



**PGS**  
**HERITAGE**

**VLAKVARKFONTEIN COAL MINE EXTENSION, ASSOCIATED  
INFRASTRUCTURE AND AMENDMENTS TO EXISTING  
LICENCE CONDITIONS**

**Vlakvarkfontein 213-IR in Delmas Mpumalanga Province**

Phase 1 – Heritage Impact Assessment

**Issue Date:** 09 August 2018  
**Revision No.:** 0.1  
**Project No.:** 331HIA



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### **Declaration of Independence**

- I, Wouter Fourie, declare that –
- General declaration:
- I act as the independent heritage practitioner 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 heritage 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 from a heritage practitioner 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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**ACKNOWLEDGEMENT OF RECEIPT**

<b>Report Title</b>	<b><i>VLAKVARKFONTEIN COAL MINE EXTENSION, ASSOCIATED INFRASTRUCTURE AND AMENDMENTS TO EXISTING LICENCE CONDITIONS</i></b>		
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The heritage impact assessment report has been compiled considering the NEMA Appendix 6 requirements for specialist reports as indicated in the table below.

<b>NEMA Regs (2014) - Appendix 6</b>	<b>Relevant section in report</b>
Details of the specialist who prepared the report	Page 2 of Report – Contact details and company
The expertise of that person to compile a specialist report including a curriculum vita	Section 1.2 – refer to <b>Appendix D</b>
A declaration that the person is independent in a form as may be specified by the competent authority	Page ii of the report
An indication of the scope of, and the purpose for which, the report was prepared	Section 1.1 and 2.2
The date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 3.6
A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 5 and <b>Appendix B</b>
The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 3.6 and 5
An identification of any areas to be avoided, including buffers	Section 6
A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 3.6
A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3
A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 6
Any mitigation measures for inclusion in the EMPr	Section 6
Any conditions for inclusion in the environmental authorisation	Section 6
Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 6
A reasoned opinion as to whether the proposed activity or portions thereof should be authorised and	Section 6
If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	
A description of any consultation process that was undertaken during the course of carrying out the study	Not applicable. A public consultation process was handled as part of the EIA and EMP process.
A summary and copies if any comments that were received during any consultation process	Not applicable. To date not comments regarding heritage resources that require input from a specialist have been raised.
Any other information requested by the competent authority.	Not applicable.

## EXECUTIVE SUMMARY

PGS Heritage (Pty) Ltd (PGS) was appointed by Environmental Impact Management Services (Pty) Ltd (EIMS) to undertake a Heritage Impact Assessment (HIA) to extend the mining operations at the Vlakvarkfontein Coal Mine, located on Portions 5 and 18 of the Farm Vlakvarkfontein 213 IR. The mining area is situated approximately 30 km north east of Delmas, and approximately 15 km south west of Ogies.

The entire Vlakvarkfontein property is highly disturbed by previous and current mining activities, infrastructure developments, roads and human settlements. As such, the conclusion of the survey is that there is a low chance that in-tact, important fossil deposits or heritage resources will be exposed and/or disturbed as a result of the proposed developments by Ntshovelo Mining Resources (Pty) Ltd on the Vlakvarkfontein Coal Mine property.

The cemetery **VVF006** will most be impacted directly by the expansion of the project and it is recommended that a minimum buffer of 20 meters are kept and the cemetery buried to mitigate any damage. If this is not possible the cemetery must be relocated after completion of a full grave relocation process that adheres to all legislative requirements.

In the event that heritage resources are discovered during site clearance, construction activities must stop, and a qualified archaeologist appointed to evaluate and make recommendations on mitigation measures.

If construction activities on this property should expose any fossil deposits, a professional palaeontologist should be contacted to assess whether mitigation actions are necessary.

The overall impact of the mining activities on heritage resources is seen as acceptably low after the recommendations have been implemented and therefore, impacts can be mitigated to acceptable levels.

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## **TERMINOLOGY AND ABBREVIATIONS**

### **Archaeological resources**

This includes:

- 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;
- rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
- 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;
- 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 in the opinion of the heritage authority in any way result in a change to the nature, appearance or physical nature of a place or influence its stability and future well-being, including:

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

### **Early Stone Age**

The archaeology of the Stone Age between 700 000 and 3 300 000 years ago.



**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 and can include (but not limited to) as stated under Section 3 of the NHRA,

- places, buildings, structures and equipment of cultural significance;
- places to which oral traditions are attached or which are associated with living heritage;
- historical settlements and townscapes;
- landscapes and natural features of cultural significance;
- geological sites of scientific or cultural importance;
- archaeological and palaeontological sites;
- graves and burial grounds, and
- sites of significance relating to the history of slavery in South Africa;

**Holocene**

The most recent geological time period which commenced 10 000 years ago.

**Late Stone Age**

The archaeology of the last 30 000 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 iron-working and farming activities such as herding and agriculture.

**Middle Stone Age**

The archaeology of the Stone Age between 30 000-300 000 years ago, associated with early modern humans.

**Palaeontology**

Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

*Table 1: List of abbreviations used in this report*

<b>Abbreviations</b>	<b>Description</b>
AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation
ECO	Environmental Control Officer
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LSA	Late Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
MIA	Middle Iron Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PHRA	Provincial Heritage Resources Authority
PSSA	Palaeontological Society of South Africa
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency

