring rock outcrops for possible engravings (*ibid*). Maggs' article highlights that such images may represent abstract or symbolic spatial arrangements reflecting the cosmology of the society that made them. He uses an example taken from the Pedi, a northern Sotho group linked geographically and culturally with the Mpumalanga engravings. Within this system, social and religious structure was, and among many rural communities still is, clearly inseparable. Each member literally knows their place within the homestead according to their age, sex and status (*ibid*).

4.1.2 Historical Background

The Second South African (Anglo-Boer) War

Delius & Hay (2009) note that the area between Belfast and Machadodorp was very active during the Anglo Boer War (1899-1902) with numerous skirmishes, railway sabotage and battle sites occurring in the Mpumalanga Highveld area. The Anglo-Boer War or Second South African War was waged between Great Britain and the two Boer Republics, the Zuid Afrikaansche Republiek (ZAR) and the Oranje Vrystaat, from 1899 to 1902 (*ibid*). Pretoria was captured by the British on 5 June 1900, but this did not result in the end of the war, as had been anticipated. British forces then embarked upon the defeat of the Boer forces still occupying the then Eastern ZAR. Various British forces advanced towards the ridge of the eastern Highveld, (Jooste, 2001). In August 1900, it was decided by the Boer forces that the line must be defended at all costs, as Machadodorp, the temporary seat of the ZAR government (5 June 1900 – 27 August 1900), was to be protected to safeguard a retreat toward Lydenburg and Barberton (Fourie, 2008a). After the battle of Bergendal, where the Boer forces were defeated on 28 August 1900, and the town of Machadodorp was occupied by the British troops; on 1 September 1900, Lord Roberts, Commander-in-chief of the British troops in Southern Africa, proclaimed the Transvaal as part of the British Empire (Jooste, 2008).

4.2 Previous Archaeological and Heritage Studies in and around the Study Area

An electronic web search was undertaken and relevant archaeological and historical texts were also consulted. In this regard, the South African Heritage Resources Information System (SAHRIS) was especially helpful (see http://www.sahra.org.za/sahris) . The studies found are listed below:

- A Heritage Impact Assessment (HIA) study for the proposed New Optimum Colliery on the farm Schoonoord 164IS in the Mpumalanga Province of South Africa - Pistorius, J. C. C. (2004). This assessment located historical structures, burial grounds and remains dating from the relatively recent past.
- Heritage Impact Scoping Report for the Planned Hendrina-Marathon Power line, Mpumalanga Province – J van Schalkwyk (2007).
- AIA Northern Coal Portion 15 and 16 of the farm Weltevreden 381 JT, Belfast, Mpumalanga- Fourie, W (2008). This assessment located no heritage features.
- Arnot Colliery Mine Project of Exxaro On Portions 4 and 5 of the farm Mooifontein 448 JS and Portions 3 And 4 of the farm Tweefontein 458 JS , District Middelburg, Mpumalanga -Fourie, W (2009). This assessment located seven burial grounds, one occupied homestead with associated infrastructure dating between 1900 and 1930 and three homestead remains.
- Phase 1 Archaeological Impact Assessment for Enpact Environmental Consultants concerning the proposed Elandshoek township development on portions 2 and 6 of the farm Lindenau 303 JT and portion 2 of Berlin 466 JT, Mpumalanga Province – JP Cilliers (2010). This assessment located two burial grounds, a Black Concentration Camp, and the existence of war graves.
- A Report on a Heritage Assessment for the Proposed Arnot-Gumeni 400 Kv , in the Middelburg/Belfast area, Mpumalanga Province – Pelser, A. (2012). This assessment located stone walled Iron Age sites, possible Stone Age sites, historical homesteads/farmsteads, historical Anglo-Boer War (1899-1902) battlefield sites and others, as well as graves and burial grounds.
- Exxaro Paardeplaats Project Heritage Impact Assessment Report – Kitto, J (2012). This assessment located heritage structures, burial grounds and areas with historical mining shafts.
- A phase I Heritage Impact Assessment (HIA) study for the consolidated Environmental Management Programme report (consolidated EMPR) for Arnot Coal on the eastern highveld in the Mpumalanga Province - Pistorius, J. C. C. (2014). This assessment located historical farmstead complexes consisting of various structures, Individual historical

structures such as houses, wagon sheds, rondavels, etc. as well as burial grounds and graves, some of which can be classified as historical as they are older than sixty years.

- Proposed Expansion of Existing Mining Area into Portion Re of The Farm Roetz 210 IS, Jagtlust Colliery, near Carolina, Albert Luthuli Local Municipality, Gert Sibande District Municipality, Mpumalanga Province – Kitto, J (2015). This assessment located historical structures and graves.
- A Revised Phase I Heritage Impact Assessment (HIA) Study for the Proposed Rietvlei Open Cast Coal Mining Operation between Middelburg, Belfast and Stofberg in the Mpumalanga Province of South Africa. - Pistorius, J. C. C. (2014) This assessment located five burial grounds.
- Heritage Assessment - The Kwagga North Project, Optimum Coal, Arnot, Mpumalanga – Fourie, W (2016). This assessment located 29burial grounds, containing a total of approximately 350 graves, six farmsteads and one quarry site.

4.3 Spatial analysis findings

A spatial and landscape analysis of the study area was conducted through the analysis of historical maps, topocadastral maps and aerial photography. The aim was to identify landscape forms, natural features and structures that potentially have heritage significance or have associated features and structures that have heritage significance.

The analysis of the studies conducted in the area assisted in the development of the following landform type to heritage find matrix in **Table 5.**

Table 5: Landform to heritage matrix

LANDDFORM TYPE	HERITAGE FIND TYPE
Crests and foothills	LSA and MSA scatters, LIA settlements
Crest of small hills	Small LSA sites – scatters of stone artefacts, ostrich eggshell, pottery and beads
Watering holes/pans	LSA sites, LIA settlements
Farmsteads	Historical archaeological material
Ridges and drainage lines	LSA sites, LIA settlements
Forested areas	LIA sites

4.4 Archival and Historic Maps of the Study Area and Surrounding Landscape

4.4.1 First Edition of the 2529DB Topographical Sheet

A portion of the First Edition of the 2529DB Topographical Sheet is depicted below. The map was based on aerial photography undertaken in 1964 and was surveyed in 1967 and drawn in 1969 by the Trigonometrical Survey Office.

4.4.2 First Edition of the 2529DD Topographical Sheet

A portion of the First Edition of the 2529DD Topographical Sheet is depicted below. The map was based on aerial photography undertaken in 1964 and was surveyed in 1967 and drawn in 1968 by the Trigonometrical Survey Office.

4.4.3 First Edition of the 2530CA Topographical Sheet

A portion of the First Edition of the 2530CA Topographical Sheet is depicted below. The map was based on aerial photography undertaken in 1964 and was surveyed in 1969 and drawn in 1970 by the Trigonometrical Survey Office.

4.4.4 First Edition of the 2530CC Topographical Sheet

A portion of the First Edition of the 2530CC Topographical Sheet is depicted below. The map was based on aerial photography undertaken in 1964 and was surveyed in 1969 and drawn in 1970 by the Trigonometrical Survey Office.

The following observations can be made from the above-mentioned maps:

- Several colonial structures occur in the study area. These include: farm buildings, a school, a shed, windmills, anti-erosion walls, a kraal and a grave.
- Possible archaeological features are represented as “huts”. Several of these occur in the study area.

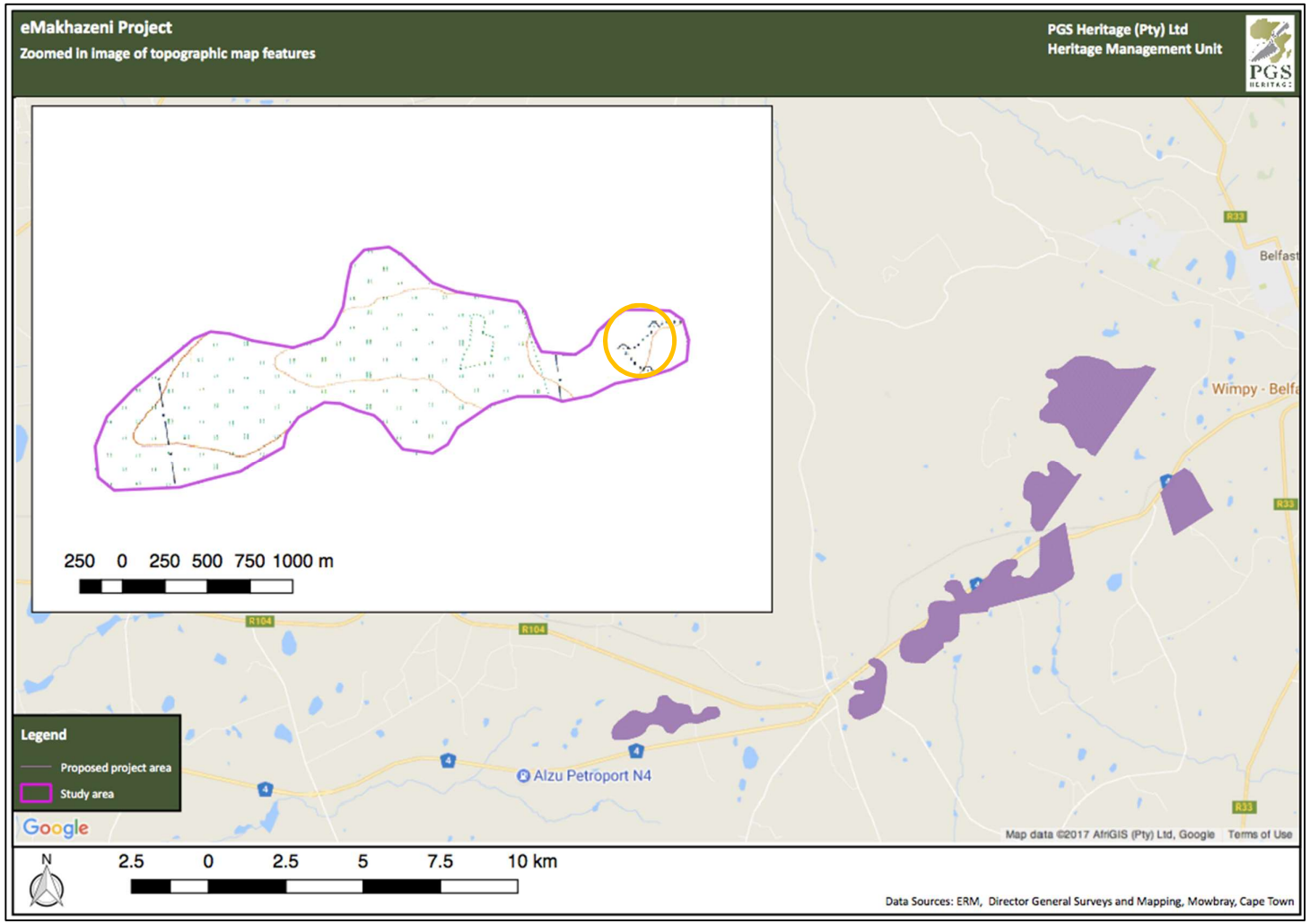


Figure 4 – Enlarged section of study area showing topographic map features. Three huts can be seen on the eastern side of the area (yellow circle).

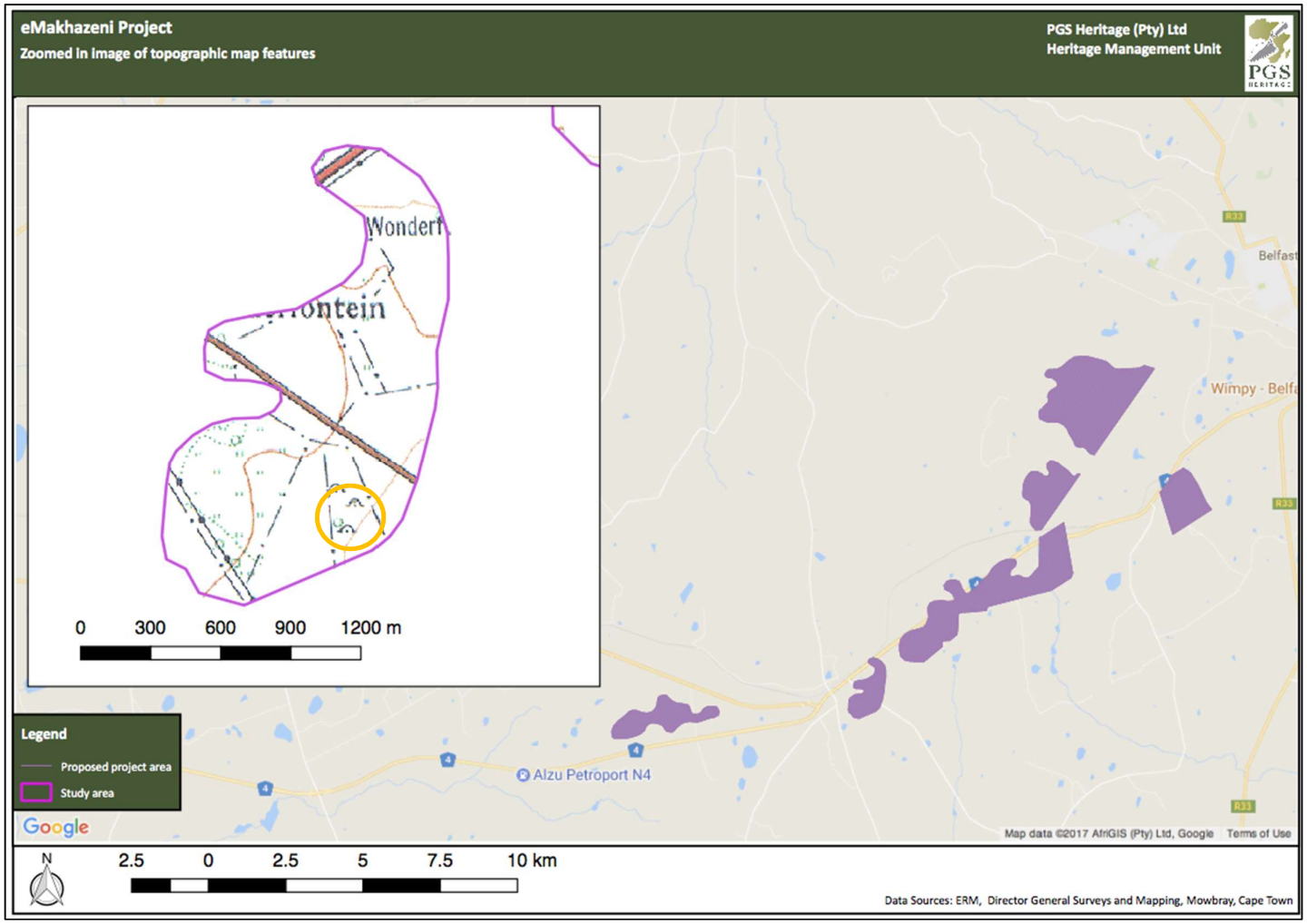


Figure 5 – Enlarged section of study area showing topographic map features. Three huts can be seen at the S-E side of the section (yellow circle)

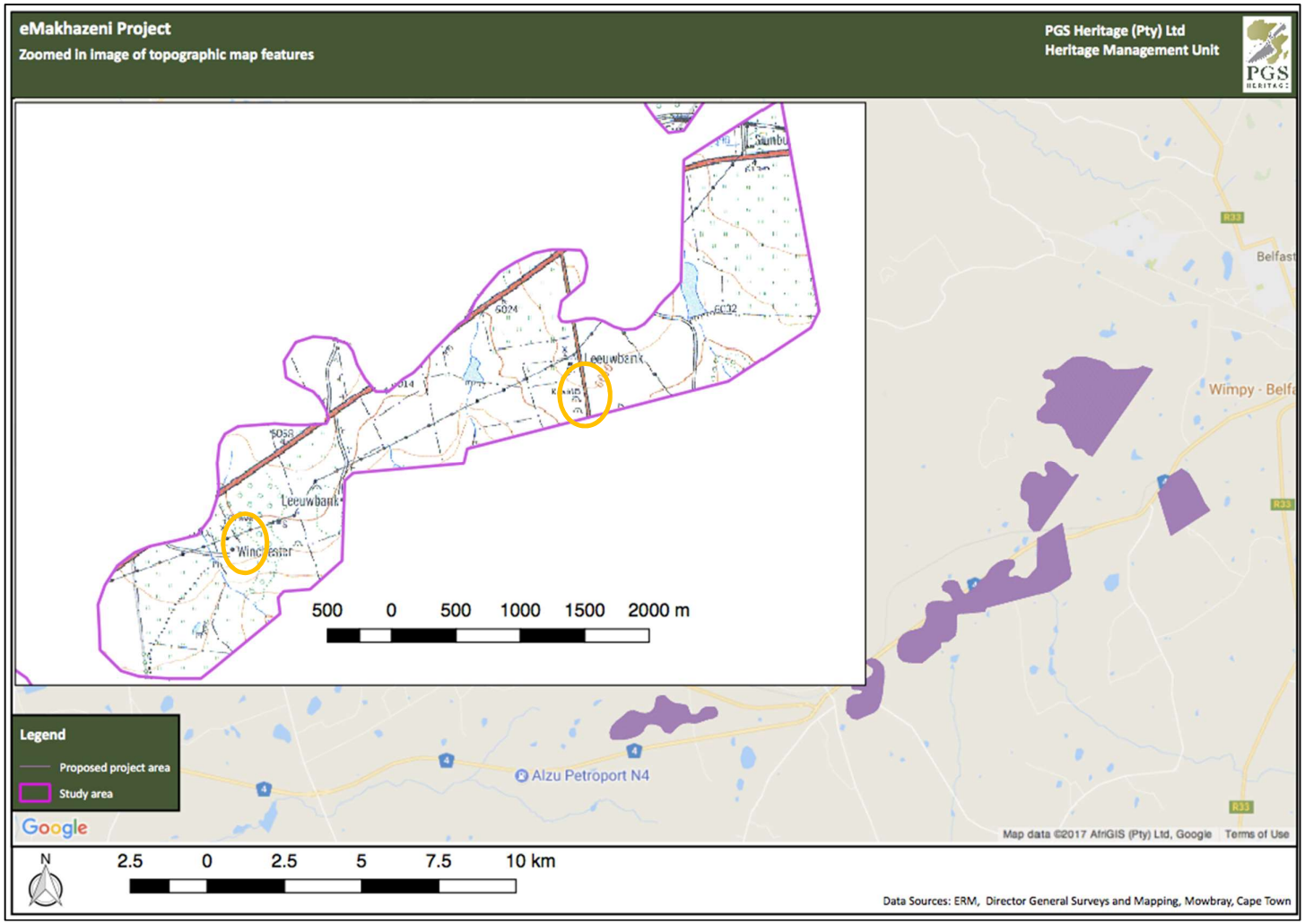


Figure 6 – Enlarged section of study area showing topographic map features. This image shows structures, huts and a grave (yellow circles).

