PEMBANI COAL

PROPOSED OPENCAST MINING ON THE FARM KWAGGAFONTEIN 8 IT, NEAR CAROLINA, ALBERT LUTHULI LOCAL MUNICIPALITY, GERT SIBANDE DISTRICT MUNICIPALITY, MPUMALANGA PROVINCE

HERITAGE ASSESSMENT

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Reg No 2003/008940/07

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 an 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 (delete whichever is not applicable)

- *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: _____

Report Title	Proposed opencast mining on the farm Kwaggafontein 8 IT, near Carolina, Albert Luthuli Local Municipality, Gert Sibande District Municipality, Mpumalanga Province.		
Control	**Name**	**Signature**	**Designation**
Author	**J Angel**		**Heritage specialist**
Reviewed	**W Fourie**		**Heritage Specialist**

ACKNOWLEDGEMENT OF RECEIPT

CLIENT: Environmental Management Services (Pty) Ltd

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EXECUTIVE SUMMARY

PGS Heritage was appointed by Environmental Impact Management Services (Pty) Ltd hereafter referred to as EIMS, to undertake a Heritage Impact Assessment (HIA) that forms part of the Environmental Impact Assessment of the proposed opencast mining activities on the farm Kwaggafontein 8 IT, Gert Sibande district Municipality, Mpumalanga Province.

The HIA of the proposed opencast mining activities on the farm Kwaggafontein 8 IT has presented that the impacts for heritage will be low. The mitigation measures to follow have already been put in place where the cemetery should be demarcated with a 20 m buffer. No further mitigation measures are recommended.

The impacts of the proposed development on palaeontology is also low with recommended mitigation measures stating that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required for the commencement of this development, pending the discovery or exposure of any fossil remains during the construction phase.

Should fossil remains be discovered during any phase of construction, either on the surface or exposed by fresh excavations, the ECO responsible for these developments should be alerted immediately. Such discoveries ought to be protected (preferably *in situ*) and the ECO should alert SAHRA (South African Heritage Research Agency) so that appropriate mitigation (*e.g.* recording, sampling or collection) can be taken by a professional palaeontologist.

It is my considered opinion, that the absence of heritage resources within the proposed and existing opencast foot print. Along with the judged low negative impact on palaeontological resources as analysed in the palaeontological desktop assessment (Butler, 2017) show that the project can continue with the recommended heritage management measures.

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Terminology and Abbreviations

Archaeological resources
This includes:

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 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;
iii. 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:

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

Early Stone Age
The archaeology of the Stone Age between 700 000 and 2 500 000 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

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

Late 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 iron-working and farming activities such as herding and agriculture.

Middle Stone Age
The archaeology of the Stone Age 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, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

ABBREVIATIONS	DESCRIPTION
ASAPA	Association of South African Professional Archaeologists
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
EAP	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Early Stone Age
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency

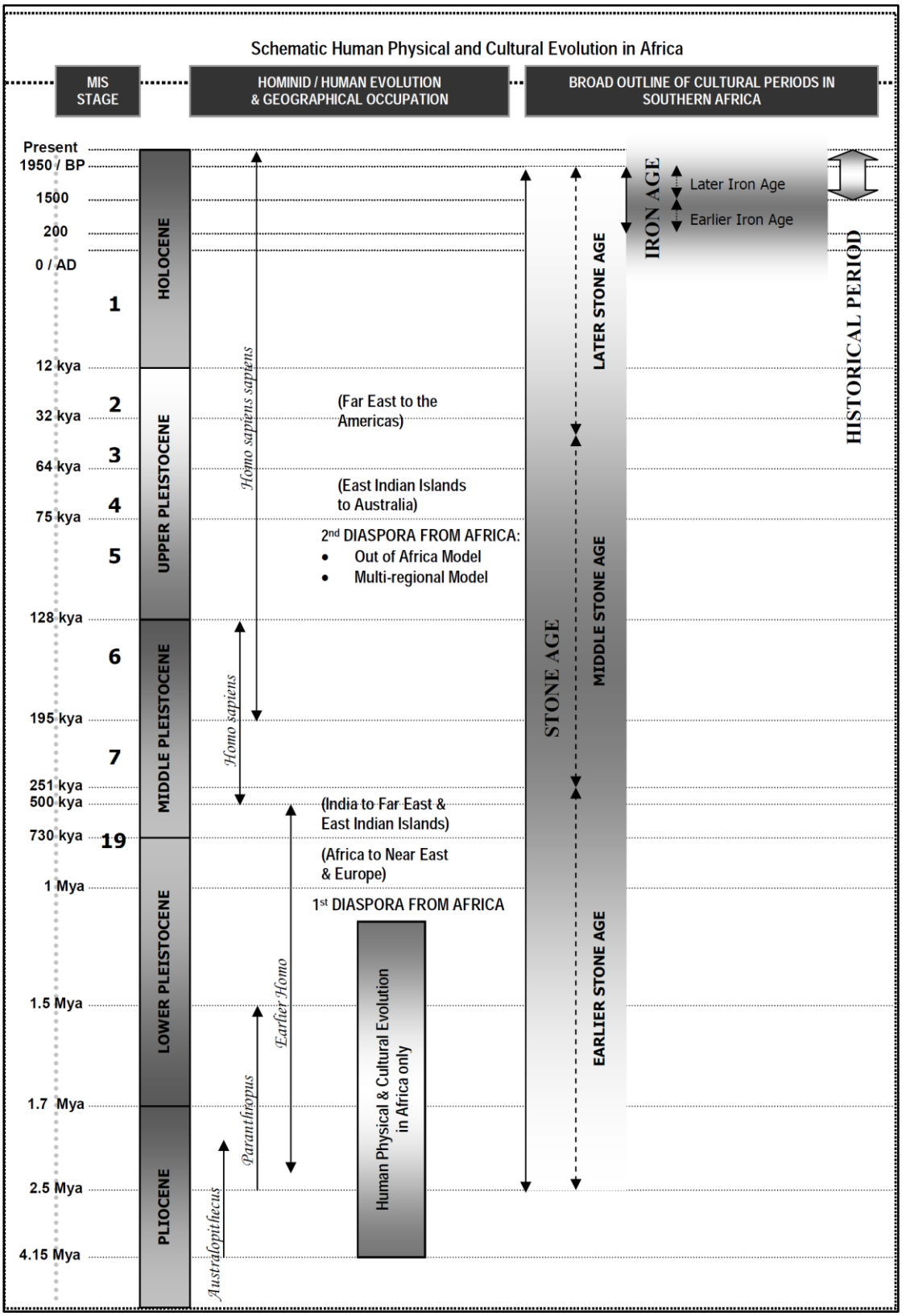

Figure 1 – Human and Cultural Time line in Africa (Morris, 2008)

1 INTRODUCTION

PGS Heritage (Pty) Ltd was appointed by Environmental Impact Management Services (Pty) Ltd hereafter referred to as EIMS, to undertake a Heritage Impact Assessment (HIA) that forms part of the Environmental Impact Assessment (EIA) as part of the proposed opencast mining on the farm Kwaggafontein 8 IT, near Carolina, Albert Luthuli Local Municipality, Gert Sibande District Municipality, Mpumalanga Province.

1.1 Scope of the Study

The aim of the study is to identify possible heritage resources and finds that may occur in the proposed development area. The HIA aims to inform the EIA in the development of a comprehensive EMPr 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 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.

Jessica Angel, holds a Masters degree in Archaeology and is registered as a Professional Archaeologist with the Association of Southern African Professional Archaeologists (ASAPA).

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

Data for the specific area of the Kwaggafontein Open Cast Mining operation is limited and this report has incorporated information from a variety of sources including previous studies undertaken.

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. 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.

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 Impact Assessment (EIA) – Section (32)(2)(d)
    d. Environmental Management Plan (EMP) – 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. Mineral 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(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, and those developments administered through NEMA, MPRDA legislation. 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 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. A further important aspect to be taken account of in the Regulations under NEMA is the Specialist Report requirements laid down in Section 33 of the regulations (Fourie, 2008).

1.5 Heritage Significance Grading

Heritage 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 1 - 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

2 TECHNICAL DETAILS OF THE PROJECT

2.1 Site Location and Description

Location	The Kwaggafontein 8 IT Open Cast Mining Operations are proposed to occur on two sites. The first is about 42 Ha, with a coordinate at approximately -26.002245°, 30.146859° The second is about 5 Ha, with a coordinate at approximately -26.000468°, 30.160629°