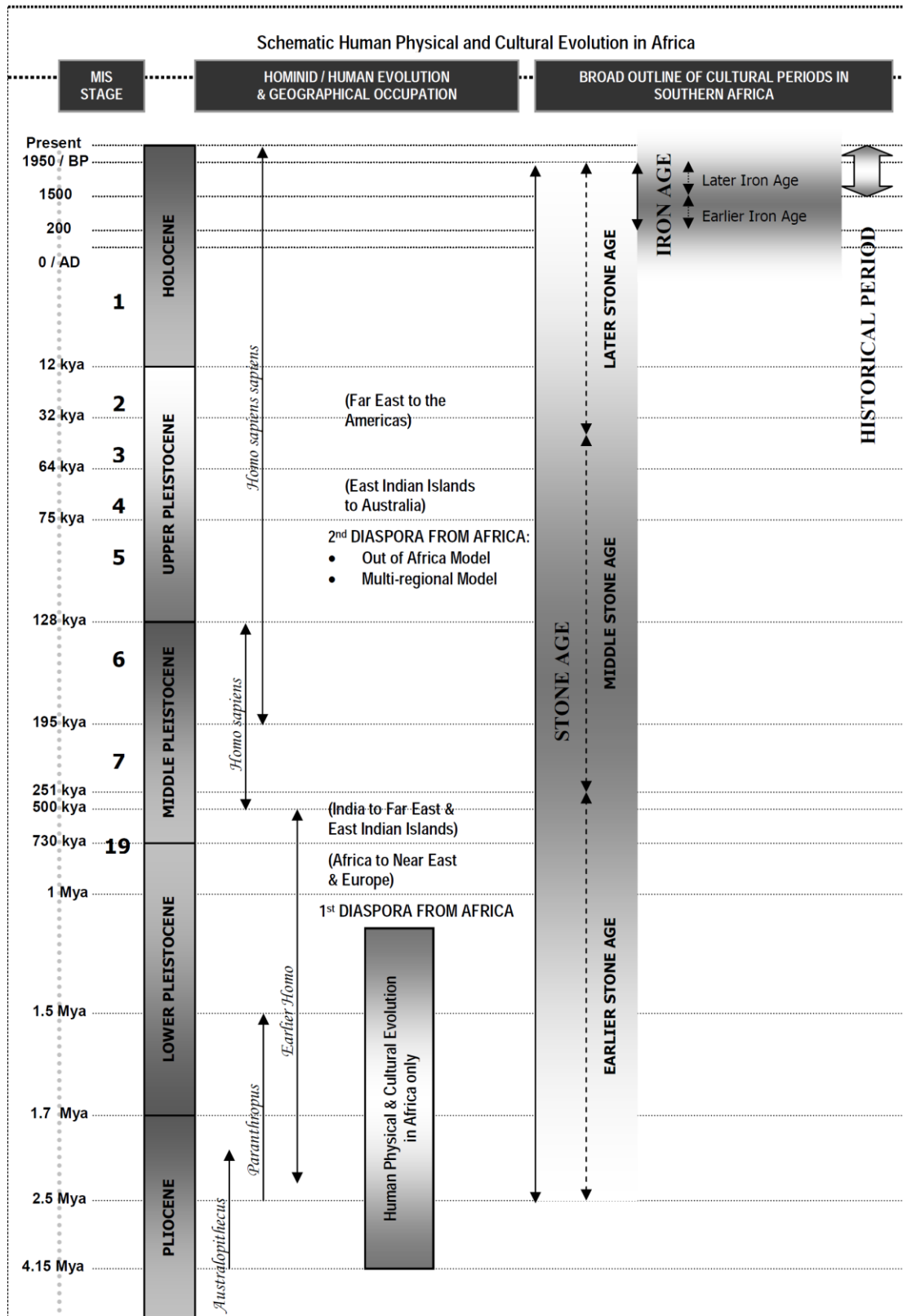


Figure 1 – Human and Cultural Time line in Africa (Morris, 2008)

## **1 INTRODUCTION**

PGS Heritage (Pty) Ltd (PGS) was appointed by Environmental Impact Management Services (Pty) Ltd (EIMS) to undertake a Heritage Impact Assessment (HIA) to extend the mining operations at the Vlakvarkfontein Coal Mine, located on Portions 5 and 18 of the Farm Vlakvarkfontein 213 IR. The mining area is situated approximately 30 km north east of Delmas, and approximately 15 km south west of Ogies.

### **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 prospecting area. The HIA aims to assist the developer in managing the discovered heritage resources in a responsible manner, in order 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 Report was compiled by PGS Heritage (PGS).

The staff at PGS has a combined experience of nearly 40 years in the heritage consulting industry. PGS and its staff have extensive experience in managing HIA processes. PGS will only undertake heritage assessment work where they have the relevant expertise and experience to undertake that work competently.

Wouter Fourie, the Project Coordinator, is registered with the Association of Southern African Professional Archaeologists (ASAPA) as a Professional Archaeologist and is accredited as a Principal Investigator; he is further an Accredited Professional Heritage Practitioner with the Association of Professional Heritage Practitioners (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 immediately be contacted.

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. In the event that 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:

- National Environmental Management Act (NEMA), Act 107 of 1998
- National Heritage Resources Act (NHRA), Act 25 of 1999
- Mineral 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.

- National Environmental Management Act (NEMA) Act 107 of 1998
  - Basic Environmental Assessment (BEA) – Section (23)(2)(d)
  - Environmental Scoping Report (ESR) – Section (29)(1)(d)
  - Environmental Impact Assessment (EIA) – Section (32)(2)(d)
  - Environmental Management Plan (EMP) – Section (34)(b)
- National Heritage Resources Act (NHRA) Act 25 of 1999
  - Protection of Heritage Resources – Sections 34 to 36; and
  - Heritage Resources Management – Section 38
- Mineral and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
  - Section 39(3)

The NHRA stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34(1) of the NHRA states that, “no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority...” 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 of NHRA. This study falls under s38(8) and requires comment from the relevant heritage resources authority.

## 2 TECHNICAL DETAILS OF THE PROJECT

### 2.1 Locality

The Vlakvarkfontein Coal Mine area is situated approximately 30km north east of Delmas, and approximately 15km south west of Ogies. The N12 highway passes to the north of the mining area. The project falls within the Victor Khanye Local Municipality (**Figure 2**).