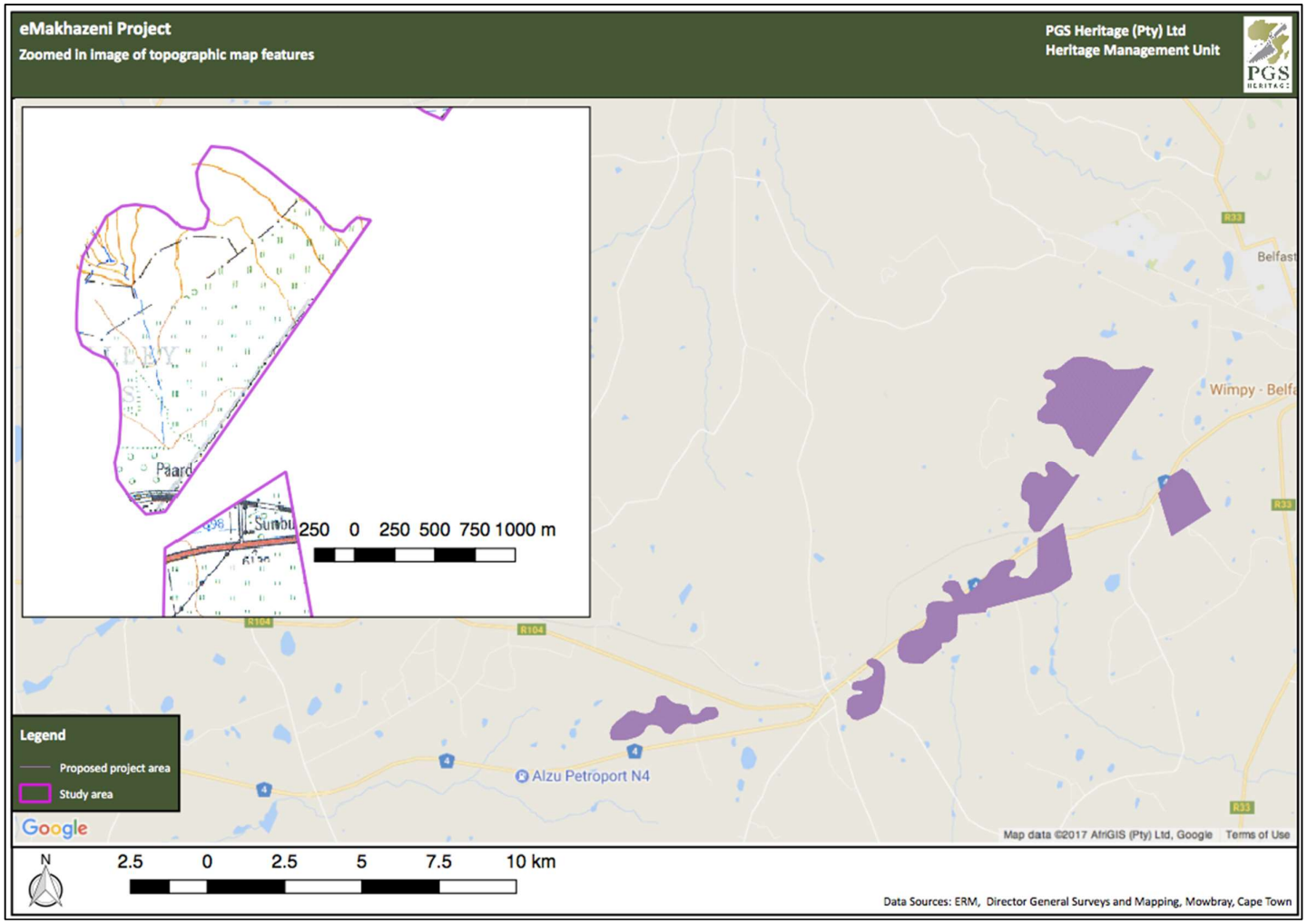


Figure 7 – Enlarged section of study area showing topographic map features. No features of interest are depicted in the study area.

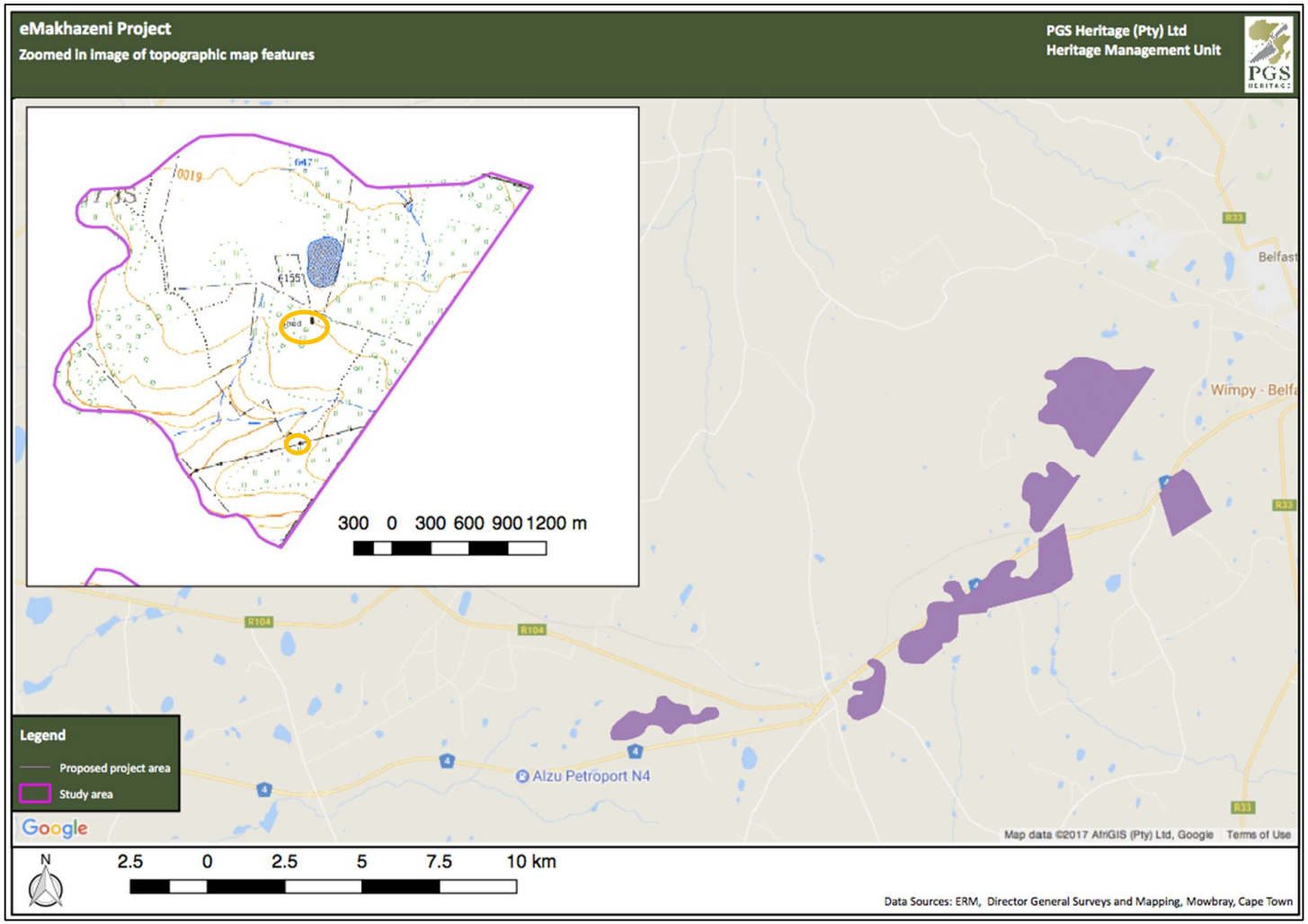


Figure 8 – Enlarged section of study area showing topographic map features. A hut and a shed are depicted in the middle of this section (yellow circles).

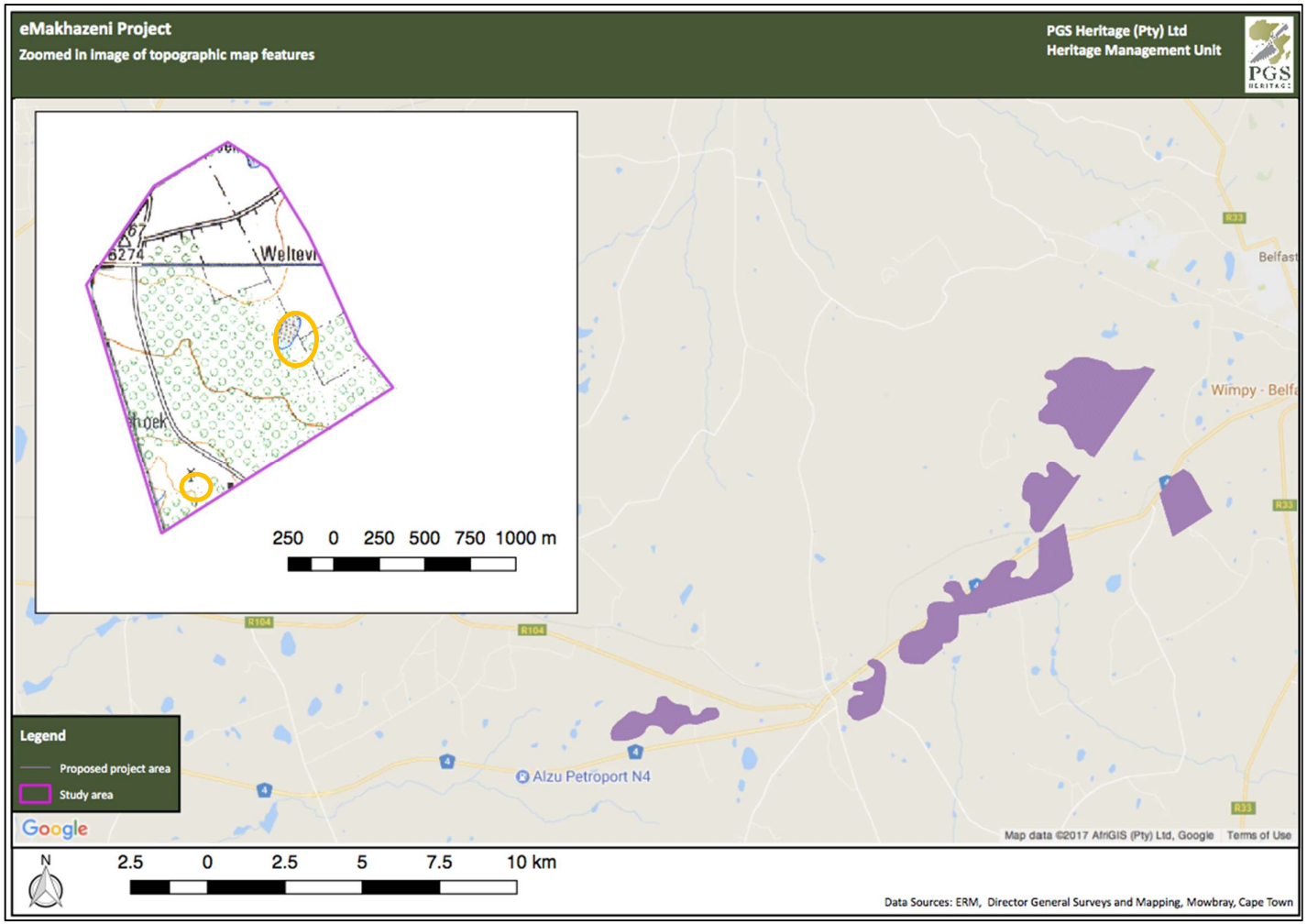


Figure 9 – Enlarged section of study area showing topographic map features. A windmill and a dry pan are depicted (yellow circles).

4.4.5 Google Earth Aerial photo analysis

After the analysis of the historical topocadastral maps had been completed, an analysis of available aerial photographs was done. The aim was to identify man-made structures, as well as landforms that can possible be associated with settlement patterns of historical people. These landforms, as identified in **Table 5,** guided the focussed fieldwork to assist in the identification of potential heritage resources. Attention was given to distinguish between man-made watering holes and naturally occurring watering holes, as the latter often have associated heritage resources and features.

4.4.6 Heritage sensitivities

The evaluation of the possible heritage resource finds and their heritage significance linked to mitigation requirements was linked to the types of landform. This enabled the development of a heritage sensitivity map. These landforms do not indicate "no-go" areas, but the possibility of finding heritage significant sites that could require mitigation work.

4.4.7 Possible finds

The evaluation of aerial photographs has indicated areas that may be sensitive from a heritage perspective. The analysis of the studies conducted in the area assisted in the development of the landform type to heritage find matrix in **Table 5**.

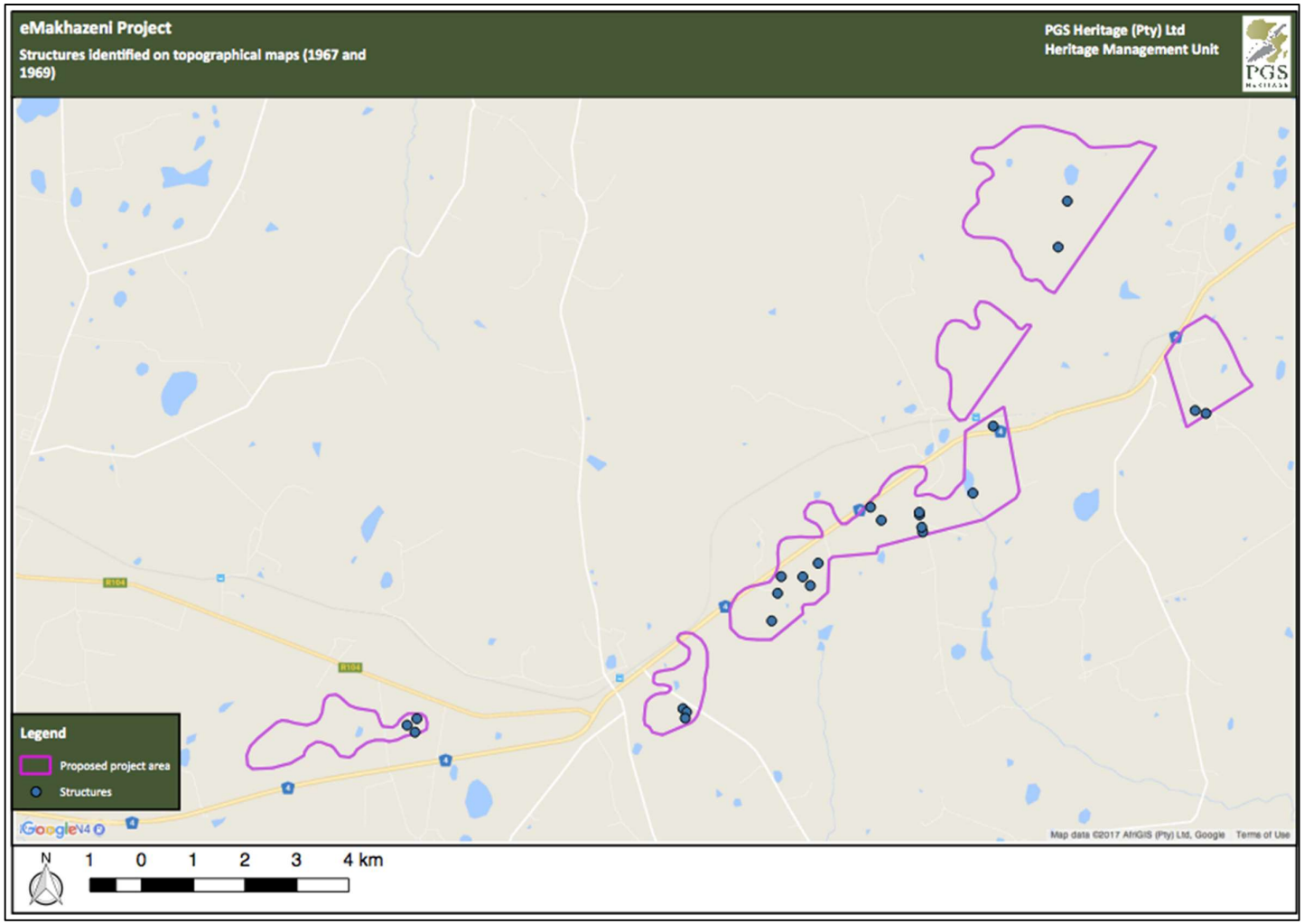


Figure 10 – Positions of structures Identified on the topographical maps (blue dots).