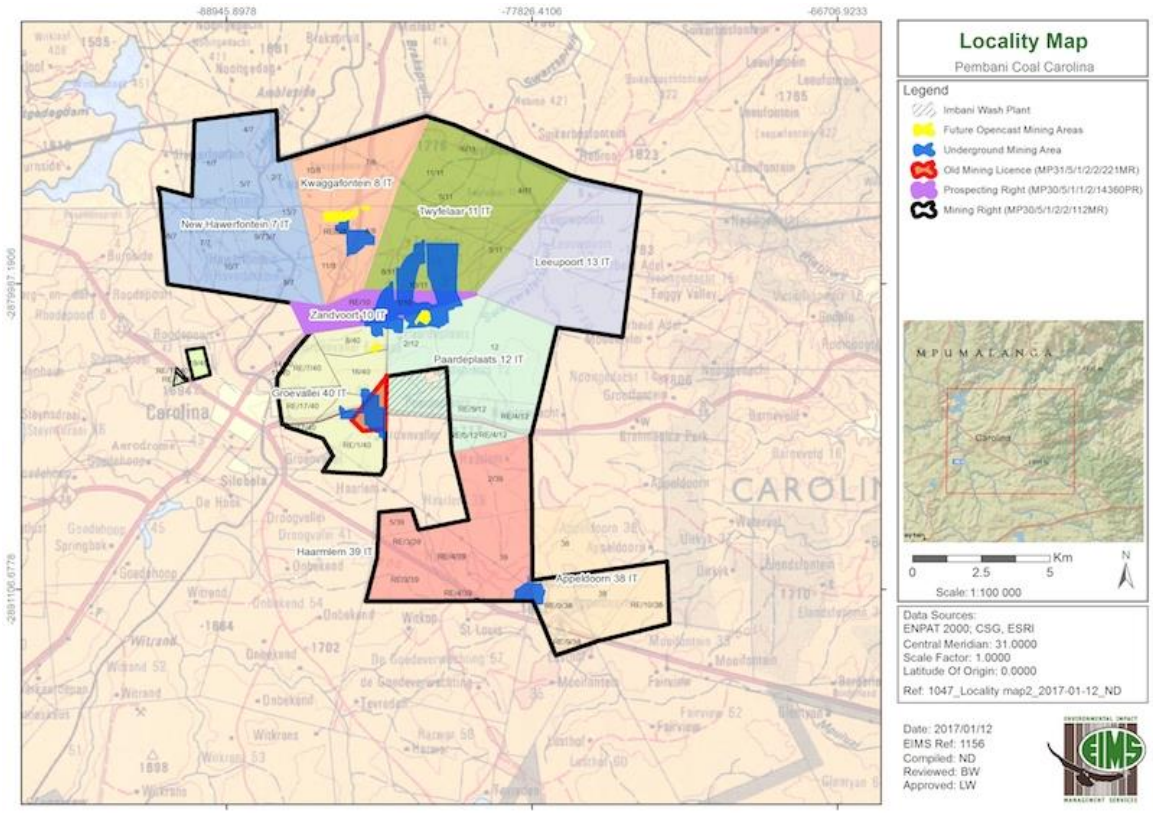

Figure 2 – Site location of the Pembani Coal Mine (Image provided by EIMS, 2017)

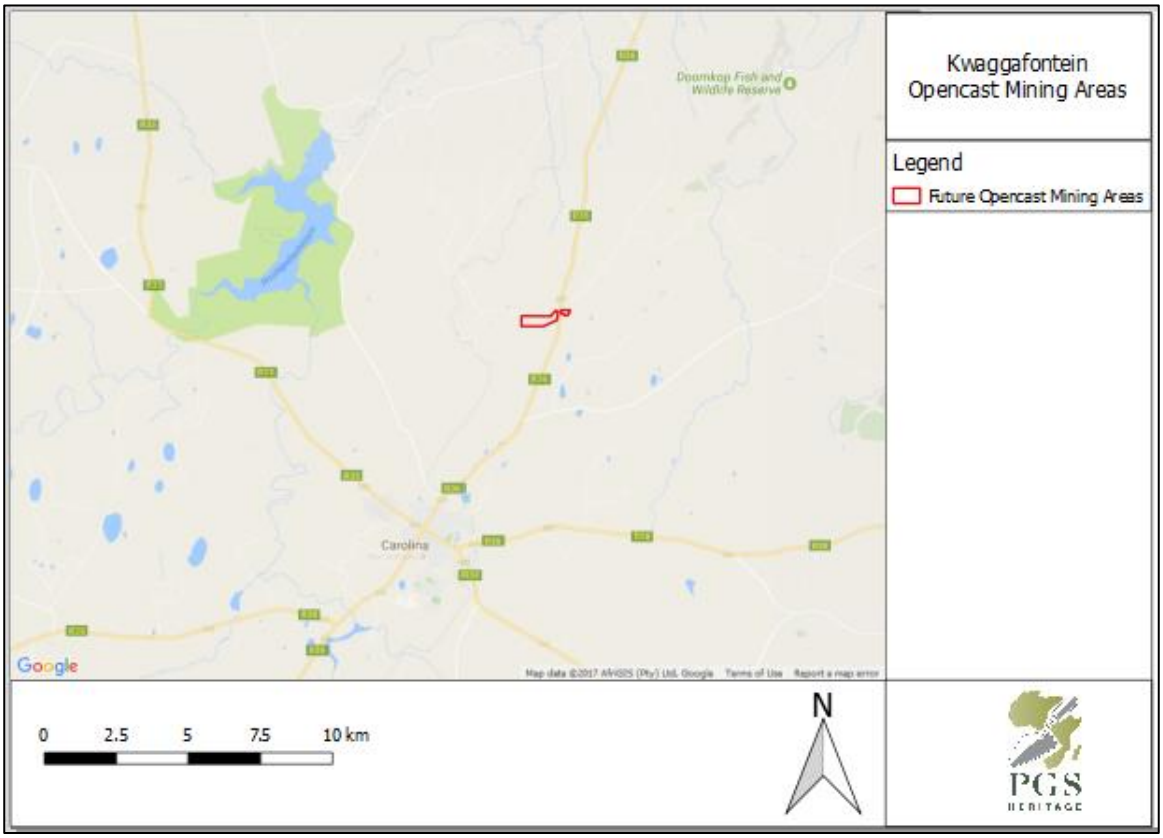

Figure 3 – Site location

2.2 Technical Project Description

2.2.1 Background

Pembani has an approved mining right (MP 30/5/1/2/2/112 MR) and EMPR in terms of the MPRDA for the mining of coal at the Pembani Colliery. Additionally, the Applicant has applied for a prospecting right (MP 30/5/1/1/2/14360 PR) and EMP in terms of the MPRDA for the prospecting of coal on Zandvoort. Furthermore, Pembani proposes to amend their existing mining works programme (within the approved mining right boundary) to include the mining of additional coal resources (EIMS 2017).

Coal will be transported and processed according to the existing mines current approved operations. Opencast mining has taken place on a number of properties and the mining areas are in various stages of rehabilitation at present. The mine has recently commenced with underground mining and wishes to extend their underground mining footprint to include Zandvoort and also wish to make an amendment to the existing mining works programme to include the mining of additional coal resources by opencast and underground mining. This includes new opencast mining operations: Portions RE of 6, 7, 8 and 10 of the farm Kwaggafontein 8 IT; Portion 8 of the farm Groenvallei 40 IT and Portion 2 of the farm Paardeplaats 12 IT. (EIMS 2017)

Pembani is required to undergo an EA process including an Environmental Impact Assessment to assess any new impacts associated with the change in the extent of the approved mining area, and also to consolidate the numerous authorisation processes that have been undertaken to date to produce a single overarching EMPR for holistic management of the Pembani Colliery going forward (EIMS, 2017).