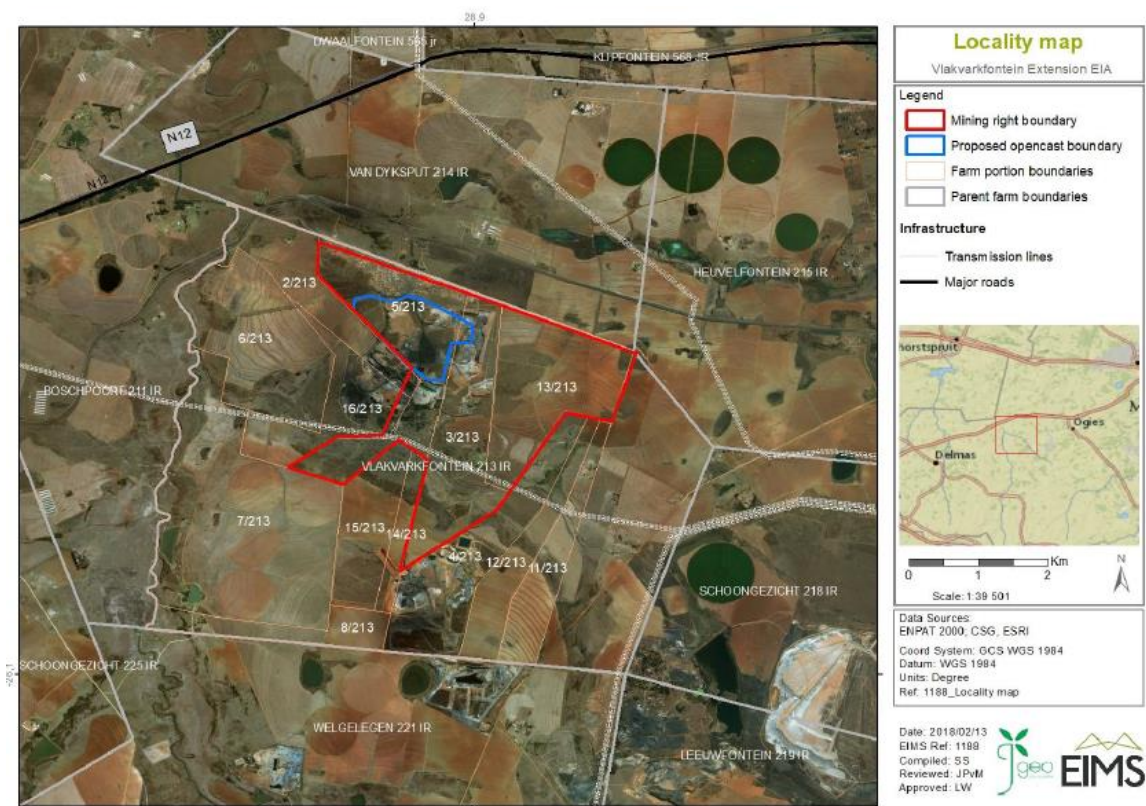


Figure 2 – Locality of study area (EIMS, 2018)

## 2.2 Technical Project Description

It is proposed to expand the open cast mining operations, using the roll-over mining method, onto Portion 5 of the farm Vlakvarkfontein 213IR. This area is within the existing approved mining right boundary but was not specifically included and assessed in the approved Environmental Management Programme Report (EMPR) and associated environmental permits and authorisations. The proposed new mining operations will necessitate the relocation and re-establishment of the existing ancillary infrastructure associated with the current mining operations, including the Pollution Control Dam (PCD) and the administrative structures. It is also proposed to establish a coal processing plant (wash plant) to decontaminate the Run of Mine (RoM) coal. An application for the amendment to the existing Mine Works Programme (MWP) and Environmental Management Programme (EMPR), through an MPRDA Section 102 Application, and a full Environmental Impact Assessment (EIA) for the proposed new mining area is, therefore, required to support an application for environmental authorisation (EA) / waste management licence (WML) as applicable. A new water use licence application (WULA) for the relevant water use triggers associated with the proposed project will also be undertaken.





Figure 4 – GPS Tracks (yellow) of survey conducted within the area proposed for development (blue) within the Vlakvarkfontein Coal Mine. Red indicates farm boundary.



Figure 5 – Context photo of the area proposed for development on the Vlakvarkfontein Coal Mine property. Note heavily disturbed landscape and extensive relocation of surface sediments down to considerable depth.

The entire Vlakvarkfontein property is highly disturbed by previous and current mining activities, infrastructure developments, roads and human settlements. As such, the conclusion of the survey is that there is a low chance that in-tact, important fossil deposits or heritage resources will be



exposed and/or disturbed as a result of the proposed developments by Ntshovelo Mining Resources (Pty) Ltd on the Vlakvarkfontein Coal Mine property.

### 3.2 Archival findings

The archival research focused on available information sources that were used to compile a background history of the study area and surrounds. This data then informed the possible heritage resources to be expected during field surveying.

#### 3.2.1 Delmas

Delmas is a small farming town situated east of Johannesburg in Mpumalanga Province. Most of the farm in the area of Delmas specialise in maize farming and production. Other farms in the area specialise in wheat, potatoes, chicken and beans production. Other than agricultural activities, Delmas is also known for its coal mines - collieries dating back as far as the 1800s and early 1900's.

#### 3.2.2 Archaeological and Historical Significance

Two archival search processes took place and they include Map Archives (Figure 6, 7, 8) and Deeds and other Records. The two archival search processes yielded the following findings about Vlakvarkfontein 213 - IR.

*1903 Major Jackson Series Sheet shows the following about the study area and its surrounding:*

- Two structures are depicted – possible early farmstead and the store (**Figure 8** – red arrows). The structures are definitely over 60 years old; however, only a store was located during the physical survey.
- On the southern boundary of the study area 3 mining activities are shown (2 between Vlakvarkfontein 101 and Welgelegen 544 and 1 between Mooimeisjesfontein 113 and Welgelegen 544). Other mining activities are shown in Boshpoort 336. This shows that mining activities were already in existence in the area before the survey and drawing of the map in 1903.
- A number of roads enter through Vlakvarkfontein 101 and splits through in Mooimeisjesfontein 113.

*1913, 1928 (Revision) 1: 250, 000 Map reveals the following about the study area:*

- Eight structures are depicted in a close cluster in Vlakvarkfontein 101 (**Figure 7** – red oval shape)
- A portion of Mooimeisjesfontein has outspan – indicative of presence of mining activities in the study area. Mooimeisjesfontein 113 is written in lower case than Vlakvarkfontein 101 which is in large case this is common when portions of one farm or total farm has be

transferred to another farm or changed names. In the case this indicates that portions of Mooimeisjesfontein 113 were transferred to Vlakvarkfontein 101 (see Deeds and other Records search below 4. 2. 2)

- There is inclusion of names, Helena Rust and Spes Bona in the maps- Spes Bona is farmstead in the south-east boundary of the study site and falls outside the study area.
- A railway line with railway crossing and Abor Station are shown north of the study area. Far north-east of the study area Kendal Station – the railway line joining Benoni and Middelburg and was constructed and completed just before 1913.
- North of the railway is a main road also joining Benoni and Middelburg.