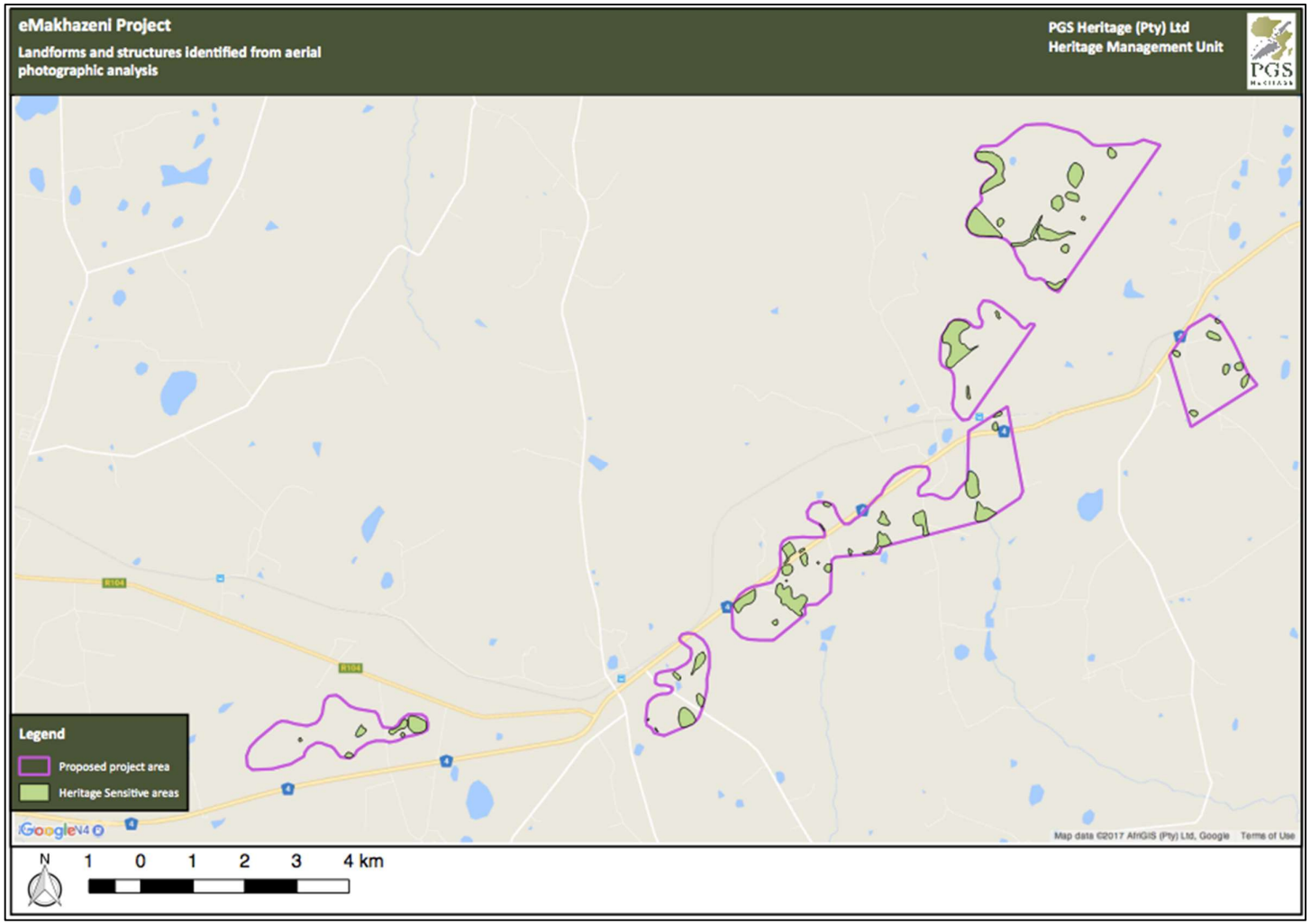


Figure 11 – Correlation of landforms and structures identified from the aerial photographic analysis

4.4.8 Stakeholder Engagement

The current stakeholder engagement process has identified only one grave, located on the farm Leeuwbank. This identified grave was confirmed during the fieldwork phase of the HIA.

5 FIELDWORK FINDINGS

5.1 Methodology

A survey of the mining footprint was conducted from 10-13 October 2017. Due to the nature of cultural remains, with the majority of artefacts occurring below surface, two archaeologists from PGS conducted a vehicle and foot-survey that covered the study area. The fieldwork was logged with a GPS to provide a background of the areas covered **(Figure 12).**

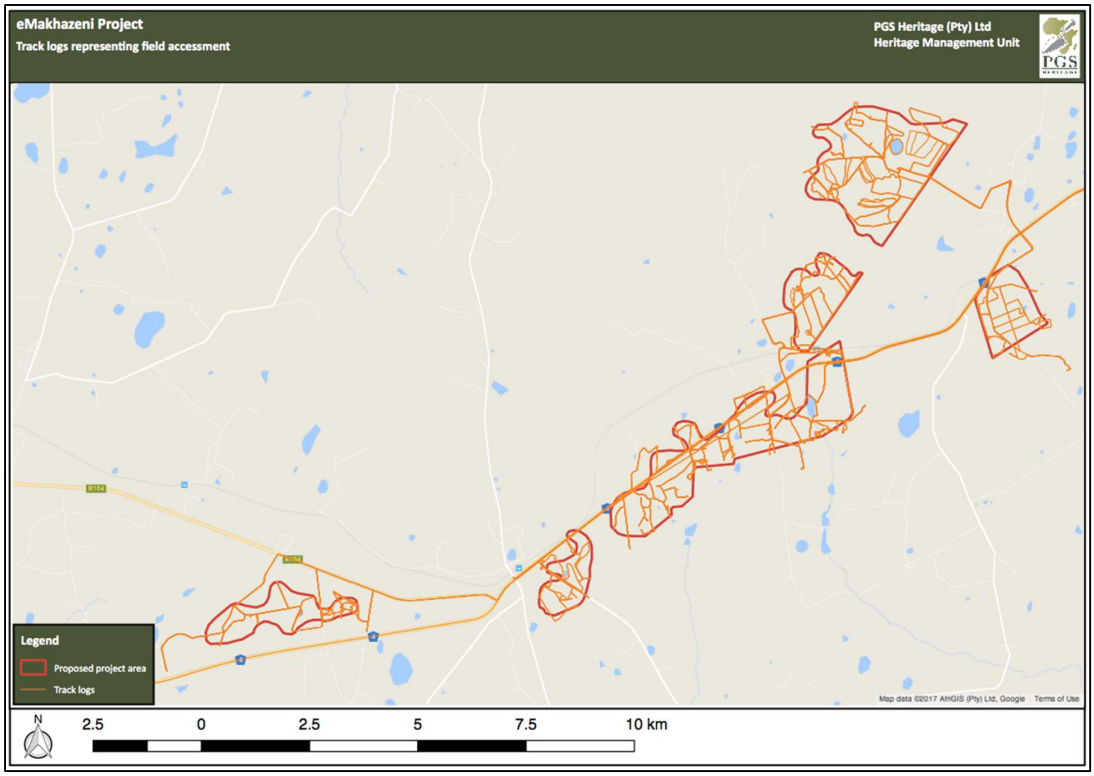


Figure 12 – Footprint area (red polygons) with fieldwork tracklogs (orange).

The proposed site is characterised by agricultural land with patches of bushveld, and sporadic forested areas.

Figure 13- General bushveld conditions around a ridge

Figure 14- General Agricultural landscape

5.2 Findings

During the survey 28 heritage resources sites were identified. The identified sites are described in the table below (**Table 6**).

Table 6: Heritage resources identified

Site[1] number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
001	-25.786688°	29.959234°	None	According to Mr Gerrit Roos, this is a historical burial site of two English officers, dating to the South African War. The graves are in a poor state and not maintained. There is no fence demarcating the site.	High	3A
 *Figure 15 - Poorly maintained burial site at 001*						

[1] *Site in this context refers to a place where a heritage resource is located and not a proclaimed heritage site as contemplated under s27 of the NHRA.*

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
002	-25.781527°	29.960103°	BG	Burial site consisting of one single grave from the early 1900's. According the farm owner Mr Roos, the grave belonged to a house keeper of a unit of English soldiers during the South African War.	High	GP.A

Figure 16 - Burial site at 002, single grave

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
003	-25.779361°	29.963136°	BG	Burial site consisting of two graves. Only one grave has a marker. The site is poorly maintained and no fence is in place. The size of the site is approximately 2x2 m.	High	GP.A

Figure 17 - Burial site at 003, Grave marker

Figure 18 - Burial site at 003

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
004	-25.779153°	29.963586°	BG	A stone built house occurs at this location. The age is undetermined; however, it is not believed to be older than 60 years. The house is approximately 10x10m and occurs across the road from the burial site at 003.	None	None

Figure 19 - Stone built house at 004

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
005	-25.788808°	29.933192°	BG	A small farmstead occurs at this location. The buildings do not feature on the 1967 Topographic maps and are probably not older than 60 years.	None	None

Figure 20 - Small farmstead at 005

Figure 21 - Kraal at 005, showing remains of old stone packed walls

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
006	-25.788766°	29.929310°	BG	A small informal burial ground occurs at this site. There are approximately 25 graves located within a ploughed field. The graves in this site range in age, with one of the oldest dated to 1887. There is no fence protecting the burial ground. The size of the site is approximately 15x10m	HIGH	GP.A

Figure 22 - Burial site at 006

Figure 23 - Grave from 1887 at 006

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
007	-25.790553°	29.925758°	BG	A small burial ground occurs at this location. There are 4 graves within the walled site. The earliest grave is dated to 1944. The site is 10 x 5 m in size.	HIGH	GP.A

Figure 24 - Walled burial ground at 007

Figure 25 - Four graves within the walls of site 007

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
008	-25.791033°	29.931071°	BG	A burial ground occurs at this location. There are approximately 50 graves within a dilapidated fence surrounding the graves. The graves include those which are stone packed and presumed to be older, as well as graves with formal dressings which have very recent dates. The size of the site is approximately 20x30 m.	HIGH	GP.A

Figure 26 - One of the formally dressed graves at 008

Figure 27 - General view of the burial ground at 008

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
009	-25.791481°	29.927362°	BG	A burial site containing a single grave occurs at this location. The inscription on the headstone has faded and an age could not be determined.	HIGH	GP.A

Figure 28 - Single grave at 009

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
010	-25.792335°	29.925195°	BG	A farmstead occurs at this location. There are several buildings in the complex consisting of both brick and sandstone. No structures are depicted on the 1967 topographic maps and therefore these buildings are probably not older than 60 years. The total size of the site is approximately 150x150 m	LOW	None

Figure 29 - Farmstead at 010

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
011	-25.762664°	29.967323°	BG	A possible grave site. A stone packed feature occurs at this location. The orientation is east to west which is typical of grave sites.	HIGH	GP.A

Figure 30 - Possible grave at 011

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
012	-25.777729°	29.933617°	BG	A small house is located here. As it is not depicted on the 1967 topographic map, its age cannot be determined. However, the architectural style indicates that it could be older than 60 years.	MEDIUM	GP.B

Figure 31 - Small structure with stone foundation at 012

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
013	-25.745270°	29.960593°	BD	A burial site with a single grave occurs within a ploughed field at this location.	HIGH	GP.A

Figure 32 - Burial site at 013

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
014	-25.749368°	29.958463°	BD	A rock shelter containing khoenkhoen rock paintings as well as pottery sherds occurs at this location. Several paintings are visible on the wall of the rock shelter. The depictions are faded but are indicators of activities which occurred in the area in the past. The pottery and few stone tools which were located in and around the site suggest longer term occupation of the site. About 50 KM north of the study area, de Wittekrans farm rock paintings just outside Hendrina occur. This is highly significant site contributing greatly to South African Heritage and archaeological understanding. Site 014 is not as spectacular, but will certainly add to the khoenkhoen herder history in the area.	HIGH	3A

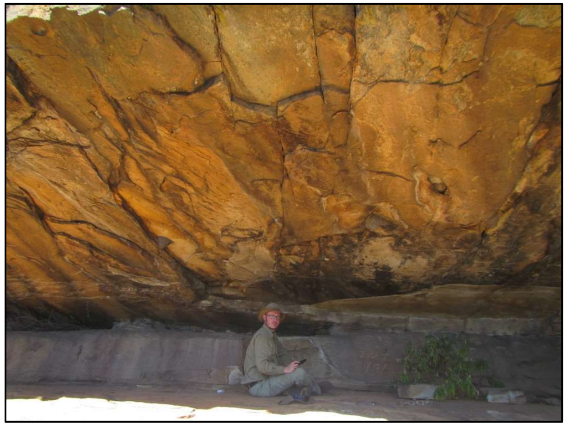
Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
 *Figure 33 - Depiction of herders at 014*				 *Figure 34 - Shelter at 014*		

Figure 35 - Pot sherds and stone tools located in and around 014

Figure 36 - Very faded depictions on the rock face at 014

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
015	-25.725119°	29.979434°	BA	A small burial ground occurs at this location. There are approximately 12 graves within a fenced off area and one grave outside of the fenced area. The site is approximately 20x10 m.	HIGH	GP.A

Figure 37 - Burial ground at 015

Figure 38 - Burial ground with one grave outside the fenced area.

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
016	-25.722485°	29.972823°	BA	Burial site with two to three graves present. One grave has a formal dressing, the other one or two have been disturbed with brick and concrete scattered over the area. There is no fence to demarcate the site. The site is approximately 10x5m.	HIGH	GP.A

Figure 39 - Burial site at 016

Figure 40 - Formal grave dressing at 016

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
017	-25.722573°	29.973048°	BA	Foundation remains are located here. This site occurs about 20 m away from site 016 and is possibly related. No evidence of this site occurs on the 1967 topographic map and therefor an age cannot be determined.	LOW	None

Figure 41 - Foundation remains at 017

Figure 42 - Structure remains at 017

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
018	-25.720904°	29.968295°	BA	Mud-wall remains occur at this location; there appears to be about five 10x12m structures alongside one another. No evidence of the sites is depicted on the 1967 topographic maps and therefore the age cannot be determined.	MEDIUM	GP.B

Figure 43 – Mud-wall remains at 018

Figure 44 – Mud-wall remains

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
019	-25.815186°	29.853767°	BE	A burial ground with approximately 14 stone packed graves occurs at this location.	HIGH	GP.A

Figure 45 - Burial site at 019

Figure 46 - Informal dressing on a grave at 019

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
020	-25.778913°	29.951633°	BG	Farmstead (Roos). Several structures comprise this farmstead at 020. Gerrit Roos stated that the house has been present for over 100 years. The style of architecture of some of the buildings would justify this statement. The size of the farmstead and associated buildings is about 200x200m	HIGH	GP.A

Figure 47 - Main farmhouse at 020

Figure 48 - Associated infrastructure at 020

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
021	-25.781161°	29.946239°	BG	A burial site containing a single grave with a formal dressing occurs at this location. There is no fence to demarcate the site.	HIGH	GP.A

Figure 49 - Single grave at 021

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
022	-25.783662°	29.953137°	BG	Burial ground containing 25-50 graves is located here. Some graves are stone packed, others have formal dressings. The site is fenced off and occurs to the south of the Roos farmstead	HIGH	GP.A

Figure 50 - Burial site at 022

Figure 51 - Formally dressed grave at 022

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
023	-25.786006°	29.936430°	BG	A burial site with one grave occurs at this location. There is a fence demarcating the site, but it is poorly maintained.	HIGH	GP.A

Figure 52 - Single grave at 023

Figure 53 - Dilapidated fencing surrounding 023

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
024	-25.805693°	29.899686°	BF	A burial ground with approximately 15 graves occurs at this location. It is a formal burial ground with a wall and a fence. The wall has collapsed on one side but the site is clearly demarcated. The site occurs just next to the N4 and is approximately 20x15m in size with burials dating to 1922	High	GP.A

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
025	-25.749991°	30.013690°	AA	Two stone packed graves occur at this location. This site is not fenced off.	HIGH	GP.A

Figure 54 - Two graves at 025

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
026	-25.766337°	30.020770°	AA	Burial ground with two graves within a fence and two or three graves outside of the fenced off area. Only one grave has a formal dressing. This burial ground occurs at the north-east corner of the Pine Streams property and is probably not situated within the affected study area.	HIGH	GP.A

Figure 55 - Burial ground at 026

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
027	-25.762805°	30.007520°	AA	A burial ground with approximately 20 graves occurs at this location. Some graves have formal dressings, others were identified by a single stone at the head.	HIGH	GP.A

Figure 56 - Burial ground at 026

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
028	-25.803694°	29.908722°	BF	A burial site with one grave occurs at this location. The site is disturbed and not fenced off. It occurs within a small bluegum plantation on the farm Wonderfontein.	HIGH	GP.A

Figure 57 - Remains of the dressing

Figure 58 - Single grave at 028

Site number	Lat	Lon	Infrastructure	Description	Heritage Significance	Heritage Rating
029	-25.818786°	29.854575°	BE	During the public participation process, it was stated that an infant burial occurs within the structure at this location.	HIGH	GPA

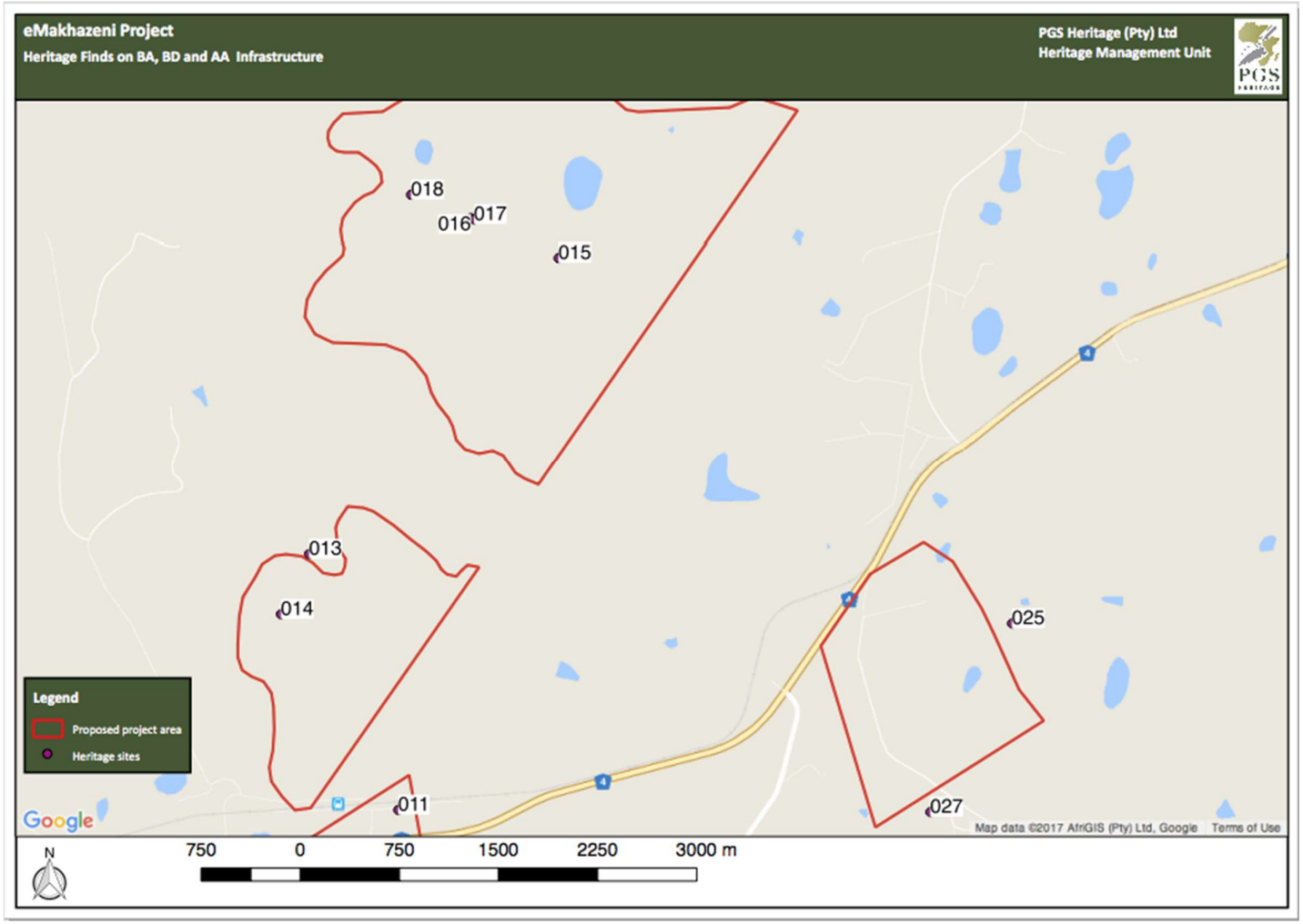


Figure 59 - Distribution of heritage resources, on BA, BD and AA infrastructure areas