2.2.2 Opencast mining and associated infrastructure.

Historically extensive opencast mining has taken place at Pembani Colliery, during which time a number of opencast pits were mined without progressive rehabilitation being undertaken. As such in addition to the current opencast mining which follows the strip mining approach with progressive rehabilitation, there are historical opencast pits in various stages of rehabilitation. Currently, limited opencast mining is undertaken in the form of strip mining where the strips are laid out to follow the surface contours. As the strips progress, the previous pit is rehabilitated, thus resulting in minimal surface disturbance. A contractor (Professional Opencast Mining

Services (POMS)) is currently conducting the opencast operations. Certain temporary infrastructure associated with the opencast mining activities (such as storm water management infrastructure) will move as the opencast mining progresses along the coal seams to the new pit areas. The coal is transported by truck to the existing Imbani Wash Plant where wet processing of the coal takes place (EIMS, 2017).

2.2.3 **Need for the project**

As an existing operational mine, the need and desirability of the current mining operations has been described in several previous environmental authorisation processes. The extension of the proposed underground mining operations to Zandvoort, as well as the proposed changes to the Mining Works Programme to include additional underground and opencast mining within the existing Mining Right, will allow the continued contribution of the mine to favourable economic impacts on both the local and regional economies (EIMS, 2017).

The extension of proposed underground mining to Zandvoort is preferred as the current Pembani operations (opencast and underground) are located adjacent to this property. The close proximity of the current operations allows for an extension of the underground mining without the need to undertake opencast operations or establish additional surface infrastructure (EIMS, 2017).

This extension of the proposed underground workings will lead to improved positive economic impacts in the form of capital injections into the local and regional economy resulting in increased commercial activity. The increased coal produced will ensure consistent product for both the local market (such as Eskom) and export market (EIMS, 2017).

In addition, the current and proposed extension of mining operations at Pembani will provide for additional employment opportunities for a workforce recruited from the surrounding area which houses many historically disadvantaged South Africans requiring employment. As per Pembani's current policy, priority will be given to recruiting additional local people for employment opportunities associated with mining activities. The extension of underground mining will therefore allow for the direct employment of approximately 203 employees, an increase from 171 currently employed and extend employment opportunities for those currently employed by Pembani.

In summary, the extension of the proposed underground mining to Portions RE and 1 of Zandvoort 10 IT and the amendment to the Mining Works Programme will allow for the following:

- Extension of LoM and associated extension of existing employment opportunities;
- Provision of additional employment opportunities;
- Continued and improved contributions to the local and export market;
- Continued contribution of rates and taxes to the Regional Services Council of Carolina;
- Continued and improved investment in social capital through the undertaking of Pembani's approved Social and Labour Plan (SLP) promoting local economic development in the surrounding area (EIMS, 2017)

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 Heritage (PGS) for the Pembani Kwaggafontein Open cast mine. The applicable maps, tables and figures, are included as stipulated in the NHRA (no 25 of 1999), the National Environmental Management Act (NEMA) (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 on foot through the proposed project area by a qualified archaeologist (January 2017), 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 heritage sites was 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 2: 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 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:

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

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table 3.

Table 3: Criteria for Determining Impact Consequence

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	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)
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years),
	3	Medium term (6-15 years),
	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).
Magnitude/ Intensity	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).
Reversibility	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 4.

Table 4: Probability Scoring

Probability	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 x P

Table 5: Determination of Environmental Risk

Consequence	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 6.

Table 6: Significance Classes

Environmental Risk Score	
Value	**Description**
< 9	Low (i.e. where this impact is unlikely to be a significant environmental risk),
≥9; <17	Medium (i.e. where the impact could have a significant environmental risk),
≥ 17	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 in 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 7: Criteria for Determining Prioritisation

Public response (PR)	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.
Cumulative Impact (CI)	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.
Irreplaceable loss of resources (LR)	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 11. The impact priority is therefore determined as follows:

Priority = PR + CI + 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 8).

Table 8: 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 9: Final Environmental Significance Rating

Environmental Significance Rating	
Value	**Description**
< 10	Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
≥10 <20	Medium (i.e. where the impact could influence the decision to develop in the area),
≥ 20	High (i.e. where the impact must have an influence on the decision process to develop in the area).

4 BACKGROUND STUDY

4.1 Archival findings

The high level archival research focused on available information sources that were used to compile a general background history of the study area and surrounds.

4.1.1 Archival/historical maps

Historical topographic maps were available for utilisation in the study:

- Topographical map 2630AA – First edition 1968. The aerial photography on which the map was based dates to 1956 and its survey work was undertaken in 1968. It was drawn in 1969 by the Trigonometrical Survey Office.

4.1.2 Topographical Maps 2630AA (First Edition)

The map was utilised to identify structures that could possibly be older than 60 years and thus protected under Section 34 and 35 of the NHRA. No structures are identified in this area.