Figure 6 - Farm Vlakvarkfontein 101 (Mooimeisjesfontein – other old name of Vlakvarkfontein 213 IR) in relation to other farms, railway line to from Johannesburg to Middelburg and various main roads. ©Map Archives, Cullen Library, University of the Witwatersrand

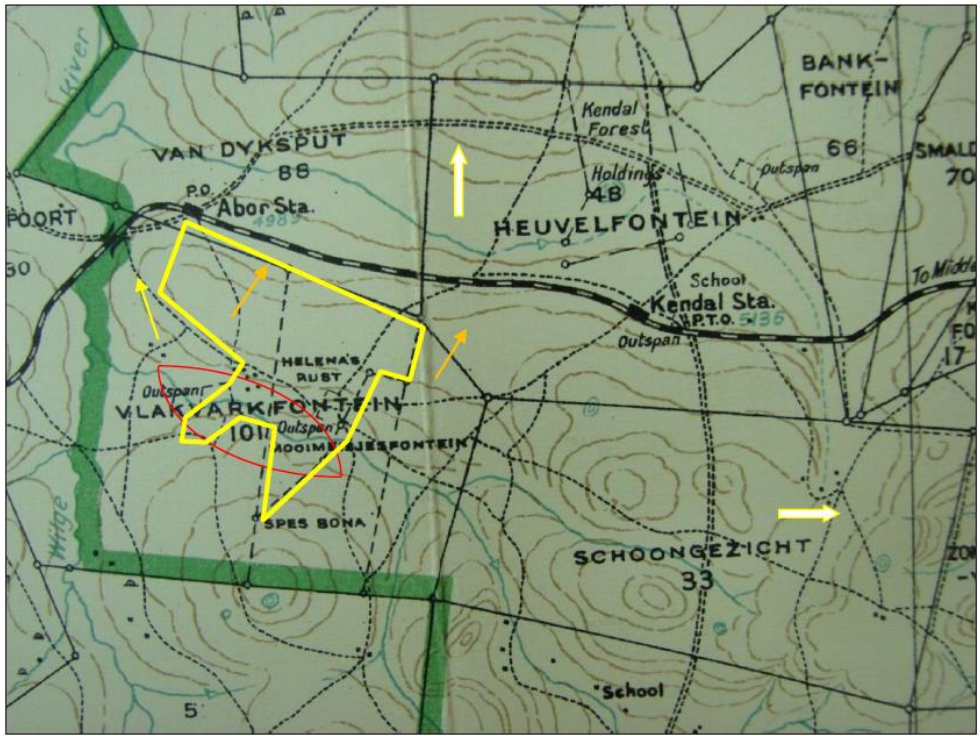


Figure 7 - 1928 Map showing Farm Vlakvarkfontein. ©Map Archives, Cullen Library, University of the Witwatersrand, Johannesburg, South Africa.

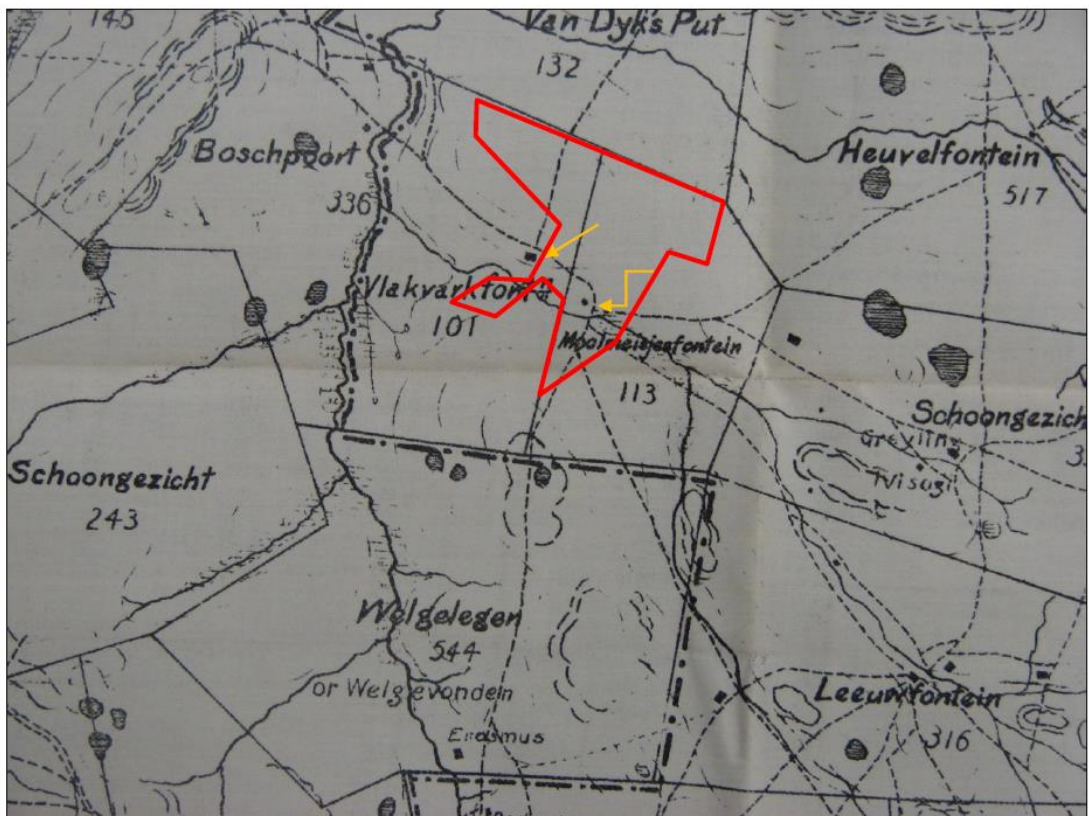


Figure 8 - Vlakvarkfontein & Mooimeisjesfontein in 1901. Note, there are only 2 structures in the property; one in the farm Vlakvarkfontein and the other in the farm Mooimeisjesfontein to the east. ©Map Archives, Cullen Library, University of the Witwatersrand, J

### 3.3 Previous HIAs in the area

A search of the South African Heritage Resources Information System (SAHRiS) has shown numerous studies in the general vicinity of the study area.

Most notably is the 2011 study completed by PGS, authored by N Thomose. The study identified eight heritage resources located within the Vlakvarkfontein mine boundary that included: 5 built environment and landscape sites (VVF01 to VVF04 and VVF08) and 3 cemeteries of various sizes (VVF05 to VVF07) (Figure 9).

Subsequent to the project implementation cemetery **VVF005** was relocated after a detailed grave relocation process and with the permission of the next-of-kin in February of 2013.

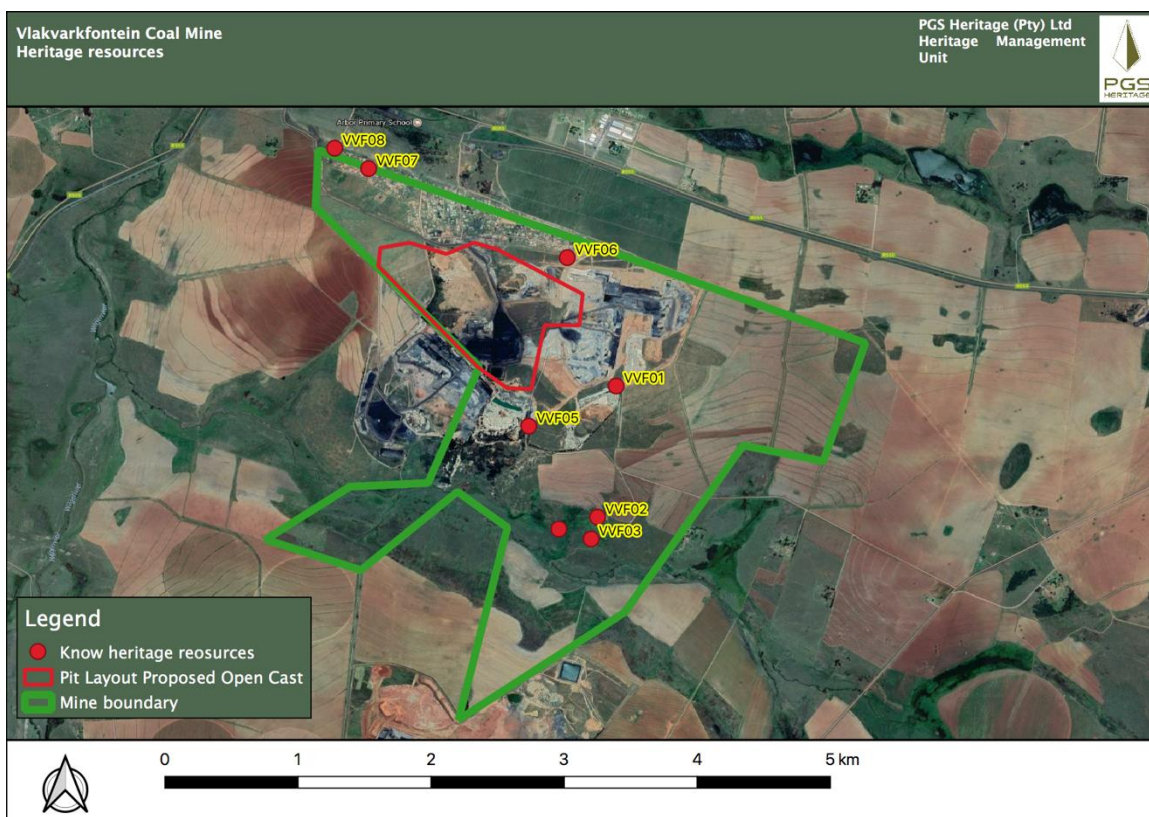


Figure 9 - Vlakvarkfontein heritage resources as identified in 2011

### 3.4 Fieldwork and Findings

Due to the nature of cultural remains, with the majority of artefacts occurring below the surface, a controlled-exclusive surface survey was conducted on foot over a period of one day by an archaeologist from PGS.

The entire Vlakvarkfontein property is highly disturbed by previous and current mining activities, infrastructure developments, roads and human settlements. As such, the conclusion of the survey is that there is a low chance that in-tact, important fossil deposits or heritage resources will be

exposed and/or disturbed as a result of the proposed developments by Ntshovelo Mining Resources (Pty) Ltd on the Vlakvarkfontein Coal Mine property.

Although heritage resources were identified during the original HIA done in 2011 by PGS (Tomose, 2011) no additional heritage resource were identified in the expansion area (**Figure 9**).

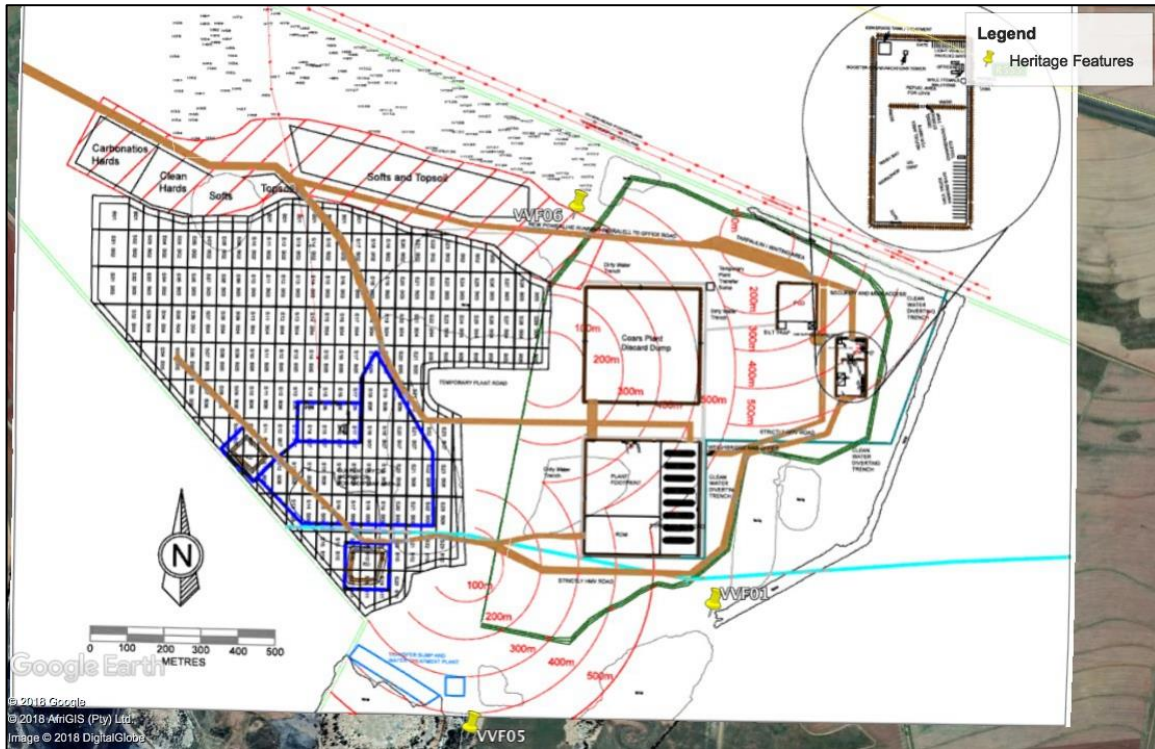


Figure 10 - Heritage features close to expansion areas

Only one of the original heritage features identified in the 2011 (Tomose), are to be possibly affected by the new expansion.

#### 3.4.1 VVF06

**GPS Coordinates:** S26 03 07.0 E28 53 54.9

**Site Type:** Cemetery

#### **Description:**

This site is an old cemetery with approximately 20 identifiable graves. The cemetery is 8m x 15 m big. All the graves are oriented West-East in two rows. The graves have stone mound/pile dressings (**Figure 11**); some just a small stone, and two have cement headstones and dressings (**Figure 12**). One of the cement headstones has fallen down. No inscriptions were found in the two graves with cement dressing and headstone. According to the old man spoken to in the village, Mr. Mtshweni, the graves have long been there, and he does not know the descendants of the deceased.

**Approximate Age:** Older than 60 years

**Potential Impact:** Moderate to High - the site falls directly adjacent to the proposed mine expansion area and will possibly be affected through the blasting and other mining activities such as dust and debris as well as trucks footprint and stock piles.

**Proposed Management Measure:** In situ management of the site through fencing and a sufficient buffer to protect against vehicle damage. If at any stage the cemetery will be directly impacted by mining activity a Phase II HIA – Proposed Cemetery Relocation is recommended.

Permission to mine closer than 100 meters from the cemetery has been granted by the Department of Mineral Resources, but the current expansion can potentially require the relocation of the cemetery.



*Figure 11 - Stone mound/pile dressing*



Figure 12 - Two graves with cement dressing and headstones. The headstone of the grave to the right in the picture has fallen

#### 4 PALAEOLOGY

The examination of PIA reports on the SAHRIS website and published academic literature provides a background for understanding the significance of palaeontological resources in and/or surrounding the study area. Several PIA reports have been compiled in the Delmas area, necessitated by the proposed mining of the Witbank Coalfield. The following provides a summary of past PIAs and academic studies that are important for the impact assessment of the Vlakvarkfontein Coal Mine property.

The area surrounding Farm Vlakvarkfontein 213R is dominated by the Ecca Group Formation (Karoo Supergroup) (**Figure 5**), in particular, the Vryheid Formation, which is comprised of interbedded sandstones and shales that preserve valuable fossils and remains of plants and insects (Johnson et al., 2006). The Ecca Group Formation is Permian (~300 – 260Ma) in age and preserves important plant trace fossils including *Diplocraterion parallelum*, *Skolithos*, *Monocraterwn*, *Scalaruuba*, *Siphonichnus eccaensis* and *Glossopteris* flora (see Anderson and McLauchlan, 1976; Bamford, 2004). The Upper Ecca (which includes the Vryheid) Formation only preserves one of the two large leaf form taxa for *Glossopteris*, namely *Gangamopteris*, which have contributed to the formation of the Witbank Coalfield (Rubidge, 2013). An extensive review of the plant fossils in this area can be read in Bamford (2004). While no macro-fossils (i.e. animals) have been found in the Vryheid Formation, its trace fossils have been critical for understanding palaeoenvironmental conditions during the Permian Period (Stainstreet et al., 1980).

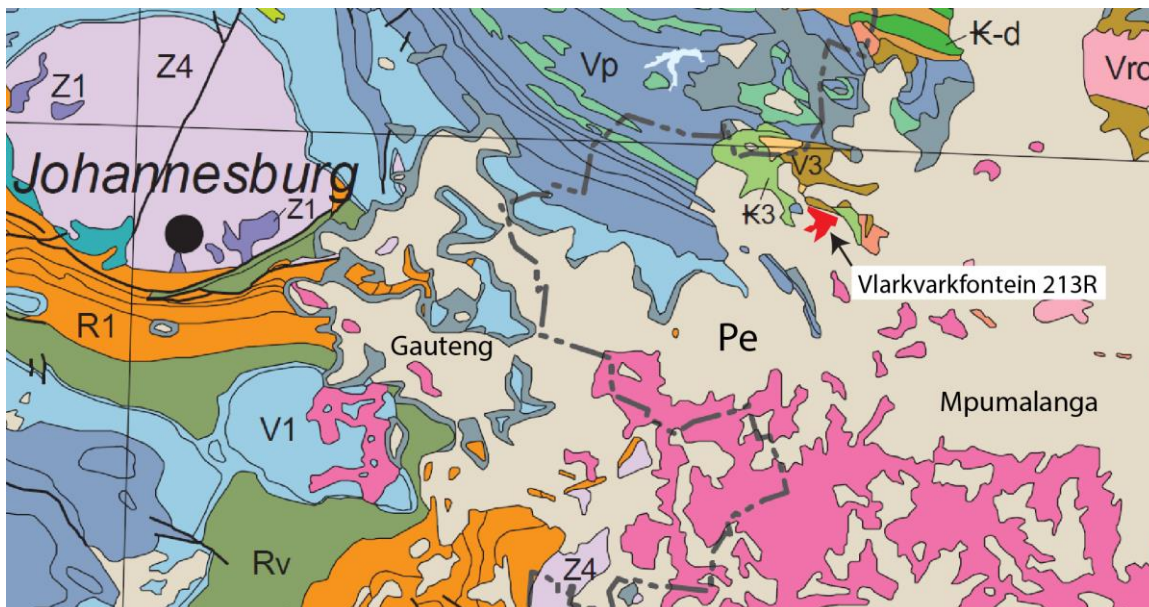


Figure 13 – Palaeontological sensitivity of area on which the study area lays.

## 5 IMPACT ASSESSMENT

The impact assessment rating is based on the rating scale as contained in **Appendix B** and **C**.

Table 2: Heritage Impact Assessment for development of the Vlarkvarkfontein Coal Mine.

Impact Name	Impact on graves				
Alternative	Alternative 1				
Phase	Construction				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	5	2
Extent of Impact	1	1	Reversibility of Impact	5	5
Duration of Impact	5	5	Probability	4	1
Environmental Risk (Pre-mitigation)					-16.00
Mitigation Measures					
recommended that a minimum buffer of 20 meters are kept and the cemetery buried to mitigate any damage. If this is not possible the cemetery must be relocated after completion of a full grave relocation process that adheres to all legislative requirements.					
Environmental Risk (Post-mitigation)					-3.25
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
<i>Low: Issue not raised in public responses</i>					
Cumulative Impacts					1
<i>Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.</i>					
Degree of potential irreplaceable loss of resources					3
<i>The impact may result in the irreplaceable loss of resources of high value (services and/or functions).</i>					
Prioritisation Factor					1.33
<b>Final Significance</b>					<b>-4.33</b>



**Table 2** suggests a high negative pre-mitigation impact on the cemetery at VVF006 and with the implementation of mitigation measures this impact will be reduced to a medium negative impact by the proposed developments in Farm Vlakvarkfontien 213R by Ntshovelo Mining Resources (Pty) Ltd.

*Table 3: Palaeontological Impact Assessment for development of the Vlakvarkfontein Coal Mine.*

Impact Name	Palaeontological Resource Impact				
Alternative	All Alternatives				
<b>Environmental Risk</b>					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature	1	1	Magnitude	1	1
Extent	1	1	Reversibility	1	1
Duration	1	1	Probability	1	1
Environmental Risk (Pre-mitigation)					1.00
Mitigation Measures					
Environmental Risk (Post-mitigation)					1.00
Degree of confidence in impact prediction:					High
<b>Impact Prioritisation</b>					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Low: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
Low: Where the impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.00
<b>Final Significance</b>					1.00

**Table 2** suggests a high negative pre-mitigation impact on the cemetery at VVF006 and with the implementation of mitigation measures this impact will be reduced to a medium negative impact by the proposed developments in Farm Vlakvarkfontien 213R by Ntshovelo Mining Resources (Pty) Ltd.

Table 3 suggests a low, negative impact on palaeontological resources by the proposed developments in Farm Vlakvarkfontien 213R by Ntshovelo Mining Resources (Pty) Ltd.

## 6 CONCLUSIONS AND RECOMMENDATIONS

The entire Vlakvarkfontein property is highly disturbed by previous and current mining activities, infrastructure developments, roads and human settlements. As such, the conclusion of the survey is that there is a low chance that in-tact, important fossil deposits or heritage resources will be exposed and/or disturbed as a result of the proposed developments by Ntshovelo Mining Resources (Pty) Ltd on the Vlakvarkfontein Coal Mine property.

The cemetery **VVF006** will most be impacted directly by the expansion of the project and it is recommended that a minimum buffer of 20 meters are kept and the cemetery buried to mitigate any damage. If this is not possible the cemetery must be relocated after completion of a full grave relocation process that adheres to all legislative requirements.

In the event that heritage resources are discovered during site clearance, construction activities must stop, and a qualified archaeologist appointed to evaluate and make recommendations on mitigation measures.

If construction activities on this property should expose any fossil deposits, a professional palaeontologist should be contacted to assess whether mitigation actions are necessary.

The overall impact of the mining activities on heritage resources is seen as acceptably low after the recommendations have been implemented and therefore, impacts can be mitigated to acceptable levels.

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## Appendix A

### ***Legislative Requirements – Terminology and Assessment Criteria***

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. NEMA;
- ii. National Heritage Resources Act (NHRA) Act 25 of 1999; and
- 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. GNR 982 of 2014 (Government Gazette 38282) promulgated under the NEMA:
  - a) Basic Assessment Report (BAR) – Regulations 19 and 23
  - b) Environmental Scoping Report (ESR) – Regulation 21
  - c) Environmental Impacts Report (EIR) – Regulation 23
  - d) EMPr – Regulations 19 and 23
- ii. NHRA:
  - a) Protection of Heritage Resources – Sections 34 to 36; and
  - b) Heritage Resources Management – Section 38
- iii. MPRDA Regulations of 2014:
  - a) Environmental reports to be compiled for application of mining right – Regulation 48.

The NHRA stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34 (1) of the NHRA states that, “no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority...”. The NEMA (Act No 107 of 1998) states that an integrated EMP should, (23 -2 (b)) “...identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage”. In accordance with legislative requirements and EIA rating criteria, the regulations of the South African Heritage Resources Agency (SAHRA) and the Association of Southern African Professional Archaeologists (ASAPA) have also been incorporated to ensure that a comprehensive legally compatible HIA report is compiled.

## **Appendix B**

### ***Heritage Assessment Methodology***

The applicable maps, tables and figures are included, as stipulated in the NHRA (Act No 25 of 1999) and NEMA (Act No 107 of 1998). The HIA process consisted of three steps;

Step I – Literature Review - The background information to the field survey relies greatly on the Heritage Background Research.

Step II – Physical Survey - A physical survey was conducted predominantly by foot within the proposed areas by two qualified archaeologists, which aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

Step III – The final step involved the recording and documentation of relevant archaeological resources, the assessment of resources in terms of the HIA criteria and report writing, as well as mapping and constructive recommendations.

The significance of identified heritage sites are 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 - <10/50m<sup>2</sup>
  - Medium/High - 10-50/50m<sup>2</sup>
  - High - >50/50m<sup>2</sup>
- 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 -

#### *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 4**).

*Table 4 - Site significance classification standards as prescribed by SAHRA.*

<b>FIELD RATING</b>	<b>GRADE</b>	<b>SIGNIFICANCE</b>	<b>RECOMMENDED MITIGATION</b>
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/High Significance	Mitigation before destruction
Generally Protected B (GP.A)		Medium/High Significance	Recording before destruction
Generally Protected C (GP.A)		Low Significance	Destruction

## Appendix C

### ASSESSMENT METHODOLOGY

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

#### Methodology for Impact Assessment

The impact assessment methodology is guided by the requirements of the NEMA EIA Regulations (2010). The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/likelihood (P) of the impact occurring. This determines the environmental risk. In addition other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S). Please note that the impact assessment must apply to the identified Sub-Station alternatives as well as the identified Transmission Line routes.

#### Determination of Environmental Risk:

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER).

The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and reversibility (R) applicable to the specific impact.

For the purpose of this methodology the consequence of the impact is represented by:

$$C = \frac{(E + D + M + R) \times N}{4}$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in **Table 5**.

*Table 5: Criteria for Determining Impact Consequence*

Aspect	Score	Definition
<b>Nature</b>	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
<b>Extent</b>	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary),
	3	Local (i.e. the area within 5 km of the site),
	4	Regional (i.e. extends between 5 and 50 km from the site)
	5	Provincial / National (i.e. extends beyond 50 km from the site)
<b>Duration</b>	1	Immediate (<1 year)
	2	Short term (1-5 years),
	3	Medium term (6-15 years),

Aspect	Score	Definition
	4	Long term (the impact will cease after the operational life span of the project),
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
<b>Magnitude/ Intensity</b>	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected),
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way),
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).
<b>Reversibility</b>	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact

Once the C has been determined the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/scored as per **Table 6**.

*Table 6: Probability Scoring*

Probability	Score	Definition
	1	Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%),
	2	Low probability (there is a possibility that the impact will occur; >25% and <50%),
	3	Medium probability (the impact may occur; >50% and <75%),
	4	High probability (it is most likely that the impact will occur- > 75% probability), or
	5	Definite (the impact will occur),

The result is a qualitative representation of relative ER associated with the impact. ER is therefore calculated as follows:

$$ER = C \times P$$

*Table 7: Determination of Environmental Risk*

<b>Consequence</b>	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5



Probability
-------------

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in **Table 8**.

*Table 8: Significance Classes*

<b>Environmental Risk Score</b>	
<b>Value</b>	<b>Description</b>
<b>&lt; 9</b>	Low (i.e. where this impact is unlikely to be a significant environmental risk),
<b>≥9; &lt;17</b>	Medium (i.e. where the impact could have a significant environmental risk),
<b>≥ 17</b>	High (i.e. where the impact will have a significant environmental risk).

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction of the degree to which the impact can be managed/mitigated.

*Impact Prioritisation:*

In accordance with the requirements of Regulation 31 (2)(l) of the EIA Regulations (GNR 543), and further to the assessment criteria presented in the Section above it is necessary to assess each potentially significant impact in terms of Cumulative impacts and the degree to which the impact may cause irreplaceable loss of resources.

In addition, it is important that the public opinion and sentiment regarding a prospective development and consequent potential impacts is considered in the decision-making process. In an effort to ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from the risk ratings but rather to focus the attention of the decision-making authority on the higher priority/significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/mitigation impacts are implemented.

*Table 9: Criteria for Determining Prioritisation*

<b>Public response (PR)</b>	Low (1)	Issue not raised in public response.
	Medium (2)	Issue has received a meaningful and justifiable public response.
	High (3)	Issue has received an intense meaningful and justifiable public response.
<b>Cumulative Impact (CI)</b>	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.

	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.
<b>Irreplaceable loss of resources (LR)</b>	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in **Table 10**. The impact priority is therefore determined as follows:

$$\text{Priority} = \text{PR} + \text{CI} + \text{LR}$$

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 2 (Refer to **Table 10**).

*Table 10: Determination of Prioritisation Factor*

Priority	Ranking	Prioritisation Factor
3	Low	1
4	Medium	1.17
5	Medium	1.33
6	Medium	1.5
7	Medium	1.67
8	Medium	1.83
9	High	2

In order to determine the final impact significance, the PF is multiplied by the ER of the post-mitigation scoring. The ultimate aim of the PF is to be able to increase the post mitigation environmental risk rating by a full ranking class, if all the priority attributes are high (i.e. if an impact comes out with a medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential, significant public response, and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance).

*Table 11: Final Environmental Significance Rating*

Environmental Significance Rating	
Value	Description

<b>&lt; 10</b>	Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
<b>≥10 &lt;20</b>	Medium (i.e. where the impact could influence the decision to develop in the area),
<b>≥ 20</b>	High (i.e. where the impact must have an influence on the decision process to develop in the area).

**Appendix D**  
**Project team CV's**

**WOUTER FOURIE**

**Professional Heritage Specialist and Professional Archaeologist and Director PGS Heritage**

**Summary of Experience**

Specialised expertise in Archaeological Mitigation and excavations, Cultural Resource Management and Heritage Impact Assessment Management, Archaeology, Anthropology, Applicable survey methods, Fieldwork and project management, Geographic Information Systems, including *inter alia* -

Involvement in various grave relocation projects (some of which relocated up to 1000 graves) and grave "rescue" excavations in the various provinces of South Africa

Involvement with various Heritage Impact Assessments, within South Africa, including -

- Archaeological Walkdowns for various projects
- Phase 2 Heritage Impact Assessments and EMPs for various projects
- Heritage Impact Assessments for various projects
  - Iron Age Mitigation Work for various projects, including archaeological excavations and monitoring
  - Involvement with various Heritage Impact Assessments, outside South Africa, including -
- Archaeological Studies in Democratic Republic of Congo
- Heritage Impact Assessments in Mozambique, Botswana and DRC
- Grave Relocation project in DRC

**Key Qualifications**

BA [Hons] (Cum laude) - Archaeology and Geography - 1997

BA - Archaeology, Geography and Anthropology - 1996

Professional Archaeologist - Association of Southern African Professional Archaeologists (ASAPA)  
- Professional Member

Accredited Professional Heritage Specialist – Association of Professional Heritage Practitioners (APHP)

CRM Accreditation (ASAPA) -

- Principal Investigator - Grave Relocations
- Field Director – Iron Age
- Field Supervisor – Colonial Period and Stone Age
- Accredited with Amafa KZN

**Key Work Experience**

2003- current - Director – Professional Grave Solutions (Pty) Ltd

2007 – 2008 - Project Manager – Matakoma-ARM, Heritage Contracts Unit, University of the Witwatersrand

2005-2007 - Director – Matakoma Heritage Consultants (Pty) Ltd

2000-2004 - CEO– Matakoma Consultants

1998-2000 - Environmental Coordinator – Randfontein Estates Limited. Randfontein, Gauteng

1997-1998 - Environmental Officer – Department of Minerals and Energy. Johannesburg, Gauteng

Worked on various heritage projects in the SADC region including, Botswana, Mozambique. Mauritius and the Democratic Republic of the Congo