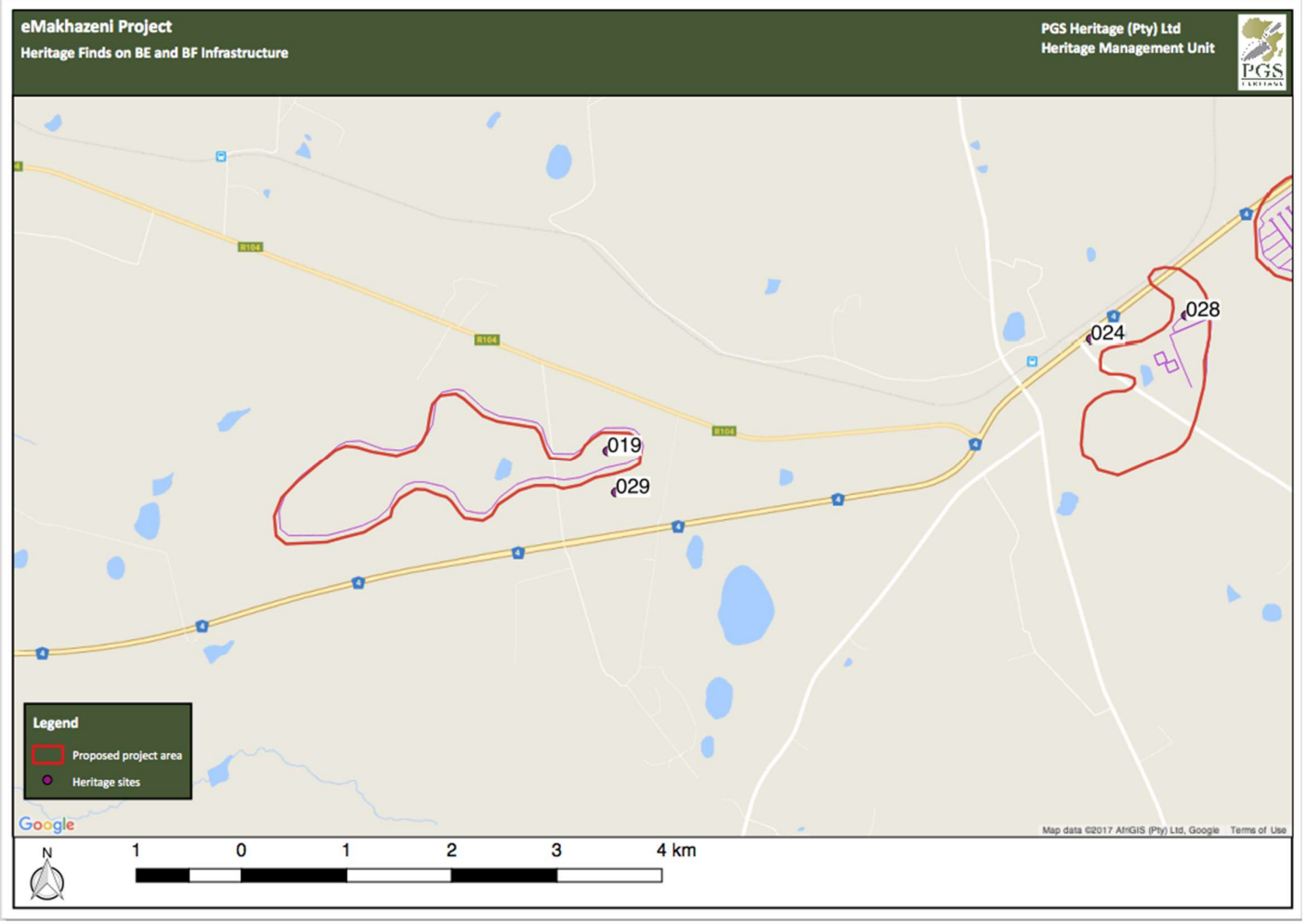


Figure 60 - Distribution of heritage resources on BE and BF infrastructure areas

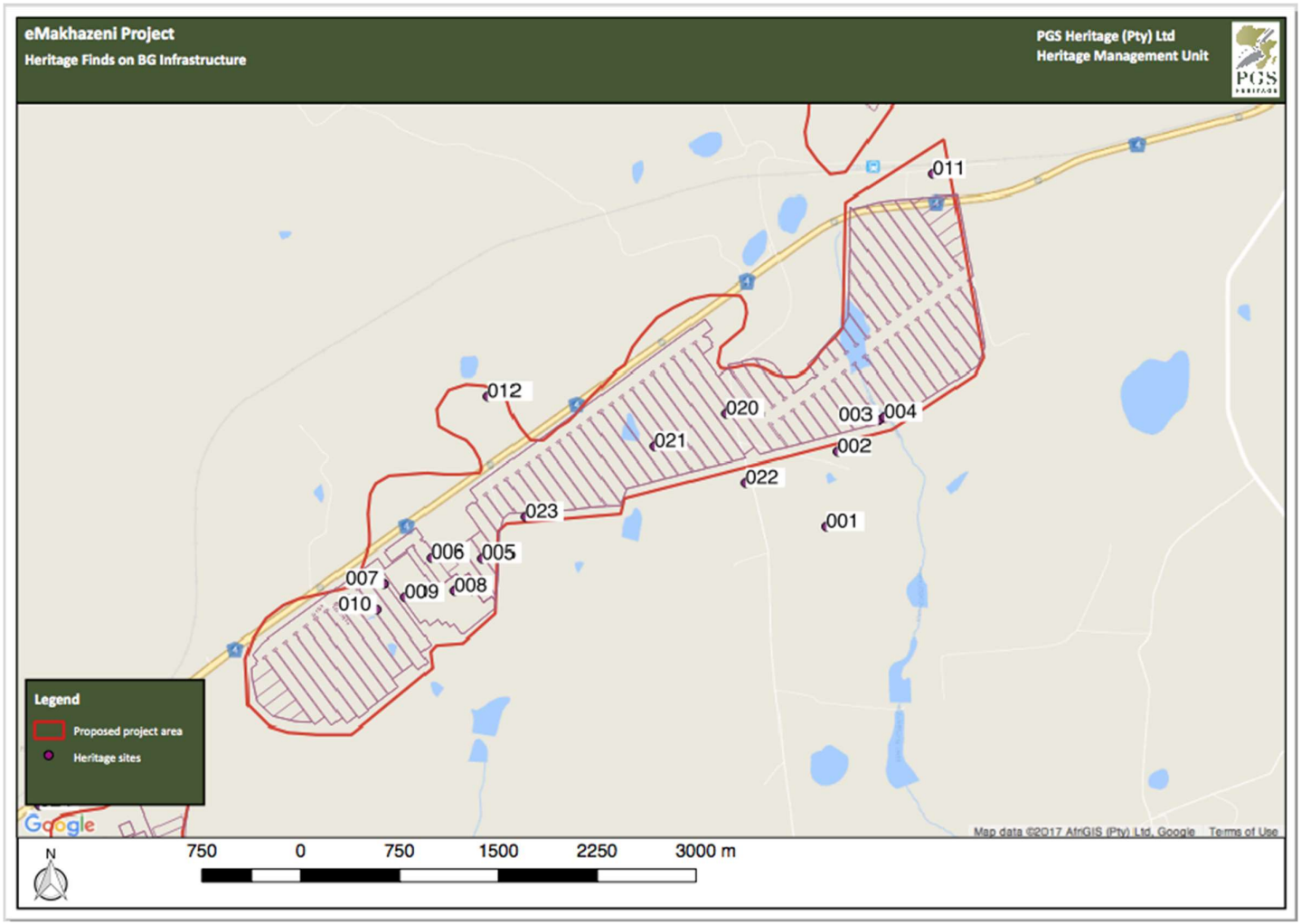


Figure 61 - Distribution of heritage resources on BG infrastructure area

6 GEOLOGICAL AND PALAEONTOLOGICAL HISTORY

The opencast and underground mining of the Umsimbithi eMakhazeni Mining Project is entirely underlain by sedimentary rocks of the Permian aged Vryheid Formation, Ecca Group, Karoo Supergroup (**Figure 62**). This Formation is known to contain a rich assemblage of plant fossils and thus coal can be mined as coal consists of fossil plant material. The Vryheid formation has a very high palaeontological sensitivity. Refer to **Appendix A** for the full Palaeontological Desktop Assessment.

6.1 Geology

The Vryheid Formation consists mostly of light grey coarse-to fine grained sandstone and siltstone sediments. Dark siltstones can be accredited to the presence of carbon enrichment and coal beds. The sediments consist of deltaic mudrocks and sandstones, nearby coastal and fluvial deposits, with intermittent coal seams. The sediments were most probably deposited on a sandy shoreline, beyond vast swamplands. Plant material accumulating within these swamps created the coal deposits that are mined today (Johnson et al, 2006).

6.2 Palaeontological Heritage

The Vryheid Formation is world renowned for its Permian fossil plant assemblages. This formation is especially known for its rich Glossopteris Flora which includes lycopods, rare ferns and horsetails, cordaitaleans, conifers and ginkgoaleans. Fossil coal is also present as coal consists of fossilized plants. The occurrence of fossil wood and insects are rare, while palynomorphs are diverse. Non-marine bivalves and fish scales have also been reported from this formation. Trace fossils are found abundantly but the diversity is low. The mesosaurid reptile, *Mesosaurus* has been found in the southern parts of the basin but may also be present in other areas of the Vryheid Formation. This Formation has a very high palaeontological sensitivity. Regardless of the rare and irregular occurrence of fossils in this biozone a single fossil may be of scientific importance as many fossil taxa are known from a single fossil.

6.3 Findings

The proposed development site of the new open pit and underground operations of the proposed Umsimbithi eMakhazeni Mining Project, Mpumalanga Province is completely underlain by the Vryheid Formation of the Ecca Group, Karoo Supergroup. The Vryheid Formation is world renowned for its Permian fossil plant assemblages. This formation is especially known for its rich Glossopteris Flora which includes lycopods, rare ferns and horsetails, cordaitaleans, conifers and ginkgoaleans. Fossil coal is also present as coal consist of fossilized plants. The occurrence of fossil wood and insects are rare, while palynomorphs are diverse. Non-marine bivalves and fish scales have also been reported from this formation. Trace fossils are found abundantly but the diversity is low. The mesosaurid reptile, *Mesosaurus* has been found in the southern parts of the basin but may also be present in the development site. This Formation has a high palaeontological sensitivity. Regardless of the rare and irregular occurrence of fossils in this biozone a single fossil may be of scientific importance as many fossil taxa are known from a single fossil.

No significant fossils are expected to be found before deep excavations (>1.5m) are completed. Though, it is extremely possible that significant fossils will be documented during excavations. The recording of fossils will enhance our knowledge of the Palaeontological Heritage of the development area.

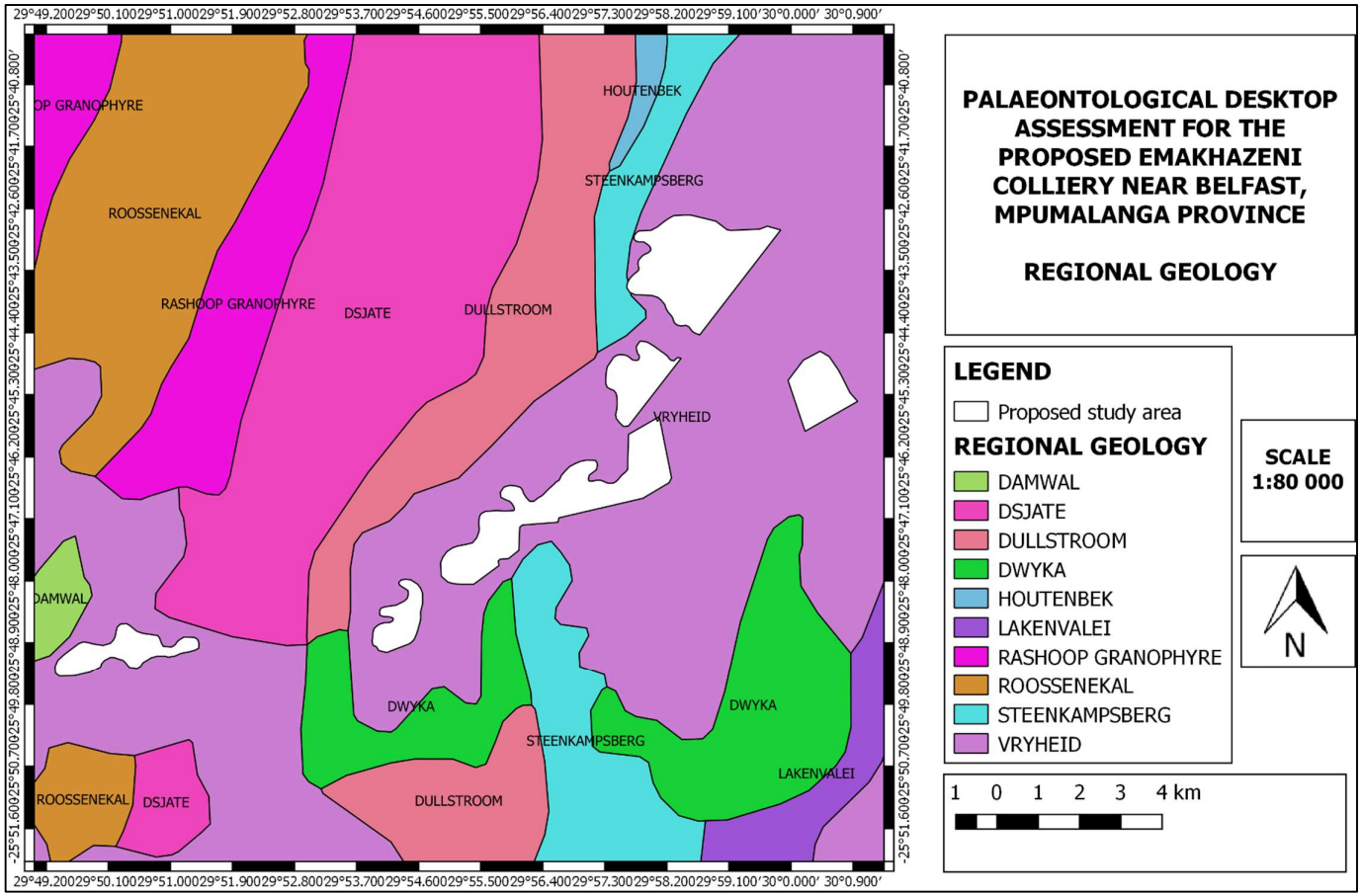


Figure 62 - The surface geology of the opencast and underground mine of the eMakhazeni Project is entirely underlain by sedimentary rocks of the Permian aged Vryheid Formation, Ecca Group, Karoo Supergroup. Map drawn by QGIS Desktop 2.14.20 with Grass 7.2.2.

7 IMPACT ASSESSMENT

The aim of the impact evaluation is to determine the extent of the impact of the proposed project on the identified heritage resources and predict possible impacts on unidentified heritage resources.

During the field work a total of 28 heritage related sites were identified with one additional site (029) identified during the public participation process. These can be subdivided into burial grounds, an archaeological site and recent historic structures. It must be considered that the heritage significance of the identified sites plays a role in the evaluation of the impact and must influence the magnitude rating of the impact tables. Thus, a heritage resource with a high heritage significance rating will have a higher impact magnitude rating than a heritage resource with a low or no heritage significance rating. Consequently, mitigation measures will be more extensive for a heritage resource with a high heritage significance than those with a low heritage significance.

Refer to **Table 7** for the impact assessment tables as described in the following subsections.

All the impacts are envisaged to happened during construction activities. Where there is an impact during Operations/Mining this is mentioned where relevant in the following section.

7.1 Impact on recent historic structures

A total of seven (7) historic structures were identified of which four (**004, 005, 010 and 017**) have no heritage significance. There are two sites (**012** and **018**) that have medium heritage significance. This is based on the probability of infant or still-born burials occurring around the structures. Such burials are a part of African customs (and must be considered during vegetation and soil clearing around these sites). Lastly, site **020** is assessed to be of high heritage significance due to the fact that it is considered to be over 100 years old.

Only site **018** will be directly impacted by mining activities in Pit BA of the proposed layout. Site **012** occurs on the northern side of the N4 in Pit BG and will not be impacted on, according to the proposed layout. Site **020** will be impacted on with proposed underground mining area of Pit BG. The impact significance rated as MEDIUM negative before mitigation and with the implementation of the mitigation measures the impact significance is reduced to LOW negative.

7.2 Impact on burial grounds

Twenty burial grounds have been identified during the field work, with one infant burial identified during the public participation process (Site **029**). Due to the social and cultural significance of burial grounds and graves a high heritage significance is given to all these sites.

7.2.1 Pit BG

The impact of the proposed project on the burial grounds located at sites **006, 007, 008 and 009** is rated as having a HIGH negative significance before mitigation and with the implementation of mitigation measures as having a LOW negative significance. The remaining sites, 001, 002, 003, 011, 021, 022 and 023 should not be impacted on by mining activity as they occur in areas where underground mining will occur according to the proposed layout.

7.2.2 Pit BE

The impact of the proposed project on the burial grounds at sites **009 and 029 (infant burial)** is rated as having a HIGH negative significance before mitigation and with the implementation of mitigation measures as having a LOW negative significance.

7.2.3 Pit BD

The burial ground at site **013** will not be affected as it occurs within underground mining activities according to the proposed layout.

7.2.4 Pit BA

The impact of the proposed project on the burial grounds at sites **015 and 016** is rated as having a HIGH negative significance before mitigation and with the implementation of mitigation measures as having a LOW negative significance.

7.2.5 Pit AA

The burial grounds at sites **025 and 026** occur in close proximity to the proposed open pit layout and may be affected by associated infrastructure; the sites are rated as having a HIGH negative significance before mitigation and with the implementation of mitigation measures as having a LOW negative significance. Site **026** is located some distance from the development area and will probably not be impacted on at all.

7.2.6 Pit BF

Burial ground site **028** is located close to the proposed open pit layout and may be affected by associated infrastructure; the site is rated as having a HIGH negative significance before mitigation and with the implementation of mitigation measures as having a LOW negative significance. Site **025** is located outside of the proposed area next to the N4 and probably will not be affected.

7.3 Impact on archaeological resources

The only archaeological site located is site **014** at Pit BD. This site is a rock shelter containing rock art as well as several pieces of pottery and stone tools. The best option for the site would be *in situ* preservation. The site is rated as having a HIGH negative significance before mitigation and with the implementation of mitigation measures as having a MEDIUM negative significance.