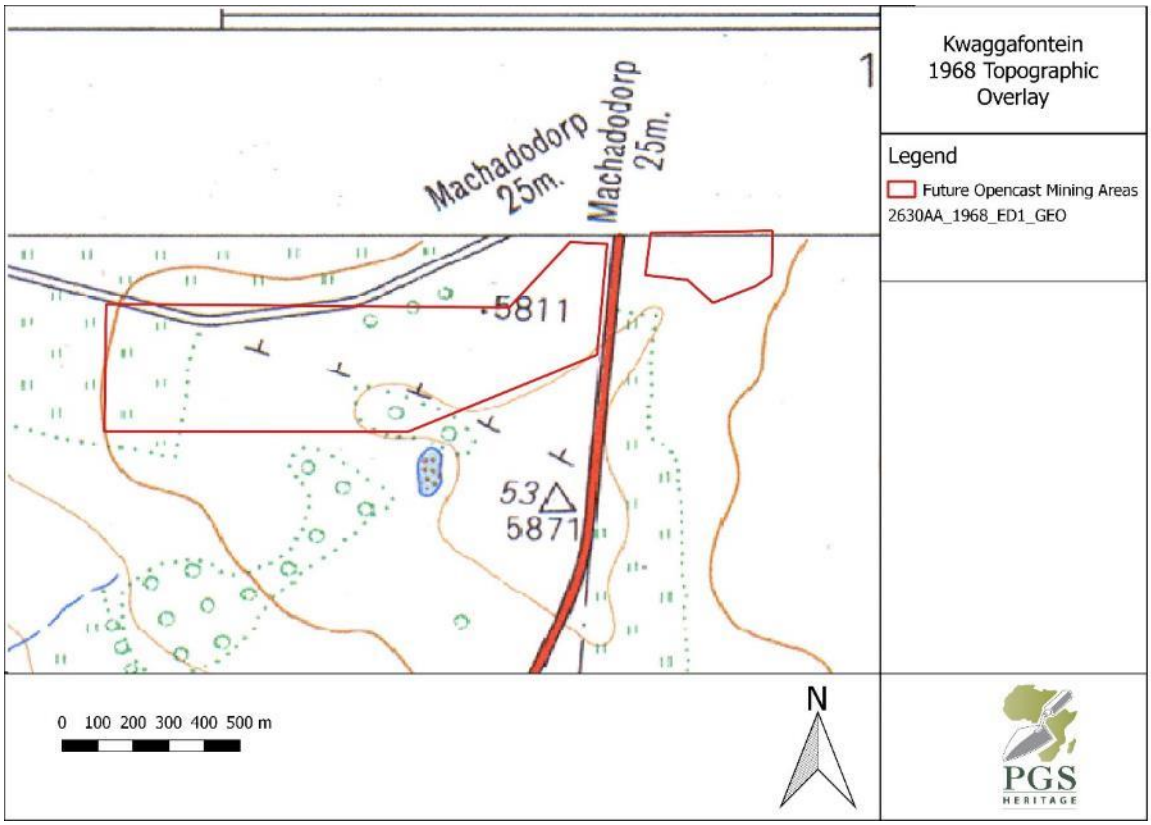

Figure 4 – 1969 Topographic Map showing no heritage features present within the study area.

4.2 Aspects of the area's history

4.2.1 Previous Heritage Studies in area

A search on the South African Heritage Resources Information System (SAHRIS) has identified Heritage Impact Assessments conducted in and around the study area:

- 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, graveyards, 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 7 cemeteries, 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 cemeteries, a Black Concentration Camp, and the existence of war graves.

- A report on a heritage assessment for the proposed Arnot-Gumeni 400 kv powerline project, 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 graveyards and cemeteries.

- Exxaro Paardeplaats Project Heritage Impact Assessment Report – Kitto, J (2012) this assessment located, 22 heritage structures, 7 cemeteries and 3 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. and graveyards 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 5 graveyards

- Heritage Assessment - The Kwagga North Project, Optimum Coal, Arnot, Mpumalanga – Fourie, W (2016), this assessment located 29 cemeteries with a total of approximately 350 graves, 6 farmsteads and one quarry site.

4.2.2 **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 *(Refer to Error! Reference source not found. for a visual representation of the human time line).*

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 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 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 5 - 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 of 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*).

4.2.3 **The 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 South African War was waged between Great Britain and the two Boer Republics, the 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 (see below), where the Boer forces were defeated; on 28 August 1900, and the town of Machadodorp was occupied by the British troops and 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).

4.2.4 **Belfast and the Battle of Bergendal**

The Battle of Bergendal, also known as the Battle of Belfast and the Battle of Dalmanutha, is called the "last set-piece battle of any size in the [Anglo-Boer] war" by Pakenham (1979). However, although the Boer forces were defeated and the British won the battle, Botha's main force remained intact. The commandos dispersed to Lydenburg and Barberton, and a phase of guerrilla warfare began. This second phase of the war lasted even longer than the first. Peace would only be declared at the end of May 1902 (Jooste, 2002). Jooste (*ibid*) provides a brief summary of the Battle of Bergendal in an article in the Military History Journal of December 2002. Because Machadodorp had become the temporary seat of the ZAR government (5 June 1900 – 27 August 1900), a defensive line was set up with the central part occupied by the Zuid Afrikaansche Republiek Politie (ZARP) under command of Commandant G.M.J. van Dam on a rocky outcrop on the farm Bergendal. On 26 August 1900, the Battle of Bergendal commenced and the British forces advanced on the Boer Lines. The Boer lines were breached in certain sections but the main resistance was coming from the ZARP position. On 27 August a major offensive was concentrated on the ZARP position, with a three hour bombardment of the ZARP kopje commencing at 11 am. The Boer defences were breached on 28 August and Buller's troops marched into Machadodorp. Five days later, on 1 September 1900, Lord Roberts proclaimed the annexation of the ZAR as the Transvaal Colony.