7.4 Impact on Paleontological Resources

The proposed development site of the new open pit and underground operations of the proposed eMakhazeni Project, Mpumalanga Province is completely underlain by the Vryheid Formation of the Ecca Group, Karoo Supergroup. The Vryheid Formation is world renowned for its Permian fossil plant assemblages. This formation is especially known for its rich Glossopteris Flora which includes lycopods, rare ferns and horsetails, cordaitaleans, conifers and ginkgoaleans. Fossil coal is also present as coal consist of fossilized plants. The occurrence of fossil wood and insects are rare, while palynomorphs are diverse. Non-marine bivalves and fish scales have also been reported from this formation. Trace fossils are found abundantly but the diversity is low. The mesosaurid reptile, *Mesosaurus* has been found in the southern parts of the basin but may also be present in the development site. This Formation has a HIGH palaeontological sensitivity. Regardless of the rare and irregular occurrence of fossils in this biozone, a single fossil may be of scientific importance as many fossil taxa are known from a single fossil.

No significant fossils are expected to be found before deep excavations (>1.5m) are completed. Thought, it is extremely possible that significant fossils will be documented during excavations. The recording of fossils will enhance our knowledge of the Palaeontological Heritage of the development area. The proposed development site is rated as having a HIGH negative significance before mitigation and with the implementation of mitigation measures as having a MEDIUM negative significance.

7.5 Impact assessment table for heritage resources

Table 7: Heritage Impact Table

No.	Affected Environment	Activity	Impact Description	BEFORE MITIGATION						Cumulative Impact	Mitigation measures / Recommendations	AFTER MITIGATION					
				Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE
	Construction																
1	Heritage	BG - Vegetation clearance for infrastructure	Destruction of graves at 006 and 007	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	no	Demarcate sites with a 50-meter buffer and avoid them. If this is not possible a detailed grave relocation process must be implemented as required under the NHRA and National Health Act regulations	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low
2	Heritage	BG - Mining	Destruction of graves 008 and 009	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	No	Demarcate sites with a 50-meter buffer and avoid them. If this is not possible a detailed grave relocation process must be implemented as required under the NHRA and National Health Act regulations	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low
3	Heritage	BE - Vegetation clearance for infrastructure	Destruction of infant and stillborn graves at 029	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High	No	Demarcate sites with a 50-meter buffer and avoid them. If this is not possible a detailed grave relocation process must be implemented as required under the NHRA and National Health Act regulations	*Minor -*	*Short Term < 18 months*	*Site or Local*	Low	*Unlikely*	Low

No.	Affected Environment	Activity	Impact Description	BEFORE MITIGATION						Cumulative Impact	Mitigation measures / Recommendations	AFTER MITIGATION					
				Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE
4	Heritage	BE - Mining	Destruction of graves at 019	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	No	Demarcate sites with a 50-meter buffer and avoid them. If this is not possible a detailed grave relocation process must be implemented as required under the NHRA and National Health Act regulations	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low
5	Heritage	BF - Vegetation clearance for infrastructure	Destruction of graves at 028	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High	No	Demarcate sites with a 50-meter buffer and avoid them. If this is not possible a detailed grave relocation process must be implemented as required under the NHRA and National Health Act regulations	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low
6	Heritage	BA - Vegetation clearance for infrastructure	Destruction of graves at 015 and 016	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High	No	Demarcate sites with a 50-meter buffer and avoid them. If this is not possible a detailed grave relocation process must be implemented as required under the NHRA and National Health Act regulations	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low
7	Heritage	BA - Vegetation clearance for infrastructure	Destruction of Mud walled remains and possible infant burials at 018	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium	No	Demarcate sites with a 50-meter buffer and avoid. If the site cannot be avoided it will need to be fully mitigated with excavations and documentation of the site	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low

No.	Affected Environment	Activity	Impact Description	BEFORE MITIGATION						Cumulative Impact	Mitigation measures / Recommendations	AFTER MITIGATION					
				Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE
8	Heritage	AA - Vegetation clearance for infrastructure	Damage to burial grounds at 025 and 027	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High	No	Demarcate sites with a 50-meter buffer and avoid them. If this is not possible a detailed grave relocation process must be implemented as required under the NHRA and National Health Act regulations	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low
9	Heritage	BD - Mining	Impact on archaeological site 014	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Possible*	High	No	This site will need to be fully mitigated with excavations and documentation of the site	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium
	Operation																
11	Heritage	Overall	Impact on palaeontology	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Definite*	High	No	The EAP and ECO must be informed that a Very High Paleontological Sensitivity is allocated to the whole study area. A Phase 1 PIA document and "Chance Find Protocol" must be completed during the first month of excavation. These recommendations must be incorporated in the EMPr of this project.	*Minor +*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium

7.6 Management recommendations and guidelines

7.6.1 Construction phase

The project will encompass a range of activities during the construction phase, including ground clearance, establishment of construction camps area and small-scale infrastructure development associated with the project.

It is possible that cultural material will be exposed during construction and may be recoverable, keeping in mind delays can be costly during construction and as such must be minimised. Development surrounding infrastructure and construction of facilities results in significant disturbance, however foundation holes do offer a window into the past and it thus may be possible to rescue some of the data and materials. It is also possible that substantial alterations will be implemented during this phase of the project and these must be catered for. Temporary infrastructure, such as construction camps and laydown areas, is often changed or added to the project as required. In general, these are low impact developments as they are superficial, resulting in little alteration of the land surface, but still need to be catered for.

During the construction phase, it is important to recognize any significant material being unearthed, making the correct judgment on which actions should be taken. It is recommended that the following chance find procedure should be implemented.

7.6.2 Chance find procedure

- A heritage practitioner / archaeologist should be appointed to develop a heritage induction program and conduct training for the ECO as well as team leaders in the identification of heritage resources and artefacts.
- An appropriately qualified heritage practitioner / archaeologist must be identified to be called upon in the event that any possible heritage resources or artefacts are identified.
- Should an archaeological site or cultural material be discovered during construction (or operation), the area should be demarcated and construction activities halted.
- The qualified heritage practitioner / archaeologist will then need to come out to the site and evaluate the extent and importance of the heritage resources and make the necessary recommendations for mitigating the find and impact on the heritage resource.
- The contractor therefore should have some sort of contingency plan so that operations could move elsewhere temporarily while the materials and data are recovered.

- Construction can commence as soon as the site has been cleared and signed off by the heritage practitioner / archaeologist.

7.7 Possible finds during construction

The study area contains numerous old homesteads as identified during the fieldwork. Excavations of foundations and soil clearance could uncover the following:

- Stone foundations;
- Ash middens associated with the farmsteads and homesteads that can contain bone, glass and clay ceramics, ash, metal objects such as spoons, knives, and knives;
- Possible infant burials.

7.8 Timeframes

It must be kept in mind that mitigation and monitoring of heritage resources discovered during construction activity will require permitting for collection or excavation of heritage resources and lead times must be worked into the construction time frames. **Table 8** gives guidelines for lead times on permitting.

Table 8: Lead times for permitting and mobilisation

Action	RESPONSIBILITY	Timeframe
Preparation for field monitoring and finalisation of contracts	The contractor and service provide	1 month
Application for permits to do necessary mitigation work	Service provider – Archaeologist and SAHRA	1 month
Documentation, excavation and archaeological report on the relevant site	Service provider – Archaeologist	3 months
Handling of chance finds – Graves/Human Remains	Service provider – Archaeologist and SAHRA	2 weeks
Relocation of burial grounds or graves in the way of construction	Service provider – Archaeologist, SAHRA, local government and provincial government	6 months

7.9 Heritage Management Plan for EMP implementation

Table 9: Heritage Management Plan for EMP implementation

NO.	MITIGATION MEASURES	PHASE	TIMEFRAME	RESPONSIBLE PARTY FOR IMPLEMENTATION	MONITORING PARTY (FREQUENCY)	TARGET	PERFORMANCE INDICATORS (MONITORING TOOL)	COST
Possible finds								
A	Implement chance find procedures in case where possible heritage finds are uncovered	Construction	During construction	Applicant ECO Heritage Specialist	ECO (weekly)	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 36 and 38 of NHRA	ECO Monthly Checklist/Report	**Possibly R50 000**
Known sites								
012	• Monitor during site clearance for possible infant and still-born burials and implement chance find procedure if any finds are uncovered.	Construction	During construction	Applicant ECO	Applicant ECO	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 36 and 38 of NHRA	ECO Monthly Checklist/Report	**Less than R10 000**
006, 007, 008, 009, 016, 019, 028 and 029	• Implement design elements to exclude the burial grounds with a 50-metre buffer. If this is not possible, a detailed grave relocation process must be implemented as required under the NHRA and National Health Act regulations.	Construction	During construction	Applicant ECO	Applicant ECO	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 36 and 38 of NHRA	ECO Monthly Checklist/Report	**Less than R3 000 000**

NO.	MITIGATION MEASURES	PHASE	TIMEFRAME	RESPONSIBLE PARTY FOR IMPLEMENTATION	MONITORING PARTY (FREQUENCY)	TARGET	PERFORMANCE INDICATORS (MONITORING TOOL)	COST
014	• The best option for the site would be *in situ* preservation. If it cannot be preserved, this site will need to be fully mitigated with excavations and documentation of the site.	Construction through to Operational	Construction Operational	Applicant ECO	Applicant ECO	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 36 and 38 of NHRA	ECO Monthly Checklist/Report	**Less than R200 000**
Palaeontology	• The EAP and ECO must be informed that a Very High Palaeontological Sensitivity is allocated to the whole study area. A Phase 1 PIA document and "Chance Find Protocol" must be completed during the first month of excavation. • These recommendations must be incorporated in the EMPr of this project.	Construction through to Operational	Construction Operational	Applicant ECO Palaeontologist	Applicant ECO	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 35 and 38 of NHRA	ECO Monthly Checklist/Report	**Less than R100 000**

7.10 Public participation comments

Table 10: Heritage Management Plan for EMP implementation

Name of individual	Issue raised	Answers
Mr Kleinbooi Mahlangu, Leeuwbank 427 JS Farm, WCA JS	My mother and granny's graves are on Blyvoortuitsig, so we need clarity on who will be affected. All those people are in Limpopo and Kwan-Ndebele and they know nothing of this project. I also see you have identified some of the Leeuwbank 427 JS landowners but some are not there, I need clarity on that.	Outside of the area surveyed
Mr Kleinbooi Mahlangu, Leeuwbank 427 JS Farm, WCA JS	If you look at that area, lots of people from Limpopo and former Kwa Ndebele are affected with their graves. Graves have been affected by Umsimbithi. Umsimbithi has destroyed some of our graves, I saw it with my own eyes, in our culture this is very important. No one has spoken to us and those areas are affected. How will this be dealt with?	For graves affected by the development, either a grave relocation process will take place with full social consultation procedures followed. If the graves are not relocated and rather fenced off during the project life span, access to graves cannot be denied to family members (Act 62 ESTA). However, they can be restricted due to safety concerns. A grave register will need to be drawn up and families will need to register which graves they represent. To visit graves, prior arrangements need to be made. For this, drafting of visitation forms will need to be done. the families need to fill in and submit documents to arrange access to the property with correct safety procedures
Ms Nomafa Nkosi Community Development Worker Ward 1	Is there a likelihood that you will find graves, and will these need to be relocated?	If the graves located will be negatively impacted on, they will need to be relocated

8 CONCLUSIONS

PGS was appointed by Kongiwe to undertake an HIA as part of the EIA for the proposed Umsimbithi eMakhazeni Mining Project near Belfast, Mpumalanga Province.

The HSR showed that the proposed Umsimbithi eMakhazeni Mining Project may have heritage resources present in the study area. This has been confirmed through archival research and the evaluation of aerial photography and topographical maps of the sites, as well as the fieldwork findings.

Evaluation of aerial photographs has indicated various areas that may be sensitive from a heritage perspective. The analysis of previous heritage studies conducted in the area assisted in the development of the following landform type to heritage find matrix in **Table 11**.

Table 11: Landform Type to Heritage Find matrix

LANDFORM TYPE	HERITAGE TYPE
Crests and foothills	LSA and MSA scatters, LIA settlements
Crest of small hills	Small LSA sites – scatters of stone artefacts, ostrich eggshell, pottery and beads
Watering holes/pans	LSA sites, LIA settlements
Farmsteads	Historical archaeological material
Ridges and drainage lines	LSA sites, LIA settlements
Forested areas	LIA sites

These findings provided the basis for the recommendation in the HSR of further field truthing through both a heritage field study and a palaeontological field study covering the site. The aim of this was to compile a comprehensive database of heritage sites in the study areas, with the aim of developing a heritage management plan for inclusion in the EMP as derived from the EIA.

8.1 Heritage

The fieldwork for the HIA identified 28 heritage resources with different heritage significance ratings. The public participation process further identified one infant burial near Pit BE (029). These sites consist of 20 burial sites (consisting of approximately 200 burials), one (1) archaeological site and seven (7) historic structures. Of these 28 resources, only 13 with heritage

significance (**006, 007, 008, 009, 012, 014, 015, 016, 018, 019, 025, 027, 028** will be directly impacted by the project activities.

The impact significance before mitigation of the heritage resources varies between HIGH negative (**All sites except 018**) and MEDIUM negative (**018**). Implementation of the recommended mitigation measures will reduce this impact rating to LOW negative (**For all sites except 014**) or MEDIUM negative in the case of **014**.

8.2 Palaeontology

No significant fossils are expected to be found before deep excavations (>1.5m) are completed. Thought, it is extremely possible that significant fossils will be documented during excavations. The recording of fossils will enhance our knowledge of the Palaeontological Heritage of the development area.

It is thus recommended that an EIA level palaeontology report should be conducted during deep excavation to assess the value and prominence of fossils in the development area and the effect of the proposed development on the palaeontological heritage. This consists of a Phase 1 field-based assessment by a professional palaeontologist. The purpose of the EIA level Report is to elaborate on the issues and potential impacts identified during the scoping phase. This is achieved by site visits and research in the site-specific study area, as well as a comprehensive assessment of the impacts identified during the scoping phase.

It is recommended that:

- *The EAP and ECO must be informed that a Very High Palaeontological Sensitivity is allocated to the whole study area. A Phase 1 PIA document and "Chance Find Protocol" must be completed during the first month of excavation.*
- *These recommendations must be incorporated in the EMPr of this project.*

The management and mitigation measures as described in Section 7 of this report have been developed to minimise the project impact on heritage resources.

It is the author's considered opinion that overall impact on heritage resources **after** the implementation of the recommended mitigation measures is acceptably low and that the project can be approved from a heritage perspective.

9 REFERENCES

Cilliers, J.P. 2010. *Phase 1 Archaeological Impact Assessment for Enpact Environmental Consultants concerning the proposed Elandshoek township development on portions 2 and 6 of the farm Lindenau 303 JT and portion 2 of Berlin 466 JT, Mpumalanga Province*. Kudzala Antiquity.

Collett, D.P. 1982. *Excavations of Stone-Walled Ruin Types in the Badfontein Valley, Eastern Transvaal, South Africa*. In The South African Archaeological Bulletin Vol. 37, No. 135 (Jun., 1982), pp. 34-43 Published by: South African Archaeological Society. Article Stable URL: http://www.jstor.org/stable/3888578

Delius, Peter (ed). 2007. *Mpumalanga: History and Heritage*. University of Kwa-Zulu Natal Press.

Delius, P and Hay, M. 2009. *Mpumalanga: An Illustrated History*. The Highveld Press

Esterhuysen, A and Smith, J. 2007. *Stories in Stone*. Chapter 2 in Mpumalanga: History and Heritage.

Evers, T.M. 1975. *Recent Iron Age Research In The Eastern Transvaal, South Africa.* In The South African Archaeological Bulletin, Vol. 30, No. 119/120 (Dec., 1975), pp. 71-83. South African Archaeological Society Stable URL: http://www.jstor.org/stable/3888096 Accessed: 03/05/2012 08:54

Fourie, W. 2008a. *Archaeological Impact Assessment: Northern Coal Portion 15 and 16 of the farm Weltevreden 381 JT, Belfast, Mpumalanga*. PGS.

Fourie, W. 2008b. *Archaeological Impact Assessments within South African Legislation*. South African Archaeological Bulletin 63 (187): 77–85, 2008

Fourie, W. 2009. *Arnot Colliery Mine Project of Exxaro On Portions 4 and 5 of the farm Mooifontein 448 JS and Portions 3 And 4 of the farm Tweefontein 458 JS , District Middelburg, Mpumalanga*

Fourie, W. 2016. *Heritage Assessment - The Kwagga North Project, Optimum Coal, Arnot, Mpumalanga.*

Jooste, C.P. 2002. *Anglo-Boer War Battles: The Battle Of Bergendal - The Last Pitched Battle Of The Anglo-Boer War.* Military History Journal Vol 12 No 4 - December

Jooste, C.P. 2008. *Machadodorp tot en met dorpstigting in 1904* (Afrikaans), MA dissertation, University of Pretoria, Pretoria, viewed 120501 http://upetd.up.ac.za/thesis/available/etd-11132008-124230

Kitto, J. 2012. *Exxaro Paardeplaats Project Heritage Impact Assessment Report*

Kitto, J. 2015. *Proposed Expansion of into portion re of the farm Roetz 210 IS, Jagtlust Colliery, near Carolina, Albert Luthuli Local Municipality, Gert Sibande District Municipality, Mpumalanga Province* .

Mason, R.J. 1968. *Transvaal and Natal Iron Age settlement revealed by aerial photography and excavation*. African Studies 27: 167-179.

Maggs, T. 1995. *Neglected Rock Art: The Rock Engravings of Agriculturist Communities in South Africa* Reviewed work(s): Source: The South African Archaeological Bulletin, Vol. 50, No. 162 (Dec.), pp. 132-142 Published by: South African Archaeological Society Stable URL: http://www.jstor.org/stable/3889062. Accessed: 01/05/2012 01:40

Morris, D. 2008. *Archaeological and Heritage Impact Assessment on Remainder of Carter Block 458, near Lime Acres, Northern Cape*. McGregor Museum.

Pakenham, T. 1979. *The Boer War*. Jonathan Ball Paperbacks. Johannesburg

Pelser, A. 2012. *A Report on a Heritage Assessment for the Proposed Arnot-Gumeni 400 kV Powerline Project, in the Middelburg/Belfast area, Mpumalanga Province*

Pistorius, J. C. C. 2004. *A Heritage Impact Assessment (HIA) study for the Proposed New Optimum Colliery on the farm Schoonoord 164IS in the Mpumalanga Province of South Africa*

Pistorius, J. C. C. 2014*. A Phase I Heritage Impact Assessment (HIA) study for the Consolidated Environmental Management Programme Report (consolidated EMPR) for Arnot Coal on the Eastern Highveld in the Mpumalanga Province*.

Pistorius, J. C. C. 2014. *A Revised Phase I Heritage Impact Assessment (HIA) study for the Proposed Rietvlei Open Cast Coal Mining Operation between Middelburg, Belfast and Stofberg in the Mpumalanga Province of South Africa*.

van Schalkwyk, J 2007. *Heritage Impact Scoping Report for the Planned Hendrina-Marathon Power line, Mpumalanga Province*

9.1 Historic Topographic Maps

The historic topographic maps used in this report were obtained from the Directorate: National Geo-spatial Information of the Department of Rural Development & Land Reform, Cape Town.

9.2 Google Earth

All the aerial depictions used in this report are from Google Earth.

Appendix A

Palaeontological Desktop

PALAEONTOLOGICAL DESKTOP ASSESSMENT FOR THE PROPOSED UMSIMBITHI EMAKHAZENI MINING PROJECT NEAR BELFAST, MPUMALANGA PROVINCE

Prepared for:

PGS Heritage (Pty) Ltd

DATE: 14 November2017

Prepared by

BANZAI ENVIRONMENTAL (PTY) LTD

EXECUTIVE SUMMARY

Umsimbithi Mining (Pty) Ltd (Umsimbithi), proposes the development of a new coal mine (Umsimbithi eMakhazeni MiningProject) on the Eastern Basin Coalfield, Mpumalanga Province. Kongiwe Environmental (Pty) Ltd has been appointed by Umsimbithi to undertake the Environmental Impact Assessment process to assess the environmental impacts necessary as part of the Mining Right Application as well as other Environment Assessments required for the proposed colliery. According to the National Heritage Resources Act (Act No 25 of 1999, section 38), a palaeontological impact assessment is required to detect the presence of fossil material within the proposed development footprint and to assess the impact of the construction and operation of the project on the palaeontological resources.

The proposed development site of the new open pit and underground operations of the proposed Umsimbithi eMakhazeni Mining Project, Mpumalanga Province is completely underlain by the Vryheid Formation of the Ecca Group, Karoo Supergroup. The Vryheid Formation is world renowned for its Permian fossil plant assemblages. This formation is especially known for its rich Glossopteris Flora which includes lycopods, rare ferns and horsetails, cordaitaleans, conifers and ginkgoaleans. Fossil coal is also present as coal consist of fossilized plants. The occurrence of fossil wood and insects are rare, while palynomorphs are diverse. Non-marine bivalves and fish scales have also been reported from this formation. Trace fossils are abundantly found but the diversity is low. The mesosaurid reptile, *Mesosaurus* has been found in the southern parts of the basin but may also be present in the development site. This Formation has a high palaeontological sensitivity. Regardless of the rare and irregular occurrence of fossils in this biozone a single fossil may be of scientific importance as many fossil taxa are known from a single fossil.

No significant fossils are expected to be found before deep excavation (>1.5m) are completed. Thought, it is extremely possible that significant fossils will be documented during excavations. The recording of fossils will enhance our knowledge of the Palaeontological Heritage of the development area.

It is thus recommended that an EIA level palaeontology report will be conducted during deep excavation to assess the value and prominence of fossils in the development area and the effect of the proposed development on the palaeontological heritage. This consists of a Phase 1 field-based assessment by a professional palaeontologist. The purpose of the EIA Report is to elaborate on the issues and potential impacts identified during the scoping phase. This is achieved by site

visits and research in the site-specific study area as well as a comprehensive assessment of the impacts identified during the scoping phase.

It is recommended that:

- *The EAP and ECO must be informed that a Very High Palaeontological Sensitivity is allocated to the whole study area. A Phase 1 PIA document and "Chance Find Protocol" must be completed during the first month of excavation.*
- *These recommendations must be incorporated in the EMPr of this project.*

CONTENTS

1 INTRODUCTION

Umsimbithi Mining (Pty) Ltd (Umsimbithi), proposes the development of a new coal mine (Umsimbithi eMakhazeni Mining Project) on the Eastern Basin Coalfield, Mpumalanga Province (Fig.1). The proposed Umsimbithi eMakhazeni Mining Project will comprise of open pit mines and underground sections (Fig. 2-7).

Umsimbithi Mining (Pty) Ltd holds a Prospecting Right, MP 58 PR, for portions of following farms:

- Bergendal 378 JT
- Bergendal 981 JT
- Driefontein 377 JT
- De Goedehoop 515 JT
- Steynsplaats 360 JT
- Forelwater 410 JT
- Majamela 973 JT
- Tweefontein 357 JT
- Weltevreden 381 JT
- Wemmershuis 379 JT
- Bospoort 399 JS
- Driefontein 398 JS
- Elandsfontein 433 JS
- Elandsfontein 1204 JS;
- Kleinfontein 432 JT
- Klippan 452 JS;
- Leeuwbank 427 JS
- Leeuwfontein 431 JS
- Paardekraal 422 JS
- Teutfontein 407 JS
- Glen Coburn 1213 JS;
- Wonderfontein 428 JS
- Rietvalley 387 JS;
- Bospoort 1208 JS.

The application for a mining right will be limited to portions of the following farms farms: Weltevreden 381 JT, Rietvalley 387 JS, Leeuwbank 427 JS, Leeuwfontein 431 JS, Paardekraal 422 JS, Wonderfontein 428 JS and Bospoort 1208 JS.

Several additional mining operations is present in the area and includes Umsimbithi's Wonderfontein Colliery, other Greenfields coal projects such as the Belfast Project (Exxaro) and Weltevreden (Northern Coal). There are prospecting projects in various stages of development in the area near the proposed Umsimbithi eMakhazeni Mining Project.

1.1 Project Information

(Information provided by Kongiwe Environmental)

The proposed Umsimbithi eMakhazeni Mining Project will be a combination of open pit and underground operations. Both mining operations may possibly be outsourced to specialist contractors. The open pit operations are planned to be mined using the rollover truck and shovel method which allows for concurrent rehabilitation. Some underground sections will also be accessed through the high wall of the open pits. The underground sections will be mined by the board and pillar method. Crushing plants and a coal washing plant will be erected as part of the project.

The Life of the mine is estimated to be more than 25 years. The mine production is estimated to produce approximately 74 million tonnes of coal during the Life of Mine. The coal will be supplied to Eskom and/or other domestic coal consumers. Mining operations will be phased, with one phase leading into the next. Trucks will remove the coal from the mines to a central washing plant if beneficiation is required, or directly to Eskom or other consumers. At full production, it is estimated that the mine will employ approximately 500 people, with most of the labour coming from the eMakhazeni Local Municipality and the surrounding areas. All employment will take place in line with all the relevant legislation, codes and statutes.

The following infrastructure will be built:

- Offices, workshops, change houses, storehouses, warehouses;
- Internal roads and haul roads, fuel storage facilities;
- Open pits, underground sections, crushing circuits, a wash plant, conveyors;
- Water supply networks, storm water networks, pollution control dams, raw water dams, effluent dams, water treatment works; and
- Topsoil stockpiles, discard dumps, and Run of Mine (ROM) stockpiles.

Water will be sourced from boreholes and recycled from opencast pits and pollution control dams. Potable water will be obtained from eMakhazeni Local Municipality or ground water sources. The water usage strategy for the colliery is being designed to operate as a closed water system and most of the water is to be recycled. Eskom will provide the electricity for the project.

Regulations and Licences

Kongiwe Environmental (Pty) Ltd has been employed by Umsimbithi to commence with the Environmental Impact Assessment process to assess the environmental impacts required as part of the Mining Right Applications well as other EAs necessary for the proposed colliery.

The following applications will be made to the Department of Mineral Resources (DMR) as competent authority for the proposed mining project:

- Mining Right Application (MRA) in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA);
- Application for EA for listed activities triggered in Listing Notices GN R983, GN R984 and GN R985, as amended in April 2017, and in accordance with the Environmental Impact Assessment (EIA) Regulations, 2014, as amended in April 2017, promulgated in terms of National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA); and
- Application for listed waste activities in terms of GN R. 921 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), as amended (NEM:WA).

Additionally, the following applications will be made to the appropriate competent authorities:

- Application for an Atmospheric Emission Licence (AEL), in terms of the National Environmental Management: Air Quality Act, 2004, (Act 39 2004) (NEM: AQA), in respect of which the Department of Environmental Affairs (DEA) is the competent authority;
- Relevant permit applications will also be made in terms of sections 34, 35 and 36 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA). The South African Heritage Resources Agency (SAHRA) and or the Mpumalanga Heritage Resources Authority (MPHRA) will be the competent authorities.

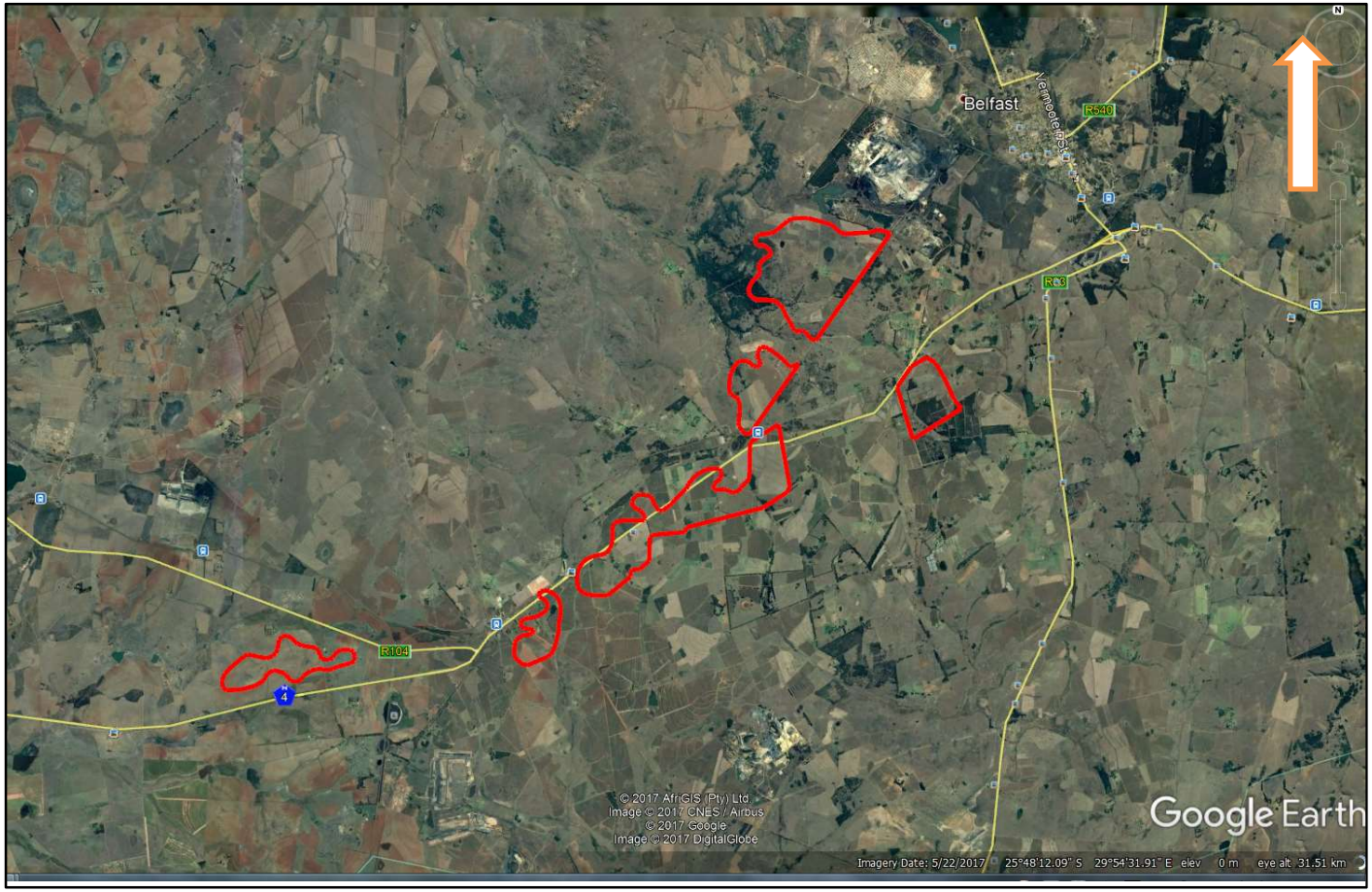


Figure 1: Google Earth image of the location of the opencast and underground mine of the eMakhazeni Project near Belfast, Mpumalanga.