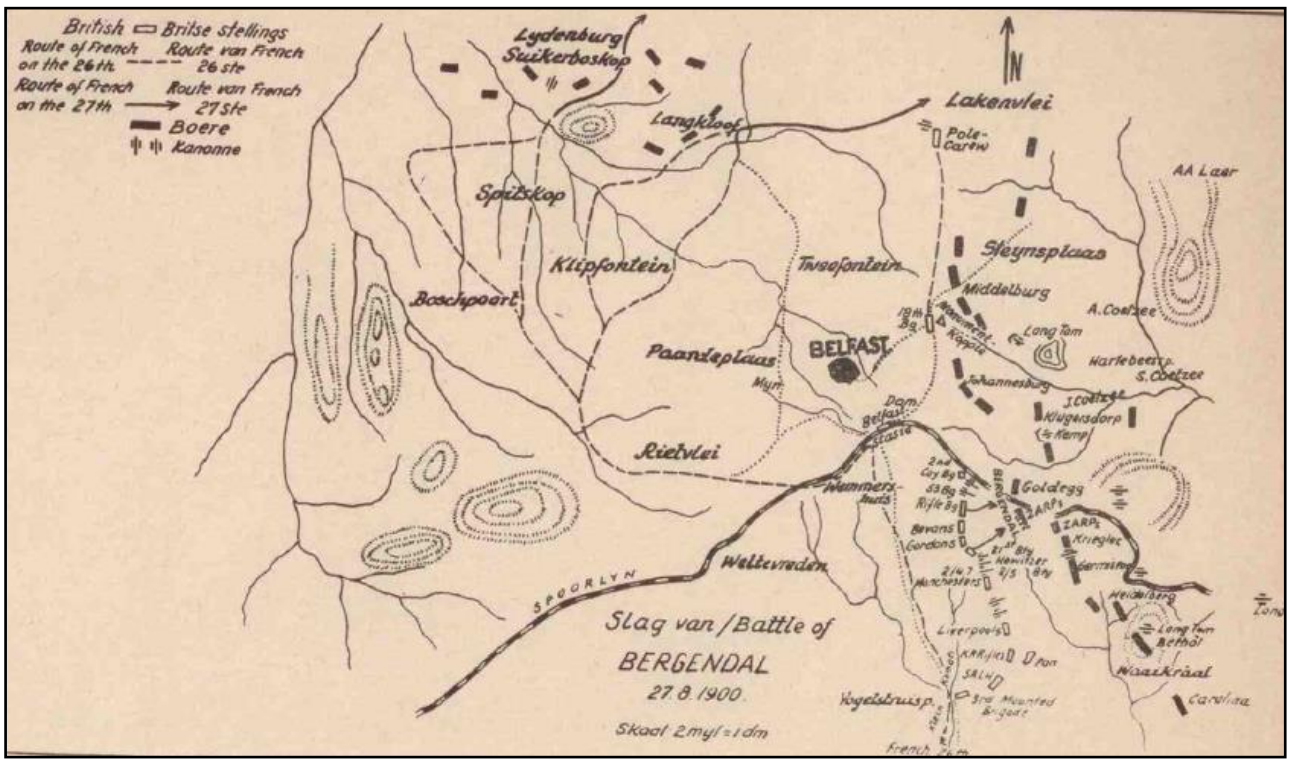

Figure 6 - Map: Battle of Bergendal (VD Merwe, 1952)

4.2.5 **Belfast Concentration Camp Graves and British Military Graves**

During the Second South African (Anglo-Boer) War, the British established a concentration camp in and around Belfast. The cemetery containing the graves of Boer/Afrikaans civilians who died in the camp is located on the outskirts of the south-western edge of the town. The cemetery also contains British and Commonwealth military graves from the Second South African War. (UCT database of British Concentration Camps of the South African War 1900-1902; http://www2.lib.uct.ac.za/mss/bccd/)

4.3 Palaeontological Background

The opencast and underground mining are on portion of the farm Kwaggafontein 8 IT is entirely underlain by sedimentary rocks of the Permian aged Vryheid Formation, Ecca Group, Karoo Supergroup. The Vryheid Formation is known for containing an abundant assemblage of plant fossils and thus the mining of coal is possible as coal is fossilized plant material (Butler, 2017)

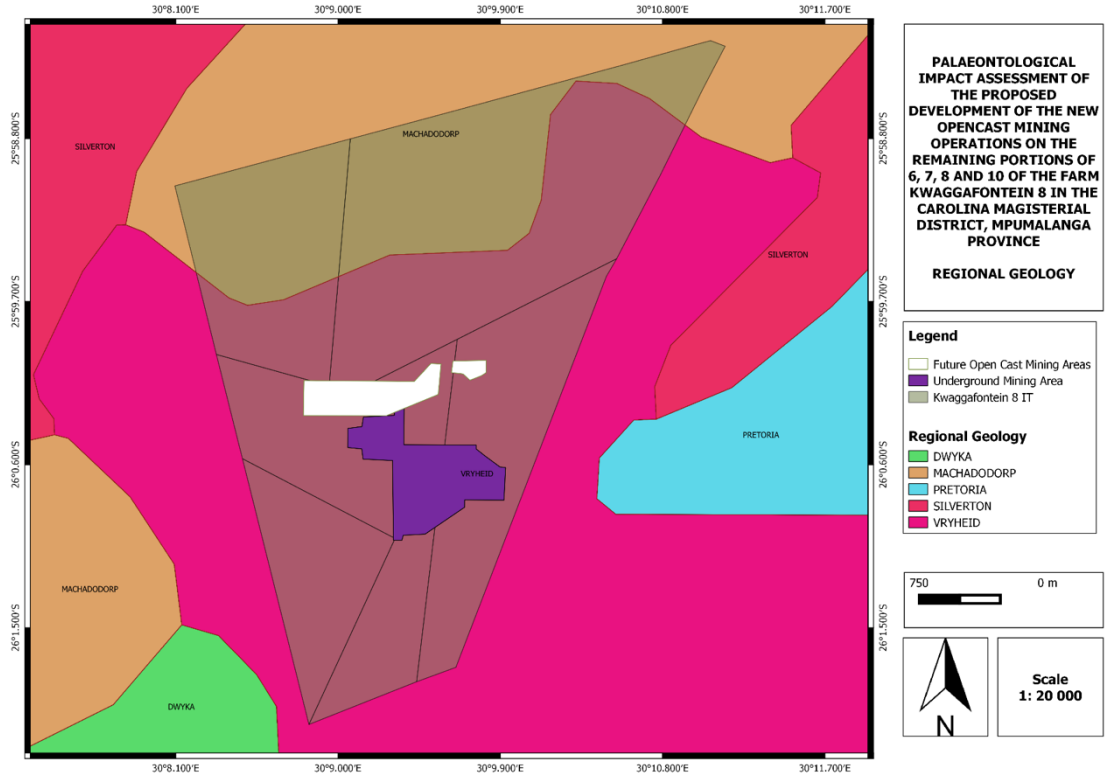

Figure 7 - The surface geology of the proposed new underground operations (indicated in purple) and open cast mining (indicated in white) on portions of the farm Kwaggafontein 8 IT, Pembani

Colliery, in Mpumalanga, South Africa. The site is completely underlain by Vryheid Formation of the Beaufort Group. (Butler, 2017)

This Group has a moderate palaeontological sensitivity. 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.

4.4 Findings of the Heritage background study

The archival research, topographic maps and site survey yielded no heritage features.

5 FIELD WORK FINDINGS

Due to the nature of cultural remains, with the majority of artefacts occurring below the surface, a controlled-exclusive surface survey was conducted over a period of 1 day by vehicle and on foot by an archaeologist from PGS. The fieldwork was conducted on the 31st of January. The fieldwork was logged with GPS receiver and all finds marked (Figure 14).

The majority of the site has already been exposed and opencast mining is currently in process. Therefore, assessment of the site for heritage remains was not possible. Satellite imagery which was observed before the site visit suggests that there were no significant buildings or stone-walls present in the area.

Just outside the construction area exists a small cemetery. It has been clearly marked and fenced off as required by SAHRA. The fenced off area is about 20x25 m and contains approximately 16 graves. The graves are dressed with rocks and oriented in the typical east west positions (Figure 8 and Figure 9).

Figure 8 -Fenced off cemetery nearby construction

Figure 9 – One of the 16 graves within the cemetery

Figure 10 – Cleared land

Figure 11 – Opencast mining in process

Figure 12 – Small pan occurring within the smaller study area

Figure 13 – Grasslands which the unaffected areas consist of.

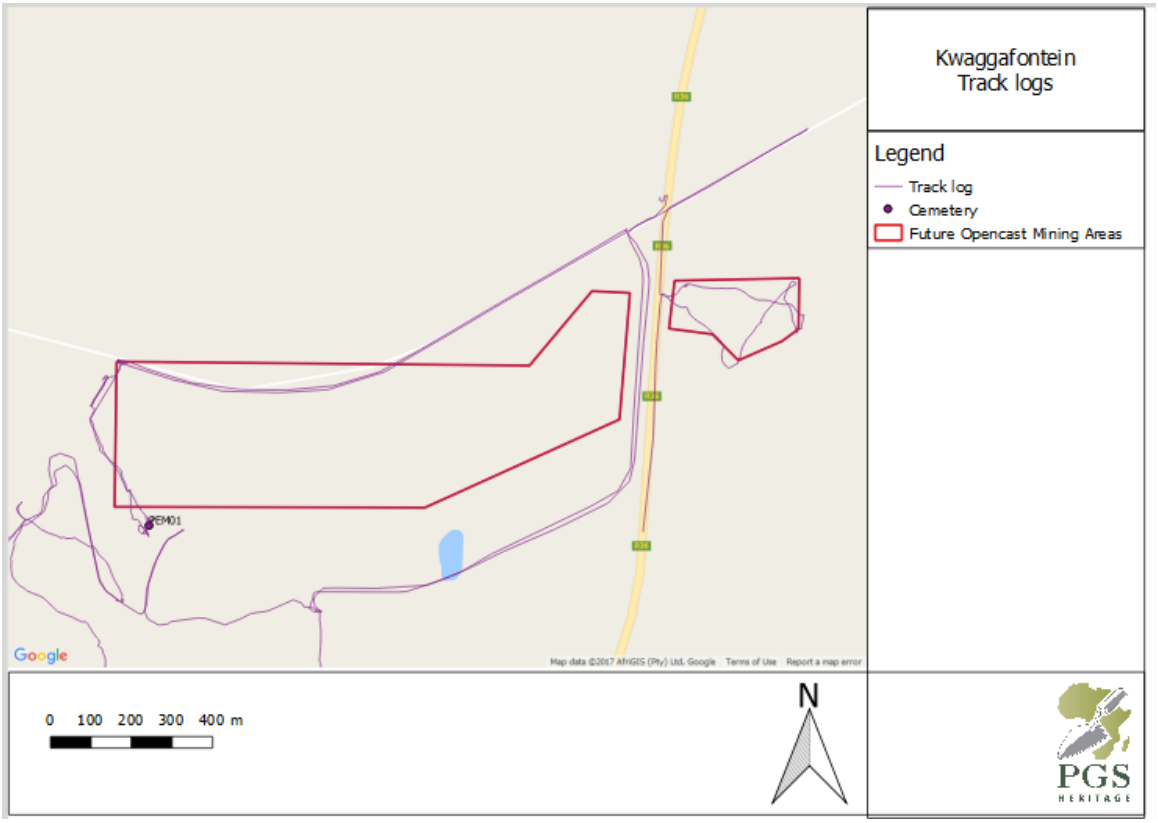

Figure 14 – Track log of field assessment.

6 IMPACT ASSESSMENT

6.1 Cemeteries

The identified cemetery is situated outside the mining area and demarcated. It is envisaged that a low negative impact is possible with the implementation of the appropriate mitigation measures.

Impact Name	**Destruction of graves**				
Alternative	**All Alternatives**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	5	1
Extent of Impact	1	1	Reversibility of Impact	4	1
Duration of Impact	2	1	Probability	1	1
Environmental Risk (Pre-mitigation)					-3.00
Mitigation Measures					
Demarcate site with a 20 meter buffer					
Environmental Risk (Post-mitigation)					-1.00
Degree of confidence in impact prediction:					High

Impact Prioritisation	
Public Response	1
Low: Issue not raised in public responses	
Cumulative Impacts	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.	
Degree of potential irreplaceable loss of resources	3
The impact may result in the irreplaceable loss of resources of high value (services and/or functions).	
Prioritisation Factor	1.67
Final Significance	-1.67

6.2 Palaeontology

The Vryheid Formation is world renown for the occurrence of coal beds and various plant fossils have been described from this formation. This formation has also trace fossil assemblages of the non-marine *Mermia* Ichnofacies, and is dominated by the ichnogenera *Umfolozia* (arthropod trackways) and *Undichna* (fish swimming trails), palaeoniscoid fish, small eocarid crustaceans, insects, trace fossils (king crab track ways. shark coprolites?), palynomorphs (organic-walled spores and pollens), petrified wood (mainly of primitive gymnosperms, silicified or calcified) and sparse vascular plant remains (Glossopteris leaves, lycopods etc). The unique mesosaurid reptile, *Mesosaurus* may also be present in the development site.

This Group has a moderate palaeontological sensitivity. 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.

Impacts from mining is rated as medium significance (Table 10).

Table 10 - Assessment of impact of mining on palaeontological resources

Impact Name	**Destruction of palaeontology**				
Alternative	**All Alternatives**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	1	2	Reversibility of Impact	3	1
Duration of Impact	5	5	Probability	3	1
Environmental Risk (Pre-mitigation)					-9.00

Mitigation Measures	
It is therefore recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required for the commencement of this development, pending the discovery or exposure of any fossil remains during the construction phase. Should fossil remains be discovered during any phase of construction, either on the surface or exposed by fresh excavations, the ECO responsible for these developments should be alerted immediately. Such discoveries ought to be protected (preferably *in situ*) and the ECO should alert SAHRA (South African Heritage Research Agency) so that appropriate mitigation (*e.g.* recording, sampling or collection) can be taken by a professional palaeontologist.	
Environmental Risk (Post-mitigation)	-2.50
Degree of confidence in impact prediction:	Medium
Impact Prioritisation	
Public Response	1
Low: Issue not raised in public responses	
Cumulative Impacts	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.	
Degree of potential irreplaceable loss of resources	3
The impact may result in the irreplaceable loss of resources of high value (services and/or functions).	
Prioritisation Factor	1.50
Final Significance	-3.75

7 CONCLUSION

PGS Heritage was appointed by Environmental Impact Management Services (Pty) Ltd hereafter referred to as EIMS, to undertake an HIA that forms part of the environmental screening investigation (ESI) as part of the planning to implementation process of the proposed opencast mining activities on the farm Kwaggafontein 8 IT, Gert Sibande district Municipality, Mpumalanga Province.

The HIA of the proposed opencast mining activities on the farm Kwaggafontein 8 IT has presented that the impacts for heritage will be low. The mitigation measures to follow have already been put in place where the cemetery should be demarcated with a 20 m buffer. No further mitigation measures are recommended.

The impacts of the proposed development on palaeontology is also low with recommended mitigation measures stating that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required for the commencement of this development, pending the discovery or exposure of any fossil remains during the construction phase.

Should fossil remains be discovered during any phase of construction, either on the surface or exposed by fresh excavations, the ECO responsible for these developments should be alerted

immediately. Such discoveries ought to be protected (preferably *in situ*) and the ECO should alert SAHRA (South African Heritage Research Agency) so that appropriate mitigation (*e.g.* recording, sampling or collection) can be taken by a professional palaeontologist.

It is my considered opinion, that the absence of heritage resources within the proposed and existing opencast foot print. Along with the judged low negative impact on palaeontological resources as analysed in the palaeontological desktop assessment (Butler, 2017) show that the project can continue with the recommended heritage management measures.

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