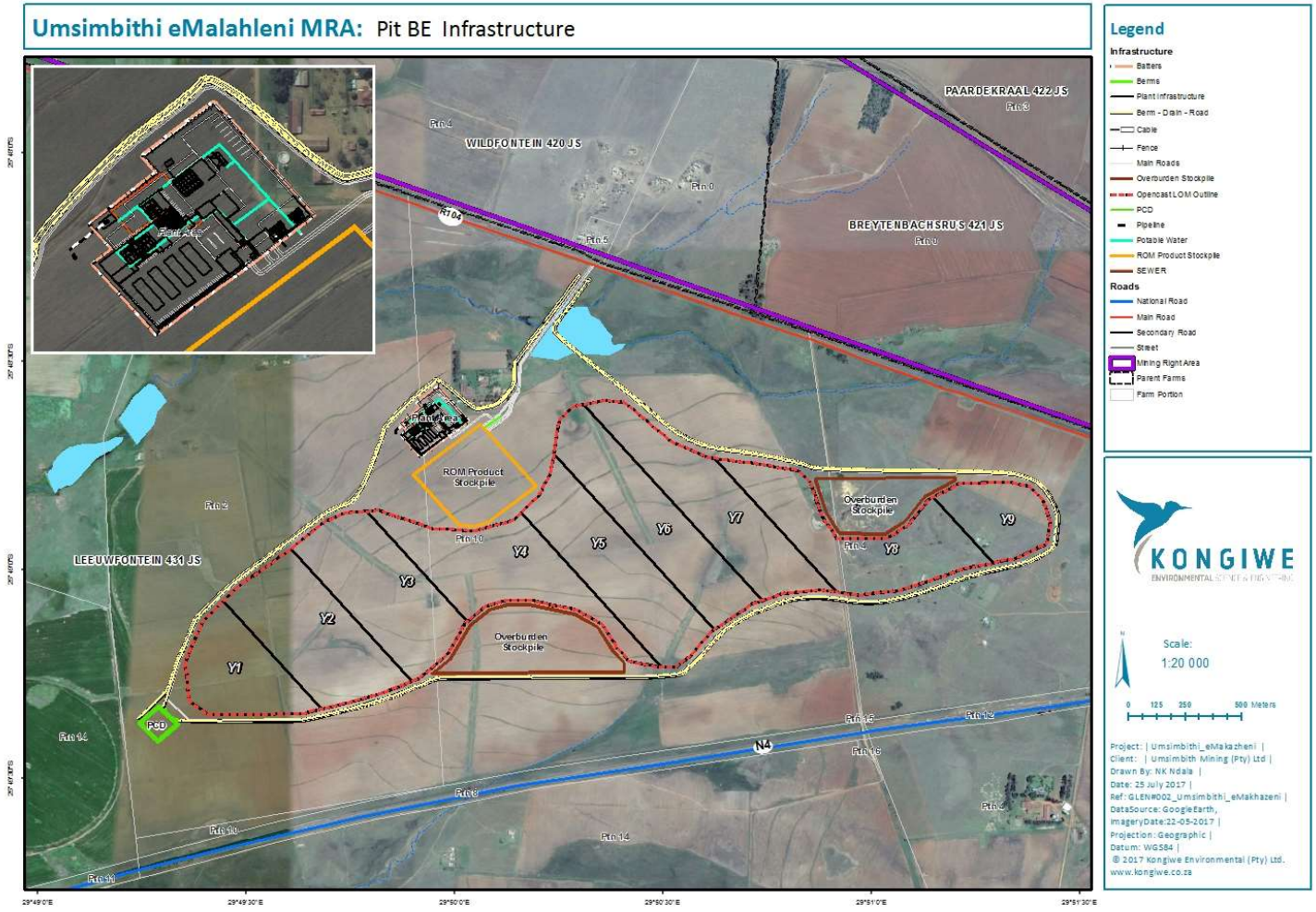


Figure **2**: The Infrastructure of Pit BE. Map provided by KONGIWE

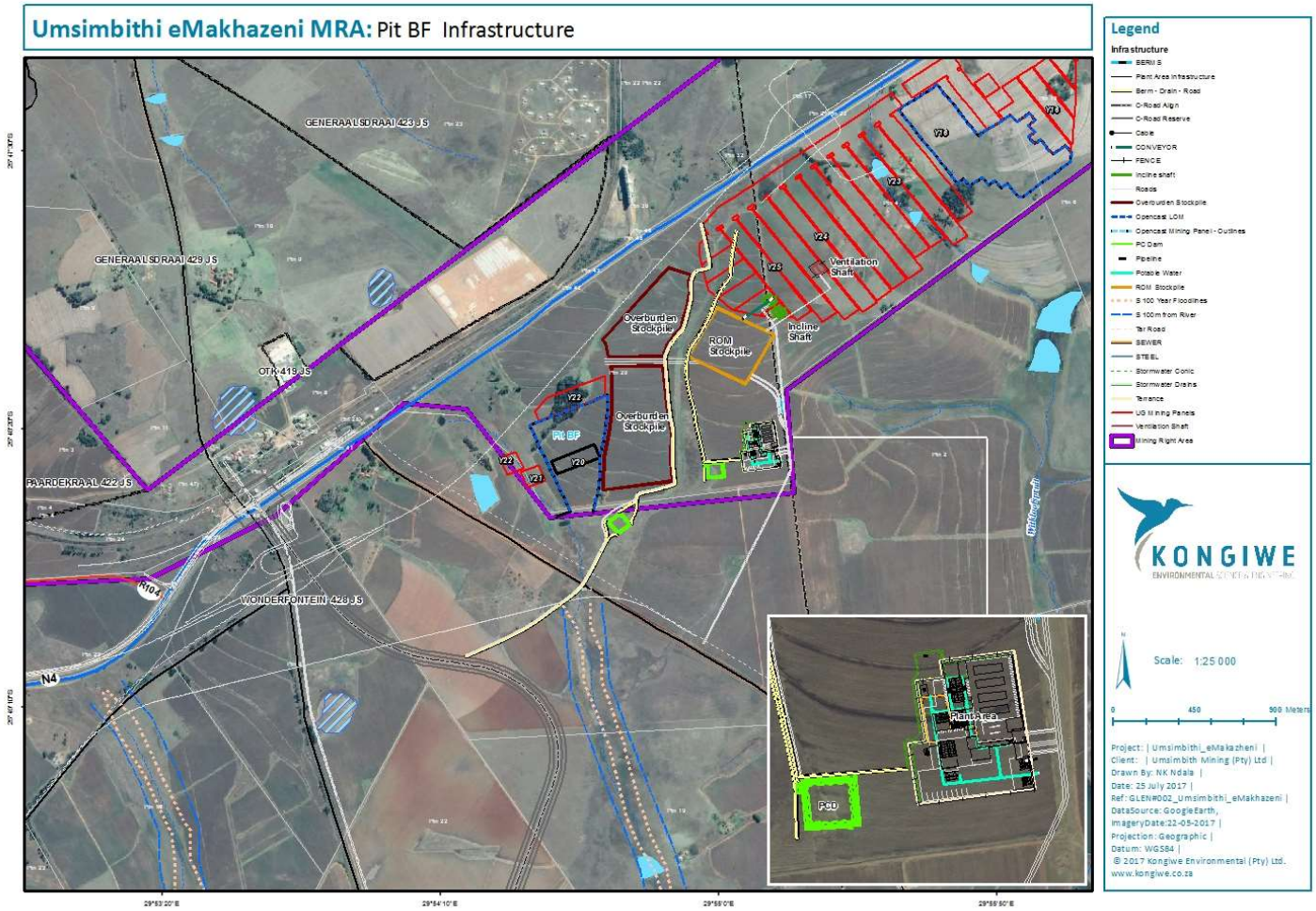


Figure 3: The Infrastructure of Pit BF. Map provided by KONGIWE

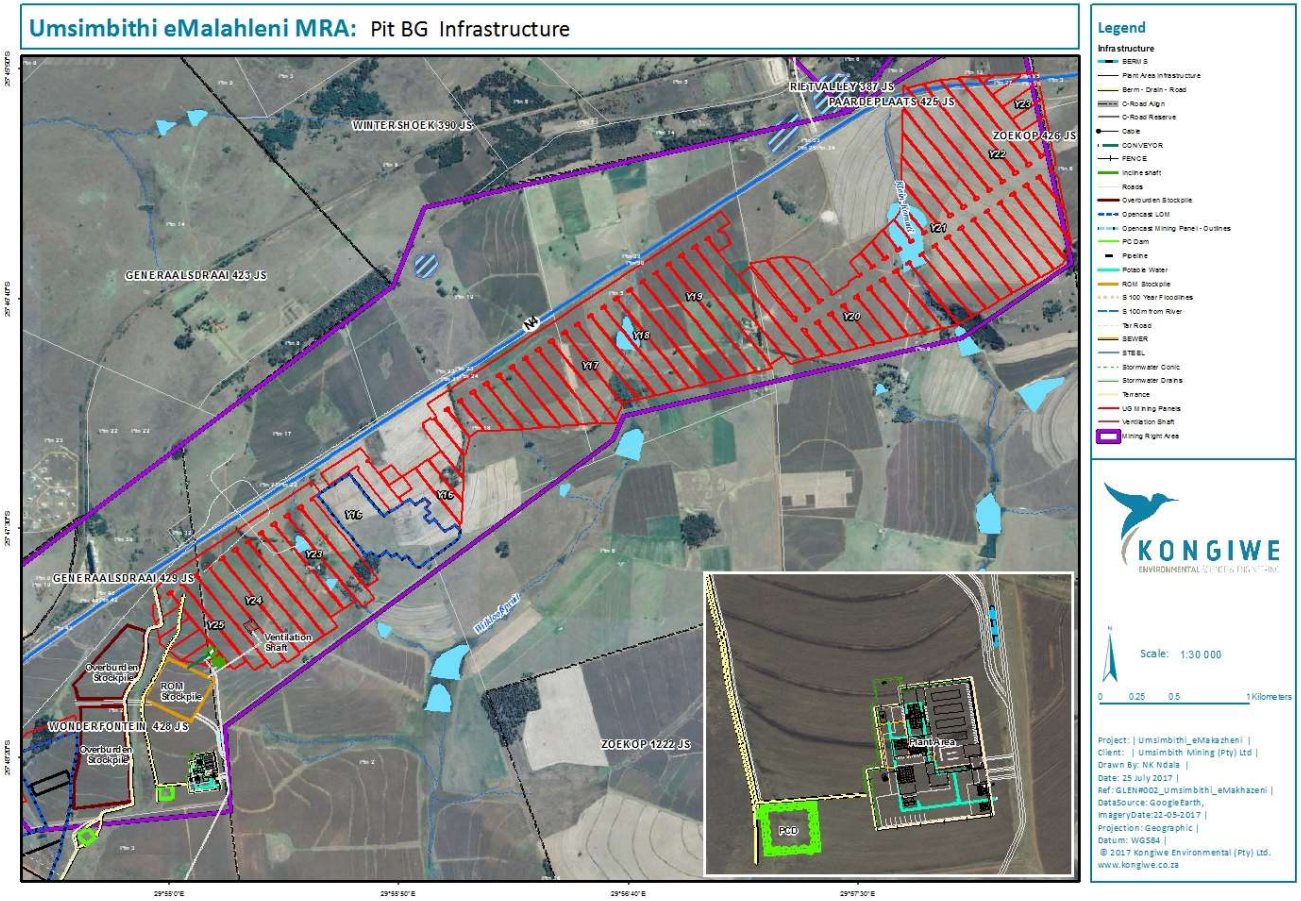


Figure 4: The Infrastructure of Pit BG. Map provided by KONGIWE

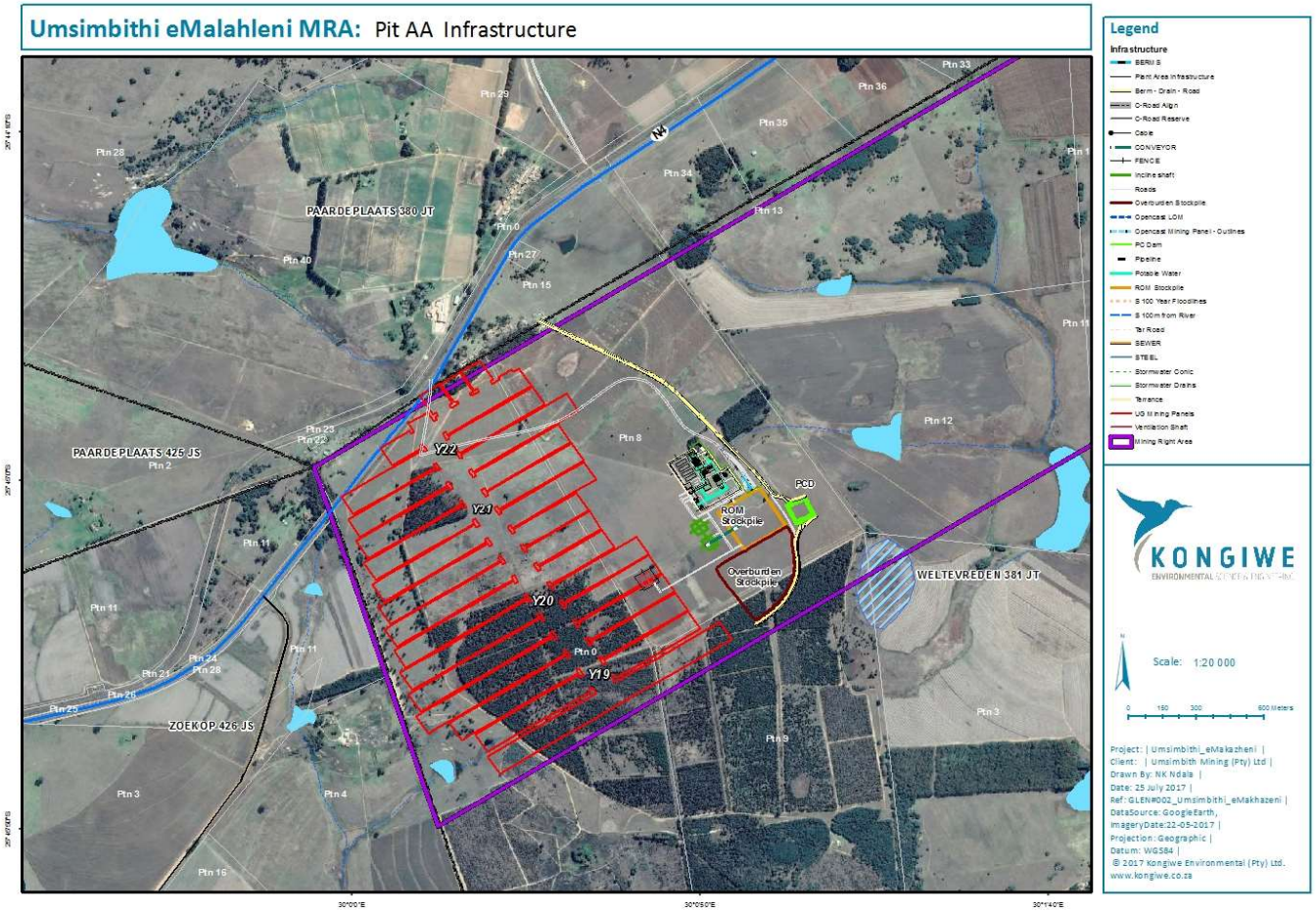


Figure 5: The Infrastructure of Pit AA. Map provided by KONGIWE

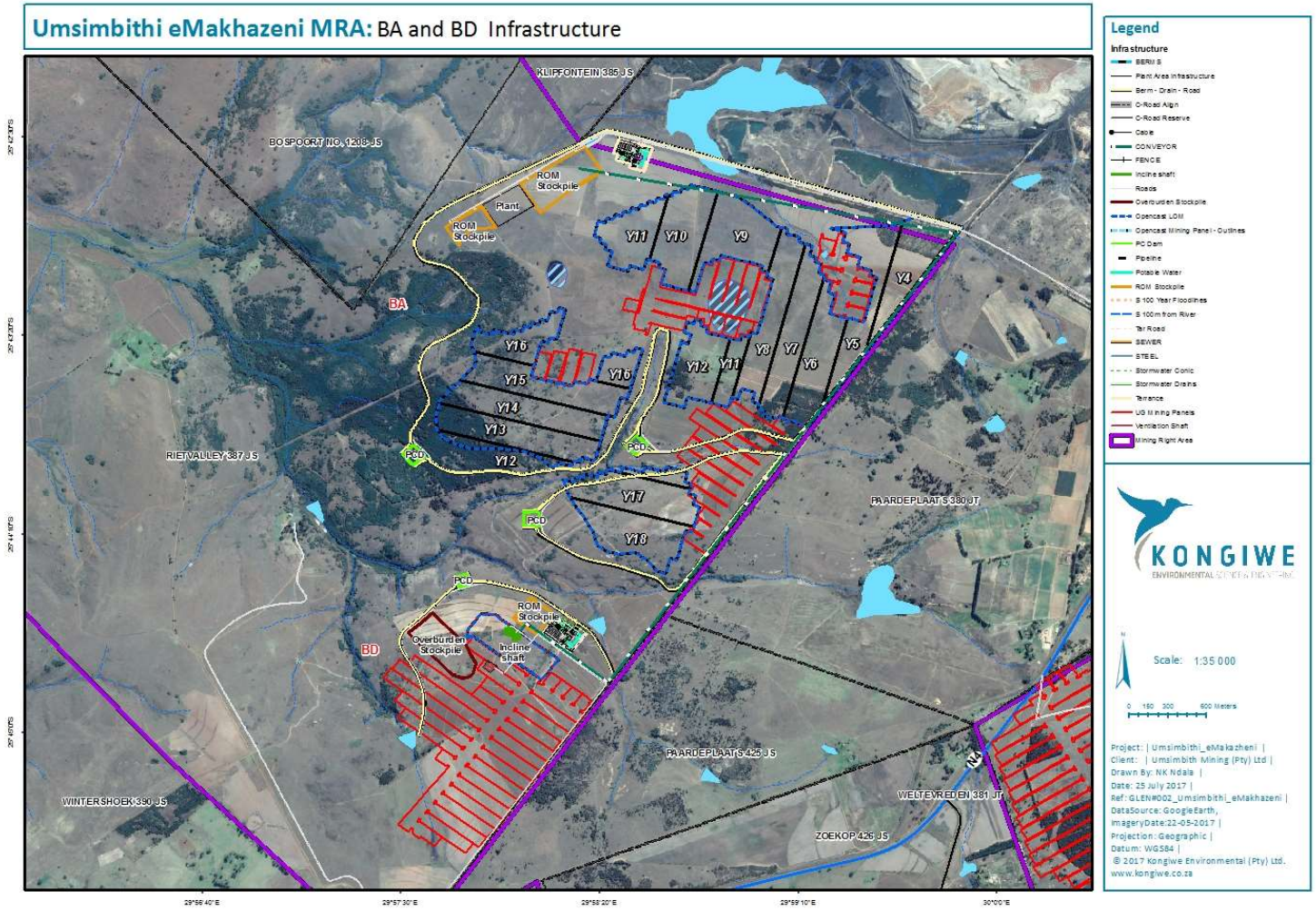


Figure 6: The Infrastructure of Pit BA. Map provided by KONGIWE.

1.2 LEGISLATION

All Cultural Heritage in South Africa is managed by the National Heritage Resources Act (Act 25 of 1999). This Palaeontological Environmental Impact Assessment forms part of the Heritage Impact Assessment (HIA) and abide by the requirements of the above mentioned Act. In accordance with Section 38, an HIA is required to evaluate any potential impacts to palaeontological heritage within the site.

SECTION 25 OF THE NATIONAL HERITAGE RESOURCES ACT 25 OF 1999

The various categories of heritage resources are recognized as part of the National Estate in Section 3 of The National Heritage Resources Act. This includes:

- geological sites of scientific or cultural significance
- palaeontological sites
- palaeontological objects and material, meteorites and rare geological samples.

According to Section 35 of the National Heritage Resources Act 1999, dealing with archaeology, palaeontology and meteorites:

- The protection of archaeological and palaeontological sites and material and meteorites are the responsibility of a provincial heritage resources authority.
- All archaeological objects, palaeontological material and meteorites are the property of the State.
- Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.
- No person may, without a permit issued by the legally responsible heritage resources authority—
    - destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
    - destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
    - trade in, sell for private gain, export or attempt to export from the Republic any archaeological or palaeontological material or object, or any meteorite; or

- bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.

- When the responsible heritage resources authority has reason to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedure in terms of Section 38 has been followed, it may—
    - serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order; and/or
    - carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary.

2 OBJECTIVE

According to the "SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports' the aims of the palaeontological impact assessment are:

- To identify exposed and subsurface rock formations that are considered to be palaeontologically important;
- To evaluate the level of palaeontological importance of the formations;
- To comment on the impact of the development on the uncovered exposed and/or potential fossil resources; and
- To recommend how the developer ought to conserve or mitigate damage to these resources.

The objective of a Palaeontological Impact Assessment, which forms of part of the Heritage Impact Assessment (HIA), is to determine the impact of the development on potential palaeontological material at the site.

When compiling a palaeontological desktop study, the potentially fossiliferous rocks present within the study area are established from geological maps (groups, formations, members and assemblage zones. The known fossil heritage within each rock unit is obtained from the PalaeoMap from SAHRIS; previous palaeontological impact studies in the same region; published scientific literature; as well as databases of various collecting institutions. The palaeontological importance of each rock unit of the development area is accordingly calculated. The probable impact of the proposed development footprint on local fossil heritage is established on the basis of

- the palaeontological importance of the rocks and
- the character and magnitude of the development footprint and
- quantity of new bedrock excavated.

When rocks of moderate to high palaeontological sensitivity are present within the study area, a field-based assessment by a professional palaeontologist is necessary. Impacts on palaeontological heritage usually only occur during the construction phase. Excavations transform the topography and may disrupt and destruct or permanently seal-in fossils at or below the ground surface and then these fossils will then no longer be accessible for scientific study.

Mitigation may precede construction or, more effectively, take place during the construction phase when new, potentially fossiliferous bedrock, is exposed and available for study. Mitigation entails the sampling, collection and recording of fossils. Preceding the excavation of any fossil heritage a permit from SAHRA must be obtained and the material will have to be housed in a permitted institution. With proper mitigation, many developments involving bedrock excavation will have a *positive* impact on our understanding of local palaeontological heritage.

3 GEOLOGICAL AND PALAEONTOLOGICAL HISTORY

The opencast and underground mining of the eMakhazeni Project is entirely underlain by sedimentary rocks of the Permian aged Vryheid Formation, Ecca Group, Karoo Supergroup (Fig. 7-8). This Formation is known to contain a rich assemblage of plant fossils and thus coal can be mined as coal consists of fossil plant material. The Vryheid formation has a very high palaeontological sensitivity.

3.1 Geology

The Vryheid Formation consists mostly of light grey course-to fine grained sandstone and siltstone sediments. Dark siltstones can be accredited to the presence of carbon enrichment and coal beds. The

sediments consist of deltaic mudrocks and sandstones, nearby coastal and fluvial deposits, with intermittent coal seams. The sediments were most probably deposited on a sandy shoreline, beyond vast swamplands. Plant material accumulating within these swamps created the coal deposits that are mined today (Johnson et al, 2006).

3.2 Palaeontological Heritage

The Vryheid Formation is world renowned for its Permian fossil plant assemblages. This formation is especially known for its rich Glossopteris Flora which includes lycopods, rare ferns and horsetails, cordaitaleans, conifers and ginkgoaleans. Fossil coal is also present as coal consist of fossilized plants. The occurrence of fossil wood and insects are rare, while palynomorphs are diverse. Non-marine bivalves and fish scales have also been reported from this formation. Trace fossils are abundantly found but the diversity is low. The mesosaurid reptile, *Mesosaurus* has been found in the southern parts of the basin but may also be present in other areas of the Vryheid Formation. This Formation has a very high palaeontological sensitivity. Regardless of the rare and irregular occurrence of fossils in this biozone a single fossil may be of scientific importance as many fossil taxa are known from a single fossil.

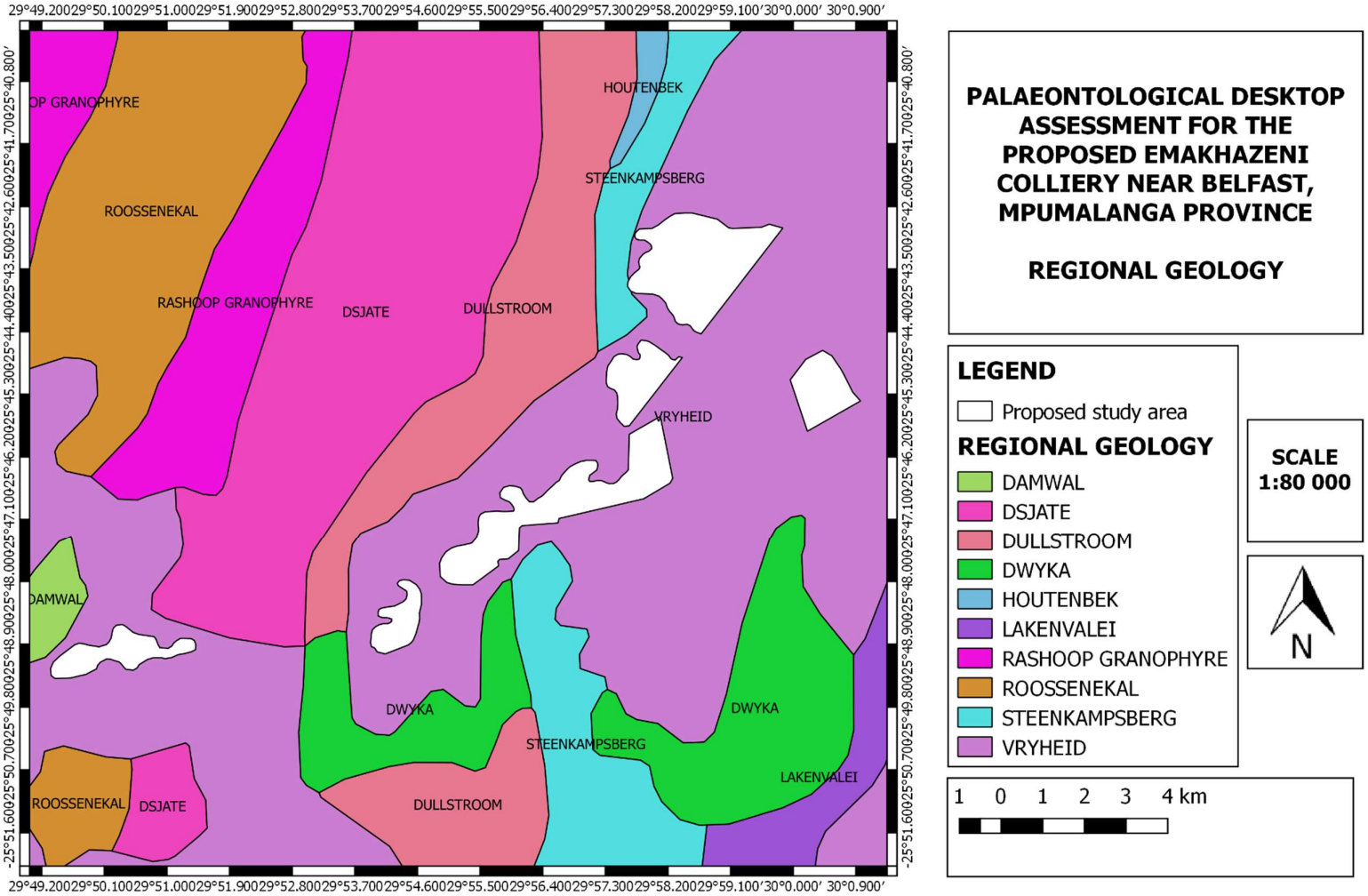


Figure 8: The surface geology of the opencast and underground mine of the eMakhazeni Project is entirely underlain by sedimentary rocks of the Permian aged Vryheid Formation, Ecca Group, Karoo Supergroup. Map drawn by QGIS Desktop 2.14.20 with Grass 7.2.2.

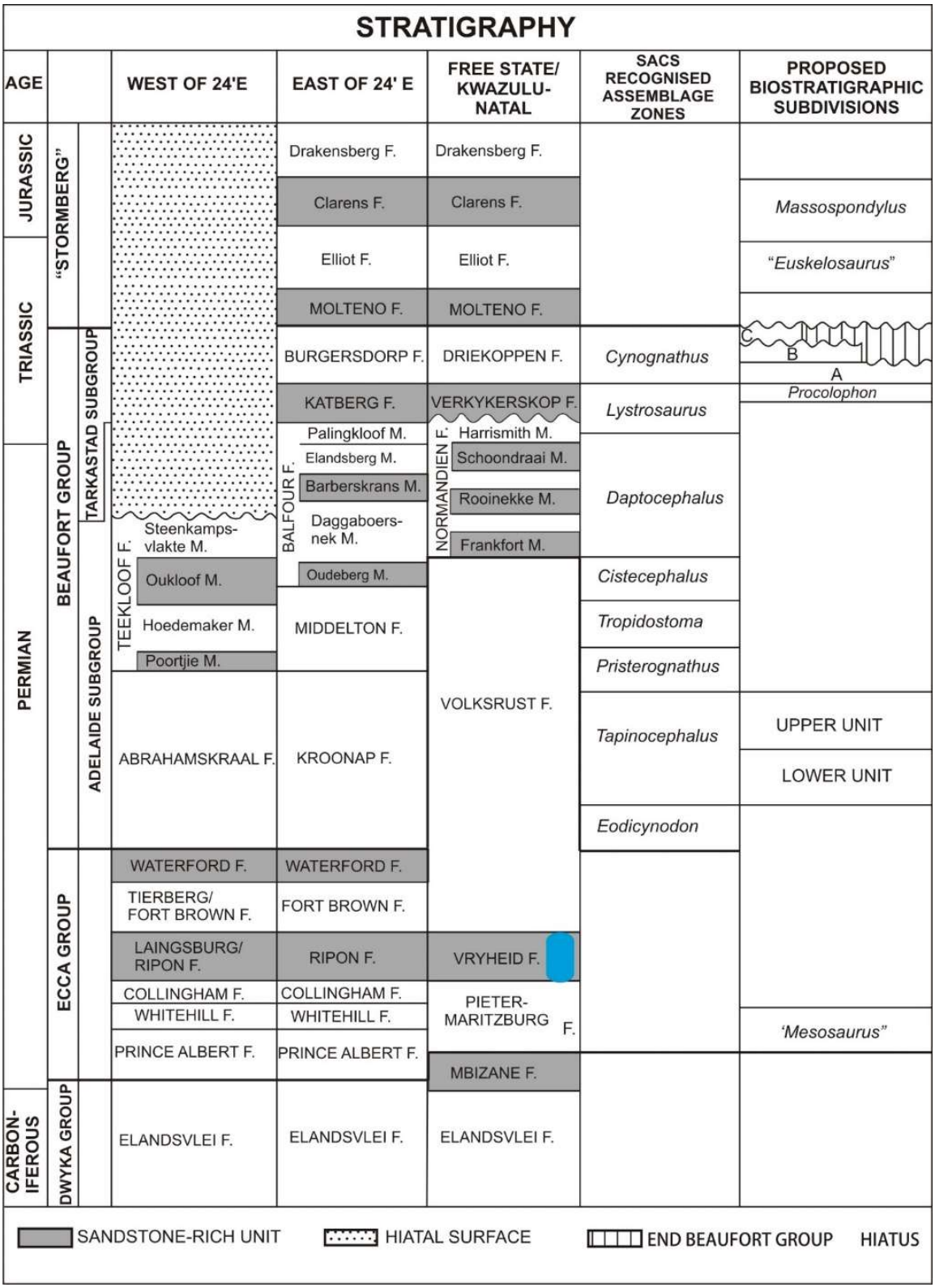


Figure 9: Lithostratigraphic (rock-based) and biostratigraphic (fossil-based) subdivisions of the Ecca and Beaufort Group of the Karoo Supergroup with rock units and fossil assemblage zones relevant to the present study marked in blue (Modified from Rubidge 1995). The subdivisions of the Ecca Group include the Vryheid and is Early Permian in age. Abbreviations: F. = Formation, M. = Member.

4 GEOGRAPHICAL LOCATION OF THE SITE

The proposed Umsimbithi eMakhazeni Mining Project is located approximately 56 kilometres east of Middelburg in the Mpumalanga Province (Fig.1). The colliery will comprise of several properties on either side of the N4 stretching from 5 km to 30 km west of eMkahazeni.

4.1 Assumptions and Limitations

The accuracy and reliability of desktop Palaeontological Impact Assessments as part of heritage impact assessments are normally limited by the following restrictions:

- Old fossil databases that have not been kept up-to-date or are not computerised. These old databases do not always include locality or geological information. South Africa has a limited number of professional palaeontologists that carry out fieldwork and most development study areas have never been surveyed by a palaeontologist.
- The accuracy of geological maps where information may be based solely on aerial photographs. Small areas of significant geology have been ignored. Geological sheet explanations maps are inadequate and little to no attention is paid to palaeontological material.
- Not all impact studies and other reports are available for background information for desktop studies.

Large areas of South Africa have not been studied palaeontologically. Fossil data collected from different areas but in similar Assemblage Zones might provide insight on the possible occurrence of fossils in an unexplored area. Desktop studies therefore usually assume the presence of unexposed fossil heritage within study areas of similar geological formations. Where considerable exposures of bedrocks or potentially fossiliferous superficial sediments are present in the study area, the reliability of a Palaeontological Impact Assessment may be improved through field-survey by a professional palaeontologist.

5 IMPACT ASSESSMENT

The Vryheid Formation of the Ecca Group is world renowned for its Permian the rich fossil plant assemblages. This formation is especially known for its rich Glossopteris Flora which includes lycopods, rare ferns and horsetails, cordaitaleans, conifers and ginkgoaleans. Fossil wood and insects are rare,

while palynomorphs are diverse. Non-marine bivalves and fish scales have also been reported. The mesosaurid reptile, *Mesosaurus* may also be present in the development site. Regardless of the sparse and sporadic occurrence of fossils in this biozone a single fossil can have a huge scientific importance as many fossil taxa are known from a single fossil.

5.1 Methodology for Impact Assessment

In order to ensure uniformity, a standard impact assessment methodology has been utilised so that a wide range of impacts can be compared. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Significance;
- Spatial scale;
- Temporal scale;
- Probability; and
- Degree of certainty.

A combined quantitative and qualitative methodology was used to describe impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors, along with the equivalent quantitative rating scale for each of the aforementioned criteria, is given in **Table 12.**

Table 12: Quantitative rating and equivalent descriptors for the impact assessment criteria

RATING	SIGNIFICANCE	EXTENT SCALE	TEMPORAL SCALE
1	VERY LOW	*Isolated site/ proposed corridor*	Incidental
2	LOW	*Study area*	Short-term
3	MODERATE	*Local*	Medium-term
4	HIGH	*Regional / Provincial*	Long-term
5	VERY HIGH	*Global / National*	Permanent

A more detailed description of each of the assessment criteria is given in the following sections.

5.1.1 Significance Assessment

The Significance rating (importance) of the associated impacts embraces the notion of extent and magnitude, but does not always clearly define these, since their importance in the rating scale is very relative. For example, the magnitude (i.e. the size) of an area affected by atmospheric pollution may be extremely large (1000 km^2) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be HIGH or VERY

HIGH, but if it is diluted it would be VERY LOW or LOW. Similarly, if 60 ha of a grassland type are destroyed, the impact would be VERY HIGH if only 100 ha of that grassland type were known. The impact would be VERY LOW if the grassland type was common.

A more detailed description of the impact significance rating scale is given in **Table 13** below.

Table 13: Description of the significance rating scale

RATING		DESCRIPTION
5	VERY HIGH	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	HIGH	Impact is of substantial order within the bounds of impacts which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time-consuming or some combination of these.
3	MODERATE	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
2	LOW	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.
1	VERY LOW	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity are needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
0	NO IMPACT	There is no impact at all - not even a very low impact on a party or system.

5.1.2 Spatial Scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in the table below.

Table 14: Description of the Spatial significance rating scale

RATING		DESCRIPTION
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of possible impacts, and will be felt at a regional scale (District Municipality to Provincial Level). The impact will affect an area up to 50 km from the proposed site.
3	Local	The impact will affect an area up to 5 km from the proposed site.
2	Study Area	The impact will affect an area not exceeding the boundary of the study area.
1	Isolated Sites / proposed site	The impact will affect an area no bigger than the site.

5.1.3 Temporal/Duration Scale

In order to accurately describe the impact, it is necessary to understand the duration and persistence of an impact in the environment. The temporal or duration scale is rated according to criteria set out in **Table 15.**

Table 15: Description of the temporal rating scale

RATING		DESCRIPTION
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than 5 years, whichever is the greater.
3	Medium-term	The environmental impact identified will operate for the duration of life of the project.
4	Long-term	The environmental impact identified will operate beyond the life of operation of the project.
5	Permanent	The environmental impact will be permanent.

5.1.4 Degree of Probability

The probability, or likelihood, of an impact occurring will be described as shown in **Table 16** below.

Table 16: Description of the degree of probability of an impact occurring

RATING	DESCRIPTION
1	Practically impossible
2	Unlikely
3	Could happen

4	Very likely
5	It's going to happen / has occurred

5.1.5 Degree of Certainty

As with all studies, it is not possible to be 100% certain of all facts, and for this reason a standard "degree of certainty" scale is used, as discussed in **Table 17.** The level of detail for specialist studies is determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

Table 17: Description of the degree of certainty rating scale

RATING	DESCRIPTION
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40 and 70% sure of a particular fact, or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The consultant believes an assessment is not possible even with additional research.

5.1.6 Quantitative Description of Impacts

To allow for impacts to be described in a quantitative manner, in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus the total value of the impact is described as the function of significance, spatial and temporal scale, as described below:

$$\textit{Impact Risk} = \frac{(\text{SIGNIFICANCE} + \textit{Spatial} + \text{Temporal})}{3} \times \frac{\text{Probability}}{5}$$

An example of how this rating scale is applied is shown below:

Table 18: Example of Rating Scale

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	High	Local	Permanent	Could Happen	**LOW**

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
Impact on heritage sites	5	2	5	4	3.2

Note: The significance, spatial and temporal scales are added to give a total of 12, which is divided by 3 to give a criterion rating of 4. The probability (4) is divided by 5 to give a probability rating of 0.8. The criteria rating of 4 is then multiplied by the probability rating (0,8) to give the final rating of 3.2

The impact risk is classified according to 5 classes as described in the table below.

Table 19: Impact Risk Classes

RATING	IMPACT CLASS	DESCRIPTION
0.1 – 1.0	1	Very Low
1.1 – 2.0	2	Low
2.1 – 3.0	3	Moderate
3.1 – 4.0	**4**	**High**
4.1 – 5.0	5	Very High

Therefore, with reference to the example used for air quality above, an impact rating of 3.2 will fall in the Impact Class 4, which will be considered to be high impact.

6 FINDINGS AND RECOMMENDATIONS

The proposed development site of the new open pit and underground operations of the proposed Umsimbithi eMakhazeni Mining Project, Mpumalanga Province is completely underlain by the Vryheid Formation of the Ecca Group, Karoo Supergroup. The Vryheid Formation is world renowned for its Permian fossil plant assemblages. This formation is especially known for its rich Glossopteris Flora which includes lycopods, rare ferns and horsetails, cordaitaleans, conifers and ginkgoaleans. Fossil coal is also present as coal consist of fossilized plants. The occurrence of fossil wood and insects are rare, while palynomorphs are diverse. Non-marine bivalves and fish scales have also been reported from this formation. Trace fossils are abundantly found but the diversity is low. The mesosaurid reptile, *Mesosaurus* has been found in the southern parts of the basin but may also be present in the development site. This Formation has a high palaeontological sensitivity. Regardless of the rare and irregular occurrence of fossils in this biozone a single fossil may be of scientific importance as many fossil taxa are known from a single fossil.

No significant fossils are expected to be found before deep excavation (>1.5m) are completed. Thought, it is extremely possible that significant fossils will be documented during excavations. The recording of fossils will enhance our knowledge of the Palaeontological Heritage of the development area.

It is thus recommended that an EIA level palaeontology report will be conducted during deep excavation to assess the value and prominence of fossils in the development area and the effect of the proposed development on the palaeontological heritage. This consists of a Phase 1 field-based assessment by a professional palaeontologist. The purpose of the EIA Report is to elaborate on the issues and potential impacts identified during the scoping phase. This is achieved by site visits and research in the site-specific study area as well as a comprehensive assessment of the impacts identified during the scoping phase.

It is recommended that:

- *The EAP and ECO must be informed that a Very High Palaeontological Sensitivity is allocated to the whole study area. A Phase 1 PIA document and "Chance Find Protocol" must be completed during the first month of excavation.*
- *These recommendations must be incorporated in the EMPr of this project.*

7 REFERENCES

ALMOND, J., PETHER, J, and GROENEWALD, G. 2013. South African National Fossil Sensitivity Map. SAHRA and Council for Geosciences. Schweitzer *et al*. (1995) pp p288

JOHNSON, M.R, ANHAUSER, C.R, and THOMAS, R.J. 2006. *The Geology of South Africa*. Geol. Soc. S. Africa. Council for Geoscience, Pretoria.

MCCARTHY, T & RUBIDGE, B. 2005. *The Story of Earth Life: A southern African perspective on a 4.6-billion-year journey.* Struik. Pp 333

MACRAE, C. 1999. Life etched in stone. *Fossils of South Africa*. 305 pp. The Geological Society of South Africa, Johannesburg.

VAN DER WALT, M., DAY, M., RUBIDGE, B. S., COOPER, A. K. & NETTERBERG, I., 2010. Utilising GIS technology to create a biozone map for the Beaufort Group (Karoo Supergroup) of South Africa. *Palaeontologia Africana,* **45:** 1-5.

8 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

The author (Elize Butler) has an MSc in Palaeontology from the University of the Free State, Bloemfontein, South Africa. She has been working in Palaeontology for more than twenty three years. She has experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the Karoo Basin. She has been a member of the Palaeontological Society of South Africa for 10 years and have been been conducting Palaeontological Impact Assessments since 2014. A total of 80 technical reports on palaeontology (scoping reports have been completed).

9 DECLARATION OF INDEPENDENCE

Declaration of Independence

I, Elize Butler, declare that –

General declaration:

- *I act as the independent palaeontological specialist in this application*
- *I will 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 declare that there are no circumstances that may compromise my objectivity in performing such work;*
- *I have expertise in conducting palaeontological impact assessments, 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 will take into account, to the extent possible, the matters listed in section 38 of the NHRA when preparing the application and any report relating to the application;*
- *I have no, and will not engage in, conflicting interests in the undertaking of the activity;*
- *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 will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all*

interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;

- *I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not*
- *All the particulars furnished by me in this form are true and correct;*
- *I will perform all other obligations as expected a palaeontological specialist in terms of the Act and the constitutions of my affiliated professional bodies; and*
- *I realise that a false declaration is an offence in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.*

Disclosure of Vested Interest

- *I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations;*

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SIGNATURE: