Proposed Rerouting a Section of the Hendrina - Kriel Transmission Line

Portions of the farms Klipplaat 14 IS and Kleinkopje 15 IS, Nkangala District Municipality, Mpumalanga Province

Heritage Impact Assessment

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DECLARATION OF INDEPENDENCE

The report has been compiled by PGS Heritage, an appointed Heritage Specialist for Aurecon. The views stipulated in this report are purely objective and no other interests are displayed in the findings and recommendations of this Heritage Impact Assessment.

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Report Title	Heritage Impact Assessment for the proposed Rerouting of a Section of the Hendrina - Kriel Transmission Line, Nkangala District Municipality, Mpumalanga Province.		
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EXPLANATION OF ABBREVIATIONS USED IN THIS DOCUMENT

Abbreviations	*Description*
AIA	Archaeological Impact Assessment
ASAPA	Association of Southern African Professional Archaeologists
CMP	Conservation Management Plan
CRM	Cultural Resource Management
EIA	Environmental Impact Assessment
EMPR	Environmental Management Programme Report
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
LIA	Late Iron Age
LSA	Later Stone Age
MSA	Middle Stone Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PGS	PGS Heritage
PHRA	Provincial Heritage Resources Authority
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System

EXECUTIVE SUMMARY

PGS Heritage was appointed by Aurecon to undertake a Heritage Impact Assessment (HIA) which forms part of the Environmental Impact Assessment (EIA) for the proposed rerouting of a section of the Hendrina - Kriel Transmission Line located on Portions of the farms Klipplaat 14 IS and Kleinkopje 15 IS, Nkangala District Municipality, Mpumalanga Province.

At the moment four development alternatives are proposed, namely the Preferred Alternative (Alternative 1a), Alternative 1, Alternative 2 and Alternative 3. All four alternatives were assessed as part of this heritage impact assessment study.

An archival and historical desktop study was undertaken which was used to compile a historical layering of the study area within its regional context. This component indicated that the landscape within which the project area is located has a rich and diverse history and included aspects relating to the farming and mining history of the area.

The desktop study work was followed by fieldwork, which comprised a walkthrough of the study area by an archaeologist as well as a palaeontologist. The archaeologist identified eight heritage sites including an old brickyard, two farm worker dwellings, an old shed, the remains of an old farmhouse, an old oak tree as well as a cemetery. Two of these sites were found to be located within 25 m of the proposed transmission line footprints, namely the old brickyard as well as one of the two farm worker dwellings.

The palaeontological fieldwork has revealed that the study area is underlain by Permian aged sandstone and interbedded shale as well as very well developed coal beds of the Vryheid Formation, Ecca Group, Karoo Supergroup. Minor trace fossils are present in the deeply weathered coarse-grained sandstone layers. Well-defined plant remains were observed in the less-coalified deposits, mainly associated with the contact zones between shale beds and coal seams. At the time of the field assessment, the potential for finding well-defined plant fossils during excavation of pylon foundations in areas underlain by shale was estimated to be high and the main shale zone had been allocated a High Palaeontological significance. The Phase 1 Palaeontological Report recommended that it would be preferable that these areas are excluded when planning for the placing of pylons. At the time those areas where excavation of pylon foundations might expose fossil-rich shale beds were allocated a Moderate

Palaeontological significance and in areas where excavation will most probably only expose sandstone, a Low Palaeontological significance is allocated.

However, a Palaeontological Field Assessment was conducted during the geotechnical investigation of the pylon positions of the Preferred Alternative. The subsequent report came to the following conclusion: *"The desktop study suggests that the study area is underlain by sedimentary deposits of the Permian aged Vryheid Formation of the Ecca Group, Karoo Supergroup, and it was expected that it would thus be highly sensitive from a palaeontological heritage perspective. Due to the lack of outcrop, it was recommended that a palaeontological investigation must be done during the geotechnical investigations in areas of potentially high palaeontological significance. This investigation confirmed that, although plant fossils are associated with the coal seams, they are not well preserved and therefore of lesser palaeontological significance as predicted. Any well-defined plant fossils that are observed during excavation of foundations for the pylons, must however be reported to the ECO."*

The second palaeontological report also provided the following recommendations:

> *"1. The ECO of the project be informed of the slight possibility of finding well-defined plant fossils in the areas underlain by shale.*
> *2. No further mitigation for Palaeontological heritage is needed.*
> *3. If any exceptionally well-defined fossils are observed during excavations, the developer must employ a qualified palaeontologist to record these fossils and collect representative samples of these fossils for further study according to SAHRA recommendations."*

Impact risk calculations were undertaken on the expected impact of the four development alternatives on the identified heritage sites. Based on this mitigation measures were proposed.

It is clear from this section that the Preferred Alternative, Alternative 2 as well as Alternative 3 will represent the lowest impact on any of the identified heritage resources. The development of Alternative 1 will result in the highest impact risk.

On the condition that the recommendations made in this report are adhered to, no heritage reasons can be given for the development not to continue.

CONTENTS **PAGE**

LIST OF APPENDICES

1 INTRODUCTION

PGS Heritage was appointed by Aurecon to undertake a Heritage Impact Assessment (HIA) which forms part of the Environmental Impact Assessment (EIA) for the proposed rerouting of a section of the Hendrina - Kriel Transmission Line located on Portions of the farms Klipplaat 14 IS and Kleinkopje 15 IS, Nkangala District Municipality, Mpumalanga Province.

1.1 Scope of the Study

The aim of the study is to identify possible heritage sites and finds that may occur in the proposed development area. The Heritage Impact Assessment (HIA) aims to inform the Environmental Impact Assessment (EIA) in the development of a comprehensive Environmental Management Plan (EMP) to assist the developer in managing the identified 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 Heritage Impact Assessment was compiled by PGS Heritage, the staff of which has a combined experience of nearly 40 years in the heritage consulting industry and have extensive experience in managing Heritage Impact Assessment (HIA) processes. Mr. Polke Birkholtz, project manager and heritage specialist, is registered with the Association of Southern African Professional Archaeologists (ASAPA) as a professional archaeologist and is also a registered member of the Cultural Resource Management (CRM) Section of ASAPA. He has more than 15 years experience in the industry.

Dr Gideon Groenewald, who conducted the palaeontological study, has a PhD in Geology from the University of Port Elizabeth (Nelson Mandela Metropolitan University) (1996) and the National Diploma in Nature Conservation from Technicon RSA (the University of South Africa) (1989). He specialises in research on South African Permian and Triassic sedimentology and macrofossils with an interest in biostratigraphy, and palaeoecological aspects. He has extensive experience in the locating of fossil material in the Karoo Supergroup and has more than 20 years of experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the southern, western, eastern and north-eastern parts of the country. His publication record includes multiple articles in internationally recognized journals.

Dr Groenewald is accredited by the Palaeontological Society of Southern Africa (society member for 25 years).

1.3 Assumptions and Limitations

The following assumptions and limitations are relevant to this study:

- Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage sites located during the fieldwork do not necessarily represent all the heritage sites present within the area. Should any heritage features or objects not included in the 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.

- The exact pylon positions for the three development alternatives are not presently known.

1.4 Legislative Context

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

i. National Environmental Management Act (NEMA) Act 107 of 1998
ii. National Heritage Resources Act (NHRA) Act 25 of 1999
iii. Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
iv. Development Facilitation Act (DFA) Act 67 of 1995

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

i. National Environmental Management Act (NEMA) Act 107 of 1998
    a. Basic Environmental Assessment (BEA) – Section (23)(2)(d)
    b. Environmental Scoping Report (ESR) – Section (29)(1)(d)
    c. Environmental Impacts Assessment (EIA) – Section (32)(2)(d)
    d. EMP (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. Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002

a. Section 39(3)

The NHRA stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34(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 (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 SAHRA and ASAPA have also been incorporated to ensure that a comprehensive and legally compatible HIA report is compiled.

1.5 Terminology and Abbreviations

Archaeological resources

i. material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;
ii. rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including a 10m buffer area;
iii. wrecks, being any vessel or aircraft, or any part thereof which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation;
iv. features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

Cultural significance

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

Development

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

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

Fossil

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

Heritage

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

Heritage resources

This means any place or object of cultural significance

Later Stone Age

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

Late Iron Age (Early Farming Communities)

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

Middle Stone Age

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

Palaeontology

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

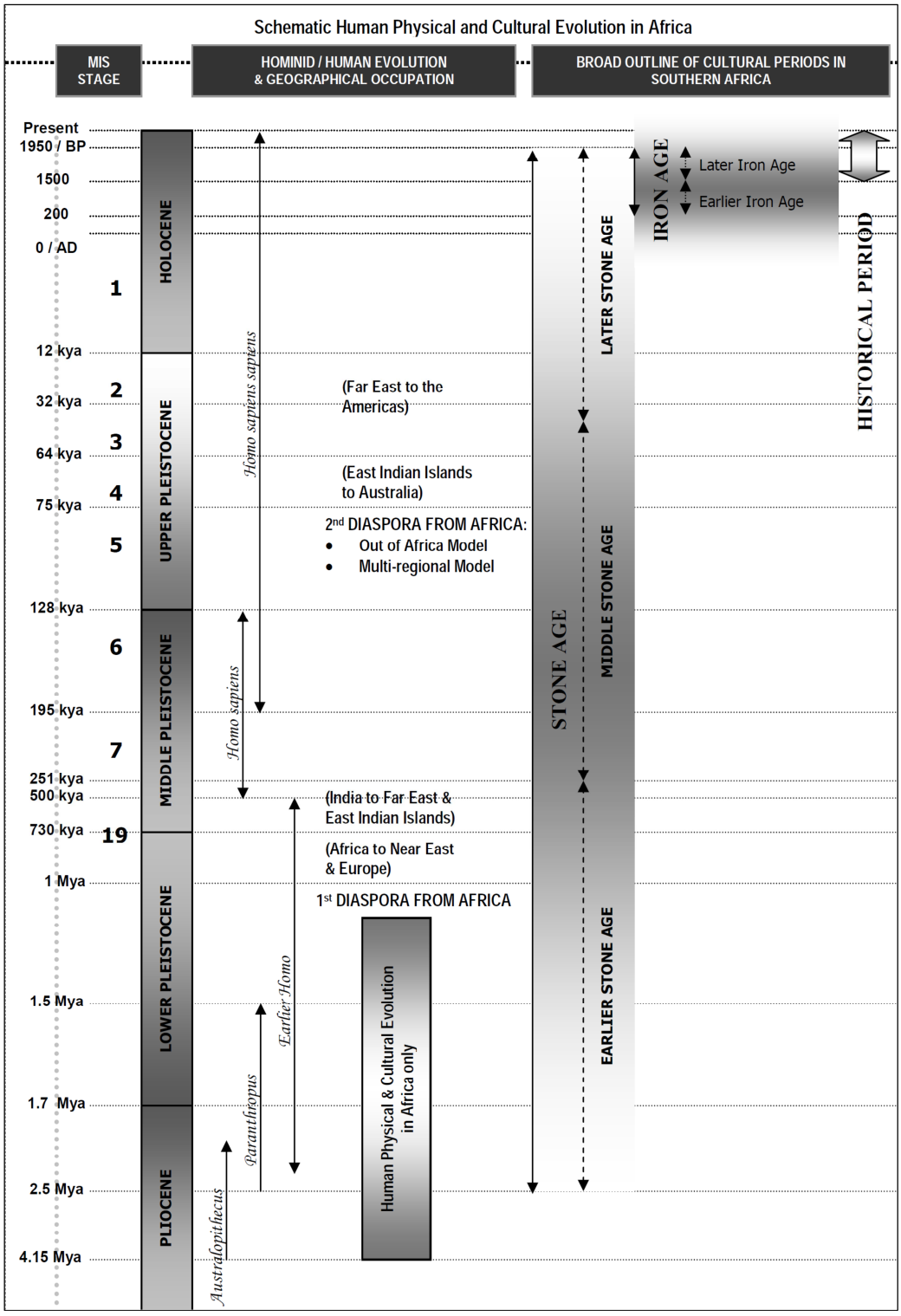


Figure 1–Human and Cultural Time line in Africa (Morris, 2008)

2 TECHNICAL DETAILS OF THE PROJECT

2.1 Site Location and Description

Coordinates	Universal Section: Start: S 26° 01' 43.8" E 29° 13' 19.8"	End: S 26 02’ 09.1” E 29° 13’ 22.1”
	Preferred Alternative: Start: S 26 02’ 10.4” E 29° 13’ 21.7” Point 3: S 26 02’ 30.1” E 29° 12’ 52.1” End: S 26° 03' 15.5" E 29° 12' 03.4"	Point 2: S 26° 02’ 25.3” E 29° 13’ 15.0” Point 4: S 26° 02' 59.6" E 29° 12' 42.3"
	Alternative 1: Start: S 26 02’ 09.1” E 29° 13’ 22.1” Point 3: S 26 02’ 31.0” E 29° 12’ 51.3” End: S 26° 03' 15.3" E 29° 12' 03.6"	Point 2: S 26° 02’ 24.0” E 29° 13’ 13.3” Point 4: S 26° 02' 56.6" E 29°12'44.7"
	Alternative 2: Start: S 26 02’ 09.1” E 29° 13’ 22.1” End: S 26° 02' 56.6" E 29°12'44.7"	Point 2: S 26° 02’ 25.5” E 29° 13’ 22.7”
	Alternative 3: Start: S 26 02’ 09.1” E 29° 13’ 22.1” End: S 26° 02' 56.6" E 29°12'44.7"	Point 2: S 26° 02’ 37.8” E 29° 13’ 20.8”
Property	Portions of the Farms Klipplaat 14 IS and Kleinkopje 15 IS.	
Location	The study area is located 5 km east-by-southeast of Coalville, 14.8 km east of Ogies and 17.3 km south-by-southwest of Emalahleni.	
Extent	Universal Section: 770.48 m Preferred Alternative: 3,279.63 Alternative 1: 3,258.15 m Alternative 2: 1,928.69 m Alternative 3: 2,043.03 m	
Land Description	The study area includes sections that had been disturbed by previous mining as well as more undisturbed areas. It is located on both sides of a stream and as a result comprises parcels of land of differing character and topography. For example, the northern end of the proposed development is located within a level agricultural field with the central sections of the development area located along the slopes of the northern bank of the stream the higher ends of which is characterised by sandstone outcrops. The south-eastern end of the study area is located In an area which had been mined and rehabilitated, whereas the south-western end of the study area comprises level undisturbed grassland.	

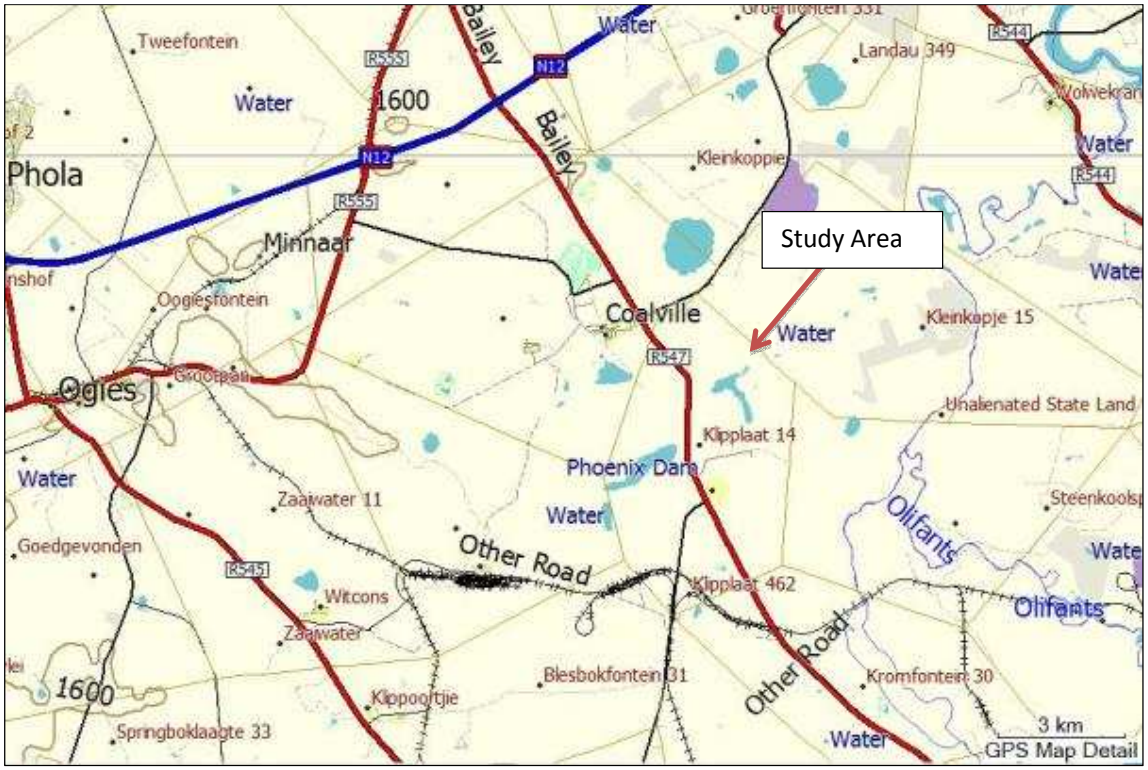


Figure 2–The study area within its regional context.

2.2 Technical Project Description

The client proposes to reroute a section of the Hendrina – Kriel transmission line. The proposed rerouting footprint will be located on Portions of the Farms Klipplaat 14 IS and Kleinkopje 15 IS and comprises a northern end which would be universal, with four development alternatives proposed for the remainder of the proposed rerouting. The four development alternatives are as follows:

- Preferred Alternative
- Alternative 1
- Alternative 2
- Alternative 3

The Google Earth image below depicts the proposed study area footprints.

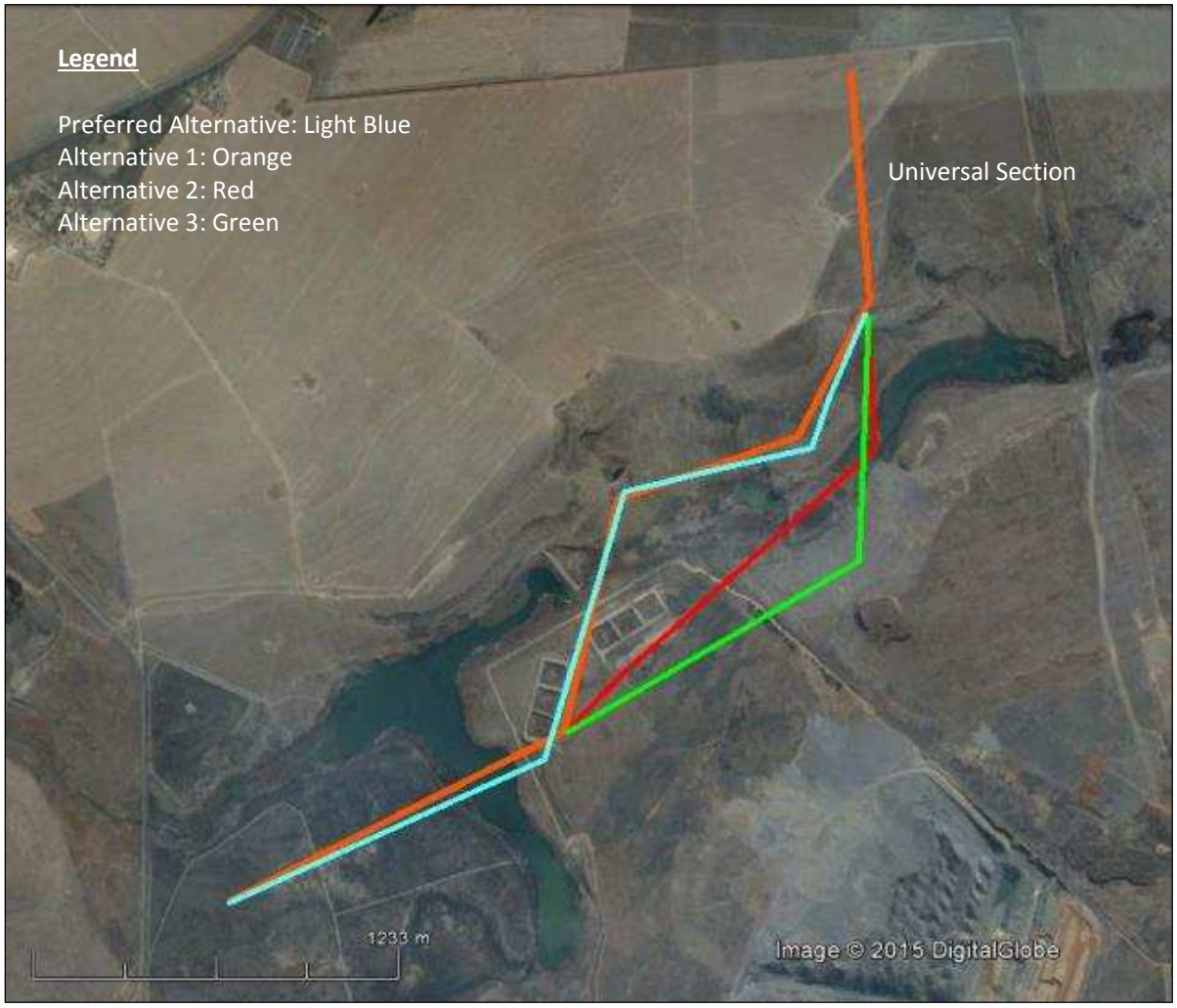


Figure 3–Google Earth depiction of the proposed development.

3 ASSESSMENT METHODOLOGY

3.1 Methodology for Assessing Heritage Site Significance

This report was compiled by PGS Heritage for a proposed rerouting of a section of the Hendrina – Kriel Transmission Line. The applicable maps, tables and figures are included as stipulated in the NHRA (no 25 of 1999) and the National Environmental Management Act (NEMA) (no 107 of 1998). The HIA process consisted of three steps:

Step I – Literature Review: The background information to the field survey leans greatly on the archival and historical cartographic material assessed as part of the study as well as a study of the available literature.

Step II – Physical Survey: A physical survey was conducted on Tuesday, 2 December 2014 and Wednesday, 3 December 2014. The survey was undertaken by a team comprising a professional archaeologist (Polke Birkholtz), field assistant (Derrick James) and palaeontologist (Dr. Gideon Groenewald). The fieldwork was undertaken on foot.

After the addition of a fourth alternative, the footprint of this additional area was surveyed on foot on Thursday, 26 February 2015. This additional fieldwork was conducted by Polke Birkholtz.

Step III – Report: The final step involved the recording and documentation of relevant heritage resources, as well as the assessment of resources regarding the heritage impact assessment criteria and report writing, as well as mapping and recommendations.

The significance of heritage sites was based on five 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 position
D - Preserve site, or extensive data collection and mapping of the site; and
E - Preserve site

Site Significance

Site significance classification standards prescribed by the South African Heritage Resources Agency (2006) and approved by the Association for Southern African Professional Archaeologists (ASAPA) for the Southern African Development Community (SADC) region, were used for the purpose of this report (see **Table 1**).

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	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)	Grade 4A	High/Medium	Mitigation before destruction
Generally Protected B (GP.B)	Grade 4B	Medium	Recording before destruction
Generally Protected C (GP.C)	Grade 4C	Low	Destruction

3.2 Methodology for Impact Assessment

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

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

A combined quantitative and qualitative methodology was used to describe impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors, along with the equivalent quantitative rating scale for each of the aforementioned criteria, is given in **Table 2**.

Table 2: Quantitative rating and equivalent descriptors for the impact assessment criteria

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

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

Significance Assessment

The significance rating (importance) of the associated impacts embraces the notion of extent and magnitude, but does not always clearly define these, since their importance in the rating scale is very relative. For example, 10 structures younger than 60 years might be affected by a proposed development, and if destroyed the impact can be considered as VERY LOW in that the structures are all of Low Heritage Significance. If two of the structures are older than 60 years and of historic significance, and as a result of High Heritage Significance, the impact will be considered to be HIGH to VERY HIGH. A more detailed description of the impact significance rating scale is given in

Table 3 below.

Table 3: Description of the significance rating scale

RATING		DESCRIPTION
5	VERY HIGH	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	HIGH	Impact is of substantial order within the bounds of impacts which could occur. In the case of adverse impacts: mitigation and/or remedial

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

Spatial Scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in **Table 4**.

Table 4: Description of the spatial significance rating scale

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

	proposed site	

Temporal/Duration Scale

In order to accurately describe the impact, it is necessary to understand the duration and persistence of an impact in the environment. The temporal or duration scale is rated according to criteria set out in **Table 5**.

Table 5: Description of the temporal rating scale

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

Degree of Probability

The probability or likelihood of an impact occurring will be outlined in **Table 6** below.

Table 6: Description of the degree of probability of an impact occurring

RATING	DESCRIPTION
1	Practically impossible
2	Unlikely
3	Could happen
4	Very likely
5	It's going to happen / has occurred

Degree of Certainty

As with all studies, it is not possible to be 100% certain of all facts, and for this reason a standard "degree of certainty" scale is used, as discussed in **Table 7**. The level of detail for

specialist studies is determined according to the degree of certainty required for decision-making.

Table 7: Description of the degree of certainty rating scale

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

Quantitative Description of Impacts

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

Impact Risk = (SIGNIFICANCE **+***Spatial***+** Temporal) X Probability

3 5

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

Table 8: Example of Rating Scale

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	Low	Local	Medium Term	Could Happen	**Low**
Impact on heritage structures	2	3	3	3	**1.6**

Note: The significance, spatial and temporal scales are added to give a total of 8, which is divided by 3 to give a criterion rating of 2.67. The probability (3) is divided by 5 to give a

probability rating of 0.6. The criteria rating of 2.67 is then multiplied by the probability rating (0,6) to give the final rating of 1,6.

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

Table 9: Impact Risk Classes

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

Therefore, with reference to the example used for heritage structures above, an impact rating of 1.6 will fall in the Impact Class 2, which will be considered to be a low impact.

4 CURRENT STATUS QUO

4.1 Description of Study Area

The proposed development comprises the rerouting of a section of the Hendrina – Kriel Transmission Line on Portions of the Farms Klipplaat 14 IS and Kleinkopje 15 IS, Nkangala District Municipality, Mpumalanga Province.

The study area includes sections that had been disturbed by previous mining as well as more undisturbed areas. It is located on both sides of a stream and as a result comprises parcels of land of differing character and topography. For example, the northern end of the proposed development is located within a level agricultural field with the central sections of the development area located along the slopes of the northern bank of the stream the higher ends of which is characterised by sandstone outcrops. The south-eastern end of the study area is located in an area which had been mined and rehabilitated, whereas the south-western end comprises level undisturbed grassland.

The wider surroundings of the study area is characterised by primarily mining activities as well as some very limited farming activities. Infrastructural development such as roads, pipelines

and power lines in support of these mining activities also characterise the surrounding landscape.

Figure 5–The agricultural field on the northern end of the proposed development.

Figure 6–General view of a section of the study area with a mined and rehabilitated portion of land visible in the front.

5 DESKTOP STUDY FINDINGS

5.1 Historic Overview of the Study Area and Surrounding Landscape

DATE	DESCRIPTION
2.5 million to 250 000 years ago	The Earlier Stone Age is the first and oldest phase identified in South Africa's archaeological history and comprises two technological phases. The earliest of these is known as Oldowan and is associated with crude flakes and hammer stones. It dates to approximately 2 million years ago. The second technological phase is the Acheulian and comprises more refined and better made stone artefacts such as the cleaver and bifacial hand axe. The Acheulian dates back to approximately 1.5 million years ago. No information with regard to Early Stone Age sites from the surrounding area could be found. However, it seems likely for such sites to exist here.
250 000 to 40 000 years ago	The Middle Stone Age is the second oldest phase identified in South Africa's archaeological history. This phase is associated with flakes, points and blades manufactured by means of the so-called 'prepared core' technique. No information with regard to Middle Stone Age sites from the surrounding area could be found. However, it seems likely for such sites

	to exist here.
40 000 years ago to the historic past	The Later Stone Age is the third archaeological phase identified and is associated with an abundance of very small artefacts known as microliths. No information with regard to Later Stone Age sites from the surrounding area could be found. However, it seems likely for such sites to exist here.
AD 1700 – AD 1840	The Buispoort facies of the Moloko branch of the Urewe Tradition is the first association of the study area's surroundings with the Iron Age. It is most likely dated to between AD 1700 and AD 1840. The key features on the decorated ceramics include rim notching, broadly incised chevrons and white bands, all with red ochre (Huffman, 2007).
AD 1821 – AD 1823	After leaving present-day KwaZulu-Natal the Khumalo Ndebele (more commonly known as the Matabele) of Mzilikazi migrated through the general vicinity of the study area under discussion before reaching the central reaches of the Vaal River in the vicinity of Heidelberg in 1823 (www.mk.org.za). Two different settlement types have been associated with the Khumalo Ndebele. The first of these is known as Type B walling and was found at Nqabeni in the Babanango area of KwaZulu-Natal. These walls stood in the open without any military or defensive considerations and comprised an inner circle of linked cattle enclosures (Huffman, 2007). The second settlement type associated with the Khumalo Ndebele is known as Doornspruit, and comprises a layout which from the air has the appearance of a 'beaded necklace'. This layout comprises long scalloped walls (which mark the back of the residential area) which closely surround a complex core which in turn comprises a number of stone circles. The structures from the centre of the settlement can be interpreted as kitchen areas and enclosures for keeping small stock. It is important to note that the Doornspruit settlement type is associated with the later settlements of the Khumalo Ndebele in areas such as the Magaliesberg Mountains and Marico and represent a settlement under the influence of the Sotho with whom the Khumalo Ndebele intermarried. The Type B settlement is associated with the early Khumalo Ndebele settlements and conforms more to the typical Zulu form of settlement. As the Khumalo Ndebele passed through the general vicinity of the study areas shortly after leaving Kwazulu-Natal, one can assume that their settlements here would have conformed more to the Type B than the Doornspruit type of settlement. It must be stressed however that no published information could be found which indicates the presence of Type B sites in the general vicinity of the study area.

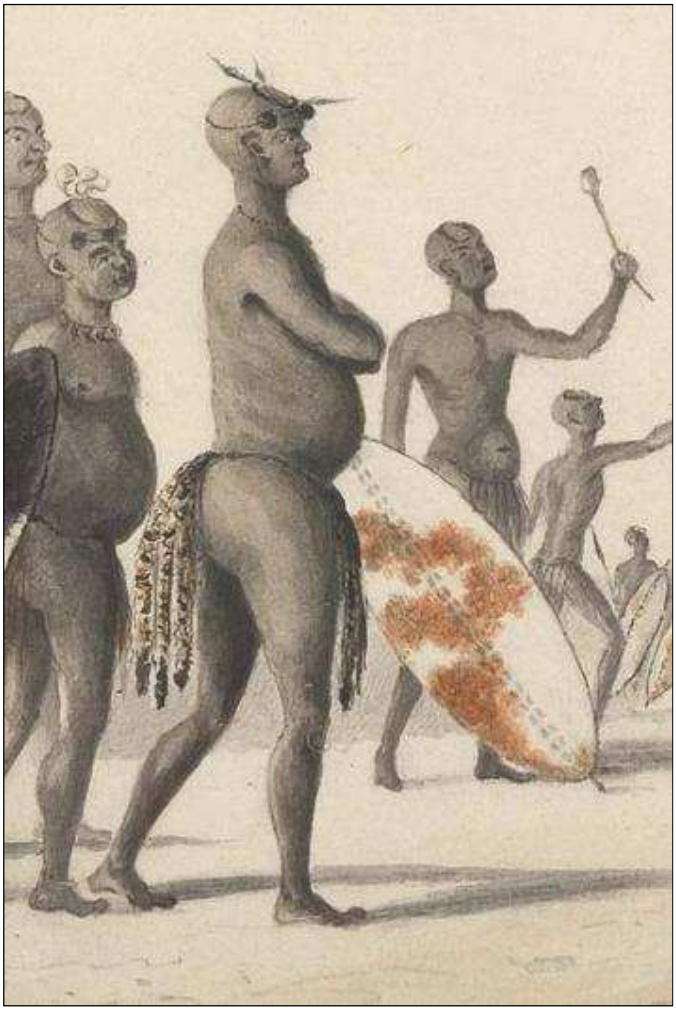


Figure 7

King Mzilikazi of the Matabele. This depiction was made by Captain Cornwallis Harris in c. 1838 (www.sahistory.org.za).

1836	The first Voortrekker parties crossed over the Vaal River (Bergh, 1999).
1845	Both the district and town of Lydenburg was established in this year (Bergh, 1999). The study area fell within the Lydenburg district at the time.
1850s – 1860s	This period saw the early establishment of farms by white farmers in the general vicinity of the study area. This said, the archival study has shown that all the farms within the study area were formally inspected by the government of the Zuid-Afrikaansche Republiek during February 1868. Of course, this does not necessarily mean that before this date no farms had already been settled and farmed on, simply that during February 1868 the farms were officially proclaimed and registered with government. The permanent settlement of white farmers in the general vicinity of the study area would have resulted in the proclamation of individual farms and the establishment of permanent farmsteads. Features that can typically be associated with early farming history of the area include farm dwellings, sheds, rectangular stone kraals, canals, farm labourer accommodation and cemeteries.

	Although it is possible that a few heritage sites associated with the very first establishment of white farmers from the study area and surroundings would likely still exist, this would be few in number due to their age as well as the destruction of farmsteads by the British forces during the South African War in accordance with the so-called 'scorched earth' policy. The other sites often associated with these early farms are graves and cemeteries for both white farmers and black farm labourers. These sites are often all that remains of the farmstead of the mid to late 19th century.
1872	The study area now fell within the district of Middelburg (Bergh, 1999). During this same year the general surroundings of the study area was visited by a geologist from Eastern Europe Woolf Harris. During his visit Harris identified coal in the Van Dyksdrift area. He is also believed to have started the Maggie's Mine the following year (Falconer, 1990).
1872 – 1894	During this time a number of small coal mining operations were started in the general vicinity, but as no railway line connected this area with the coal markets further to the west, it proved a difficult commercial undertaking. By 1889 there were four coal mines in the Witbank area, namely Brugspruit Adit, Maggie's Mine, Steenkoolspruit and Douglas (Falconer, 1990).
20 October 1894	On this day the railway line between Pretoria and Delagoa Bay (present-day Maputo) was completed near Balmoral located roughly 29 km north-west of the study area. This event was very significant for the study area and surroundings as the completion of the line meant that the vast deposits of coal known to have existed in this area since the mid 19th century could now be commercially mined (Bulpin, 1989) and easily transported to the Witwatersrand gold mines and the populated centres of Pretoria and Johannesburg where they were most required.
1896	A coal mine shaft was sunk in this year by one Samuel Stanfield. The shaft was sunk on the farm Witbank (Erasmus, 2004). During the same year the Kromfontein Coal Company appears to have been established, seemingly to mine coal on the farm Kromfontein (Gluckstein, 1903/4). The farm Kromfontein is directly south of the present study area.
1898	The study area now fell within the Bethal District. The town of Bethal had been established in 1880 (Bergh, 1999).
1899 – 1902	The Anglo Boer War (1899-1902) took place during this time. No battles or skirmishes are known from within the study area or its direct surroundings, although a number of these are known from the wider vicinity. The two closest known battle sites to the present study area are the Battle of Bakenlaagte which took place on 30 October 1901 (28 km south of the study area) and the Battle of Wilmansrust which took place on 12 June 1901 (located 25 km south-east of the study area) (Van

	der Westhuizen & Van der Westhuizen, 1900).
1903	The town of Witbank was formally proclaimed (Erasmus, 2004).
1906	The town of Witbank received its first Health Board (Bulpin, 1989).
October 1907	The Tweefontein Colliery Limited was registered at the time (South African Mining Yearbook, 1941/2). The mine was located roughly 3.7 km north-west of the study area.
1914	The town of Witbank became a municipality in this year (Bulpin, 1989).
1928	The town of Ogies was established (Erasmus, 2004).
1930	By this time the South African Iron and Steel Industrial Corporation (Iscor) possessed coal rights on portions of the farms Klipplaats, Steenkoolspruit and Kromfontein (Commonwealth Mining and Metallurgical Congress, 1930).
23 June 1936	The Phoenix Colliery Limited was registered at the time (South African Mining Yearbook, 1941/2). The mine was located 1.8 km south of the present study area. The company had leased the coal and fireclay rights from the South African Iron and Steel Industrial Corporation for a period of 99 years starting on 29 October 1936. In terms of this agreement Phoenix Colliery had to pay royalties to Iscor on all coal brought to the surface after this date (South African Mining Yearbook, 1941/2).
Early 1970s	The town of Kriel was established on the farms Roodebloem and Onverwacht and was named after the first resident magistrate of Bethal, D.J. Kriel (www.mpumalanga.com).

5.2 Aspects Relating Specifically to the History and Archaeology of the Study Area

5.2.1 Farm Ownership Histories

5.2.1.1 Klipplaat

The farm Klipplaat (old number 47, new number 14 IS) was first inspected on 20 February 1868 by P.J. Fourie. Fourie must have been the local veldkornet tasked with the job of inspecting the farms falling in the area under his jurisdiction. At the time this area would have fallen in the district of Middelburg.

On 2 April 1870 the farm was transferred to its first owner, Louis Theunis Fourie (jnr.). Two years later, on 23 February 1872, one half share portion of the farm was transferred from Fourie to Petrus Johannes Dirk Steenkamp. On 17 May 1877 the portions of the farm owned by P.J. Fourie and P.J.D. Steenkamp were transferred as one entity to Andries Herklaas du Preez.

Du Preez remained in possession of the entire farm for the next ten years. On 15 July 1887 a portion was transferred to Petrus Johannes Bezuidenhout. On 4 February 1889 this portion was transferred from Bezuidenhout to Willem Petrus Prinsloo.

On 25 March 1891, after the death of Andries Herklaas du Preez, the remaining portion of the farm which had been kept in his possession was transferred from his estate to Susanna Magdalena Malan (born Meyer). On 19 December 1898 the portion which had been transferred to Willem Petrus Prinsloo was transferred to Petronella Aletta Meyer (born Prinsloo). For the subsequent eight years the farm was owned by these two individuals, namely Petronella Aletta Meyer (born Prinsloo) and Susanna Magdalena Malan (born Meyer).

On 26 January 1906 the portion which had been transferred to Susanna Magdalena Malan (born Meyer) was subdivided into six portions with a portion each transferred on this date to Petrus Johannes Bezuidenhout, Tielman Myburgh Roux, David Hercules van Wyk, Cornelius Johannes du Preez, Jacobus Theodorus du Preez and Jan Dirk Heyns.

The second main portion of the farm before this subdivision of 1906 remained the property of Petronella Aletta Meyer (born Prinsloo) until her death in 1914. On 25 May 1915 this portion of the farm was transferred from her estate to Martha Talitha van Niekerk.

With the information that is presently available it would be impossible to accurately establish in which of these portions the section of the study area located within the farm Klipplaat would have been located. It would appear that the portion which had been owned by Susanna Magdalena Malan (born Meyer) may have enclosed the present study area as well, but this cannot be said for certain. As a result the subsequent subdivisions and transfers will not be listed in detail. However, it is worth noting that during the subsequent 40 odd years a number of transfers relating to companies and mines were recorded. These will all be listed below:

- On 28 February 1912 portions of the portions which had been transferred to Cornelius Johannes du Preez and Jan Dirk Heyns were transferred to the Transvaal Hydraulic Power Syndicate Limited. This represents the earliest ownership record of a portion of the farm by a company.
- On 14 January 1920 the two portions of portions which had been transferred to the Transvaal Hydraulic Power Syndicate Limited were now transferred to Hendersons Transvaal Estates Limited.

- On 4 February 1936 a portion of the farm was transferred from Kate Dunn Brown (born Glen) and the estate of James Simpson to the Consolidated Collieries Limited.
- On 7 July 1936 a portion of the farm was transferred from Willem Petrus Lourens Prinsloo to the Phoenix Colliery Limited.
- On 19 September 1936 two portions of the portion which had been transferred to the Consolidated Collieries Limited were now also transferred to the Phoenix Colliery Limited.
- On 11 February 1941 the two portions which had been transferred to Hendersons Transvaal Estates Limited were now transferred to Mineral Holdings Limited.
- On 4 June 1946 two portions of the farm held by three individuals were transferred to the Tweefontein United Collieries Limited.

It is evident that by 1946 significant portions of the farm were owned by mining companies, including the Tweefontein United Collieries Limited, Mineral Holdings Limited and Phoenix Colliery Limited. At least some of the workings and shafts of Tweefontein United were located approximately 700 m to the west of the study area (on the western end of the existing R547 tar road), some of the shafts and buildings of Phoenix Colliery Limited were located roughly 1.1 km south of the present study area. The locality of the Mineral Holdings property is not presently known.

5.2.1.2 Kleinkopje

The farm Kleinkopje (old number 45, new number 15 IS) was first inspected on 19 February 1868 by P.J. Fourie. As stated above Fourie must have been the local veldkornet tasked with the job of inspecting the farms falling within the area under his jurisdiction. At the time this area would have fallen in the district of Middelburg.

On 24 February 1870 the farm was transferred to its first owner, Willem Johannes Smith. At an unknown time between this date and 1875 the farm was transferred from Smith to Johannes Philippus Dreyer. On 24 May 1875 the farm was transferred from J.P. Dreyer to Christiaan Daniel Pretorius. Pretorius remained in possession of the entire farm for the rest of his life. After his death in the Middelburg Concentration Camp on 16 January 1902 (pretoriusfamilie.info/pret1/I1717.html), the farm was transferred from his estate on 29 October 1904 to his widow Anna Alida Petronella Pretorius (born Badenhorst).

On 25 January 1907 the farm was subdivided into seven portions with one portion each transferred to Theodorus Ernst van Eeden, the estate of Johannes Hendrik de Lange, Jacobus Nicolaas Badenhorst, Christiaan Daniel Pretorius, Roelof Johannes Minnaar, Jan Dirk Coehuis and Jacobus Petrus Badenhorst. On the same day the portion which had been transferred to Jacobus Nicolaas Badenhorst was transferred to Samuel Katz and Israel Slomoi trading as Katz & Slomoi.

With the information that is presently available it would be impossible to accurately establish in which of these seven portions the section of the study area located within the farm Kleinkopje would have been located. As a result the subsequent subdivisions and transfers will not be listed. However, it is worth noting that during the subsequent 40 odd years only one transfer relating to a company was recorded. The details of this transfer are that on 18 February 1949 two portions of the farm were transferred from Willem Lambertus Johannes Vos to Tweefontein United Collieries Limited.

5.2.2 The Transvaal Hydraulic Power Syndicate Limited and the Study Area

In 1917 the Tweefontein Colliery Limited applied for permission to utilise the water right of the Transvaal Hydraulic Power Syndicate Limited. Their proposal was to erect a pump station within the water right and to build a pipeline between the pump station and the Tweefontein Colliery (National Archives, WAT, 42/1917). As far as is presently known, this application was approved.

As indicated in the farm ownership histories, two sections of the farm Klipplaat were transferred to the Transvaal Hydraulic Power Syndicate Limited on 28 February 1912. It can be assumed that the water right of this company fell within these two portions. Of interest is the fact that a comparison of the archival diagram accompanying the 1917 application and a current farm division map clearly shows that the registered water right of this company comprised the exact boundaries of what is today known as Portion 8 of the farm Klipplaat 14 IS. This portion of the farm still encloses the confluence area of the two streams.

The image below depicts an overlay of the development alternatives and the archival diagram showing the water right, pump and pipeline. It is clear from this diagram that a section of the development crosses over the old water right of the Transvaal Hydraulic Power Syndicate Limited. However, the potential tangible heritage sites of the pump station and pipeline are all more than 530 m from the proposed development areas. As a result should any tangible evidence for these features have remained behind, the present development will have no impact on them.

The explanation of the symbols used on the archival diagram is as follows:

- D - “Sump in Vlei”
- E – “Pump Station on Bank”
- F - “6 inch Iron Pipe 750 feet”
- G – “8 inch Earthenware Pipe Line to gravitate to Tweefontein Colliery”
- H – “Transvaal Hydraulic Power Syndicate Limited Water Right”

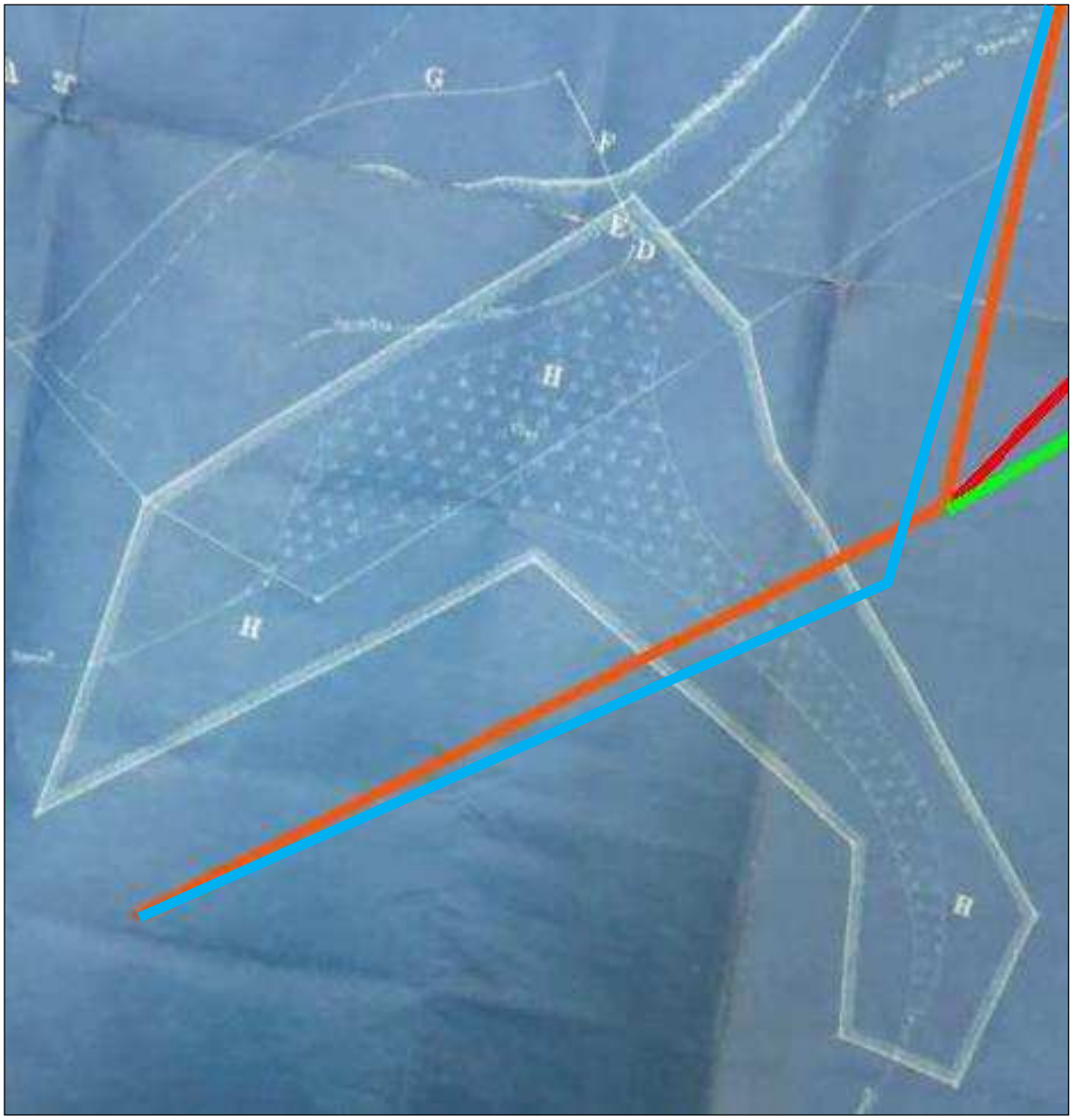


Figure 8 – An overlay of the development footprints over a section of the archival diagram depicting the water right of the Transvaal Hydraulic Power Syndicate Limited and the development of a pump station and pipeline. It is clear from this overlay that although the present development footprint will cross over the water right, any remaining tangible heritage from the conveying of water to the Tweefontein Colliery would be well away from the present development.

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

5.3.1 Bethal Sheet of the Major Jackson Map Series

This map forms part of the series of British Military maps produced under supervision of Major Jackson by the Mapping Section of the Field Intelligence Department, Army Headquarters. The sheet depicted here is the Bethal (No. 5) Sheet of the said map series, and although its original production date was June 1900, the sheet depicted here represents the second revised edition which is dated to April 1901.

Apart from a number of roads crossing through the study area, no heritage sites or features are depicted within the study area.

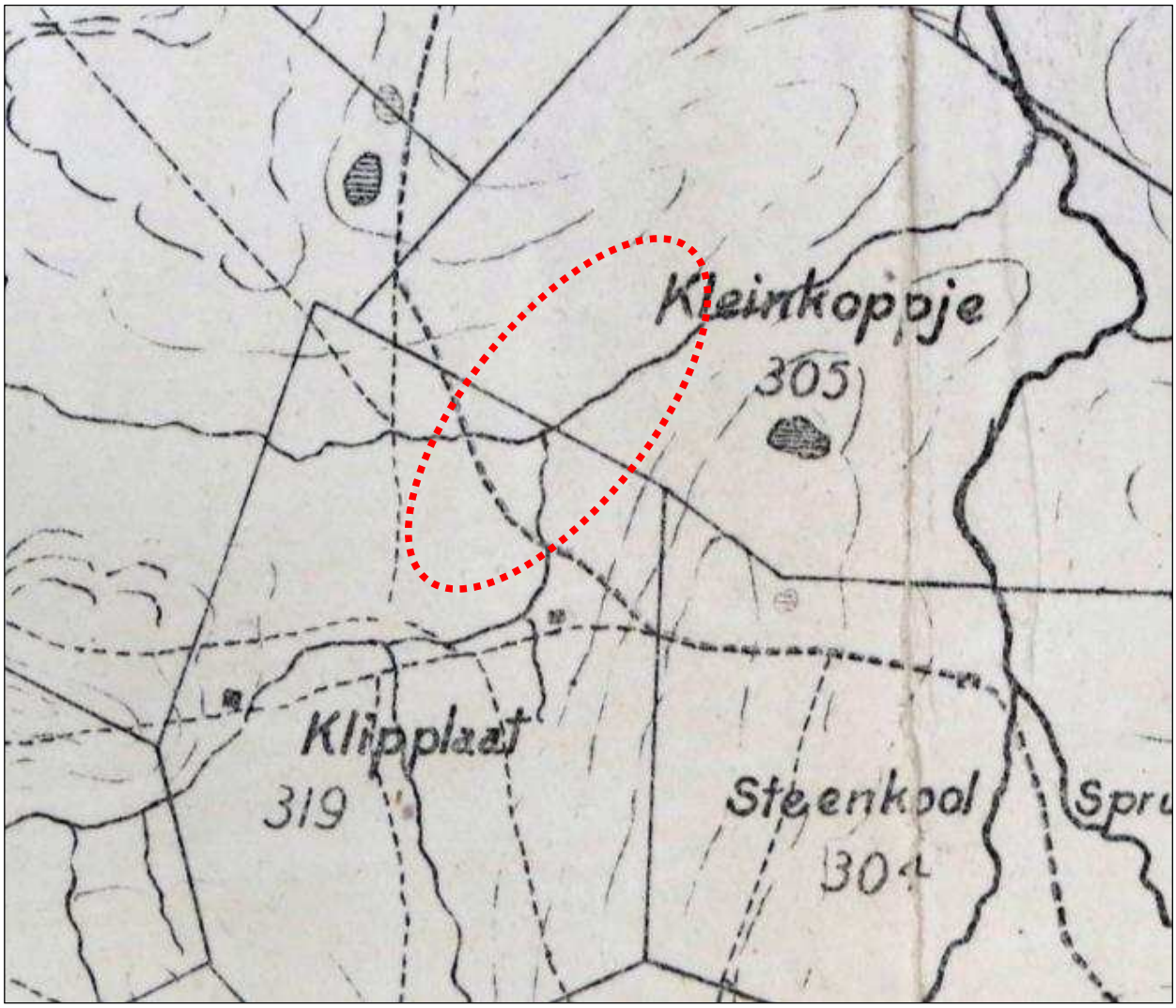


Figure 9 – Bethal sheet of the Major Jackson Map Series which dates to April 1901. The approximate position of the study area is shown in red.

5.3.2 Heidelberg and Pretoria Sheets of the Transvaal and Orange River Series, c. 1913

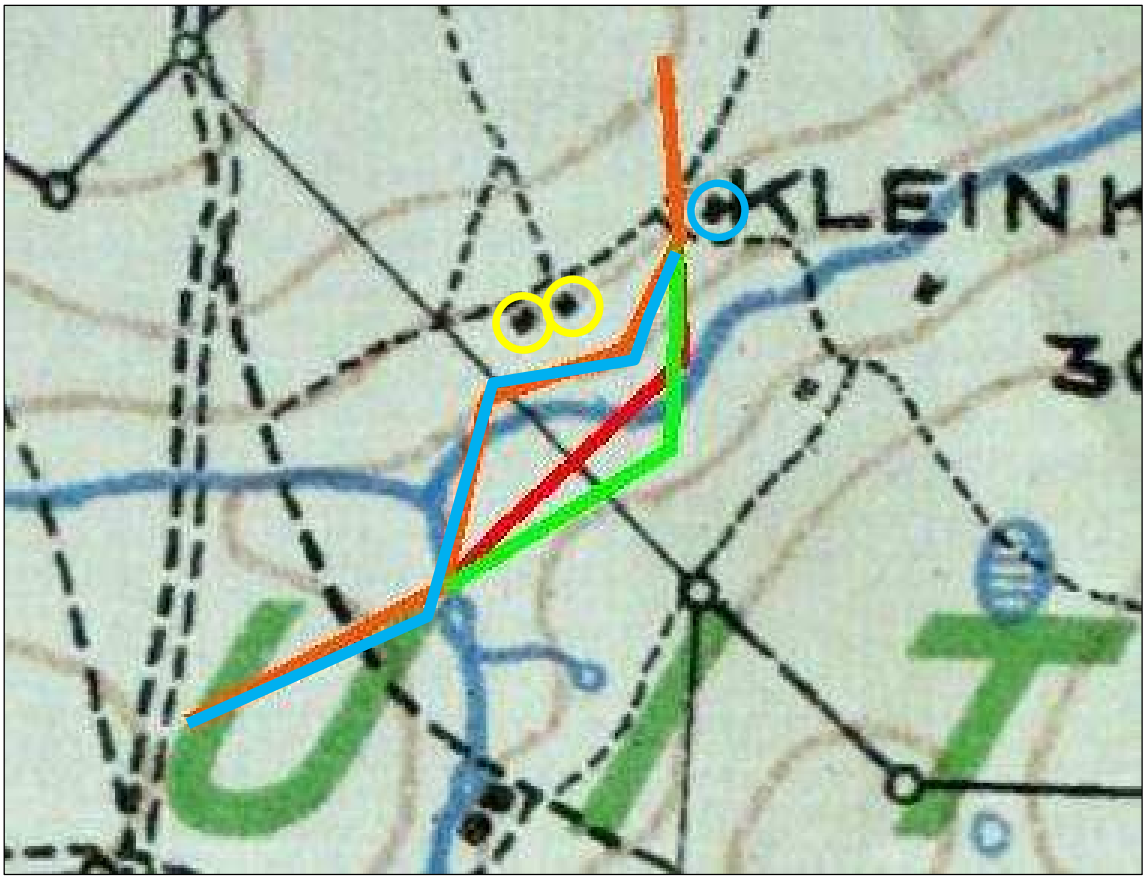
The depicted map below is from a composite map of the Heidelberg and Pretoria Map Sheets (National Archives, JUS, 560, 1852/30). Although the map is not dated, it seems likely that it was compiled from the 1:125 000 Transvaal and Orange River Series that was produced by the Transvaal Geographic Section during c. 1913.

The following observations can be made from the map:

- It is clear that the study area and surrounding landscape could at the time still be described as a typical rural area in which farming would have been the mainstay of the local economy. A number of farmsteads are dotted across the landscape with secondary roads providing access to these localities. The school depicted on the farm Steenkoolspruit is known to have provided education to the white children of this area. For example it is recorded that an individual by the name of Andries Hercules Du Preez van Wyk was born on the farm Klipplaat in 1903 and during his childhood had to travel on a daily basis between the farm and the school at Steenkoolspruit by using a donkey cart. Incidentally, in later life Van Wyk became the Administrator of the Transvaal Education Department. (Education Bulletin, 1965).
- Very few mines and almost no mining activities are yet shown on this map. This corresponds with the historic overview of the study area and surrounding landscape outlined above. From the historic overview it would appear that mining activities were at the time only taking place at Tweefontein (north-west of the study area) and Kromfontein (south of the study area). After the late 1930s mining activities started to increase in this area.
- Although no potential heritage features are depicted within the three footprints of the power line alternatives, three buildings are depicted in close proximity to these footprint areas.
- During the fieldwork the remains of a farmstead were identified where the two buildings marked in yellow are shown on the map.
- No evidence for the building marked in blue could be identified during the fieldwork. The depicted position of this building is adjacent to a rocky outcrop.

Figure 10

Sections of the Heidelberg and Pretoria composite map sheet dated to 1913 are depicted on the right and below. The depiction on the right provides the viewer with a glimpse into the characteristics of the landscape surrounding the study area at the time. As can be seen from this image, the surrounding landscape would have been characterised as a farming area with farmsteads dotted across the landscape. Two schools are also known to have existed in this wider area with one on the farm Tweefontein (not depicted) and the second on the farm Steenkoolspruit (partially shown). The image below depicts an overlay of the four alternative power line routes on the 1913 map. It is clear from this overlay that three of features are depicted in the immediate vicinity of these power line alternatives.



5.3.3 First Edition of the 2529AA Topographical Sheet

A section of the First Edition of the 2629AA Topographical Sheet is depicted below. The map was based on aerial photography undertaken in 1954, was surveyed in 1965 and drawn in 1967 by the Trigonometrical Survey Office.

A total of 38 individual features with the potential of being heritage sites are depicted on the map. These features are discussed in detail below.

- Feature 1

  A cluster of three huts are depicted here on the farm Klipplaat. At the time the hut symbol was used by the cartographers to indicate that a black homestead was located there. The fieldwork did not extent all the way on to this end and as a result it would at present be impossible to state whether these huts are still located there.

- Feature 2

  A cluster of five huts are depicted on the farm Kleinkopje. It is possible that the huts shown here formed part of the farmstead depicted on the 1913 map. If this is the case, remnants of these huts were identified during the fieldwork.

- Feature 3

  A cluster of two huts are depicted in close proximity to the Preferred Alternative (Blue). No evidence for these huts could be found during the fieldwork.

- Feature 4

  A single hut is depicted a short distance to the east of the single power line route on the northern end of the study area. No evidence for this hut could be found during the fieldwork.

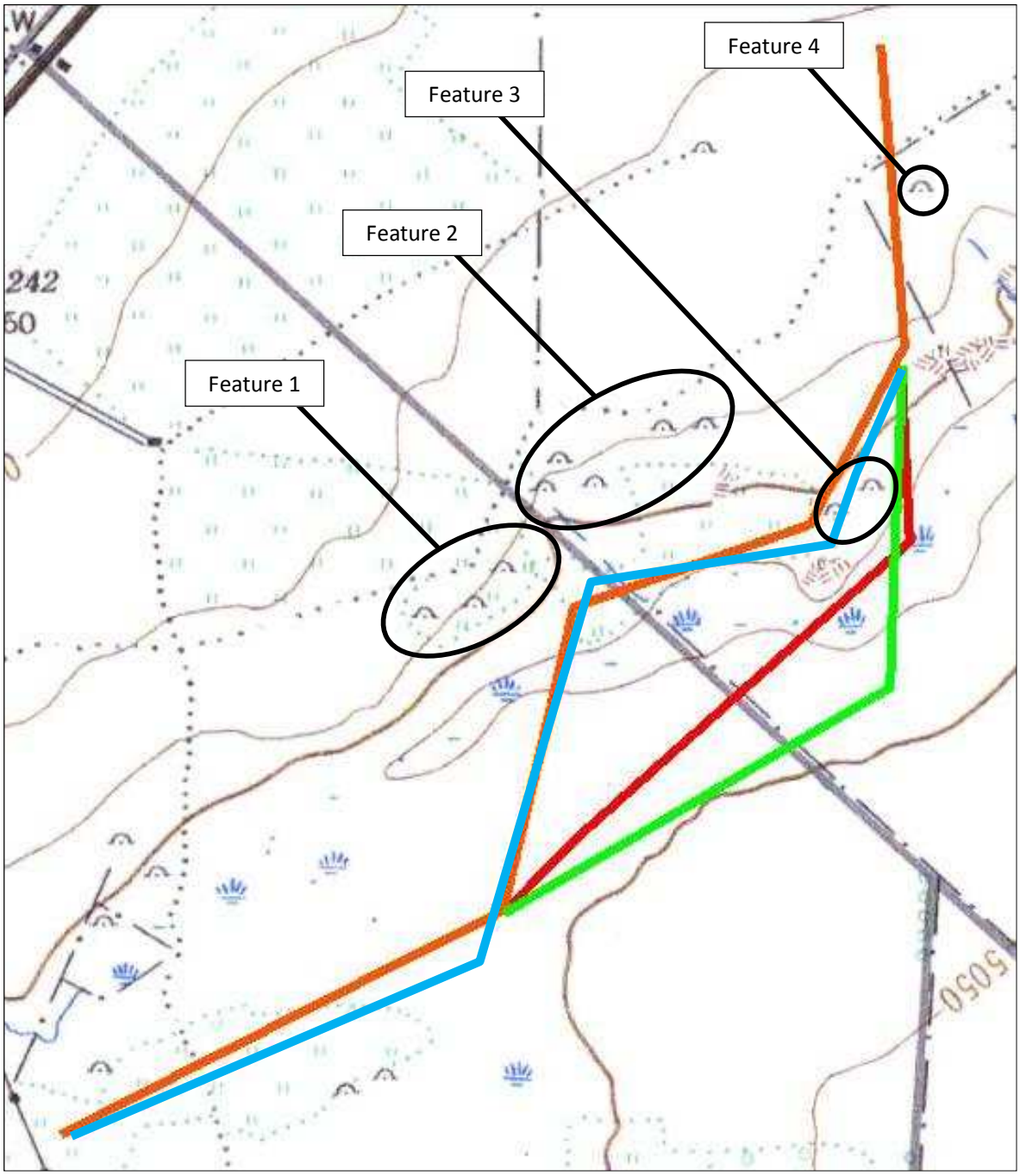


Figure 11 – Portion of the First Edition of the 2629AA Topographical Sheet that was surveyed in 1954. The position and layout of the three power line alternatives are shown.

5.4 Previous Archaeological and Heritage Studies

The South African Heritage Resources Agency Information System (SAHRIS) lists a number of previous archaeological and heritage studies from the direct surroundings of the present study area. These include the following:

- Phase 1 Archaeological Survey of the Impunzi Division of Duiker Mining. An unpublished report compiled by Matakoma and CRM Africa in 2001.
- Heritage Statement for the Atcom and Tweefontein Dragline Relocation Project. An unpublished report by Digby Wells in 2013.

These reports identified cemeteries, historic buildings and structures, Late Iron Sites as well as Stone Age sites from the surrounding landscape. None of these sites are located within the present study area.

6 FIELDWORK FINDINGS

A systematic walkthrough of the study area was undertaken by a fieldwork team comprising an archaeologist, archaeological field assistant and palaeontologist. The archaeologist was equipped with a hand-held GPS, and his recorded track logs are depicted in white below. Please note that the image below does not depict the findings of the palaeontological study.

Figure 12 – The track logs recorded during the fieldwork is depicted in fine white line whereas coloured markers depict the identified heritage sites. The identified heritage sites located either within or in close proximity to the study area are marked in yellow whereas the sites identified further than 25 m from the study area marked in blue. The numbers used here correspond with the site numbers used in this report.

6.1 Sites Identified within or in Close Proximity to the Footprint of the Preferred Alternative

Two sites were identified in close proximity to the footprint area of the Preferred Alternative. These sites will be individually discussed below.

6.1.1 Site 1

Site Coordinates:

S 26° 02' 20.5"
E 29° 13' 18.5"

Site Description:

A brick manufacturing facility is located on the northern bank of the Tweefontein stream. It extends over an area of roughly 200 m by 80 m and comprises two distinct sections, namely an area higher up against the slope that was used to source raw materials for the brick making process and a second area lower down where the actual brick manufacturing took place.

The section of the site used for obtaining the raw materials comprises extensive excavations aimed at obtaining clay to mould into brick shapes and coal to fire the clay bricks. The excavations have a sporadic appearance and are also not very deep. It would therefore appear that they were excavated by hand and not with heavy machinery. A small circular dam-like structure of bricks was identified in-between the two main excavations. While it is not absolutely certain, this structure may have been used in the processing of clay as part of the brick manufacturing activity. In the section of the site lower down the slope a number of low brick mounds and concentrations of brick were identified. A closer inspection of these brick mounds revealed the presence of coal in between the brick as well as clear evidence that these bricks had been exposed to extreme heat. It is therefore quite certain that a brick manufacturing facility was located here. No evidence for built kilns or ovens could be found and as a result it would appear that the clay bricks were fired by stacking them on a mound and placing combustibles such as coal in between and over the stacked bricks before lighting it.

The bricks manufactured here are of a standard size, blue-grey in colour with a narrow indentation (frog) on the long face of the brick.

Two glass fragments were observed in association with the lower section of the site. Both items are base fragments of which one has a triangle with the letters “CGW” which indicates that the bottle was manufactured by the Consolidated Glass Works and can therefore be dated to the period between 1946 and the present. The second fragment has stippling around its base perimeter which indicates that it was manufactured using an Automatic Bottling Machine during the period between 1940 and the present. The association of these glass fragments with the site suggests that it can in all likelihood be dated to the second half of the 20th century.

The site is located on both sides of the Preferred Alternative and Alternative 1.

Site Significance:

The site is certainly not older than 100 years, but might be older than 60 years. Nonetheless, apart from a small circular dam-like feature it does not contain any formal structures. The site is deemed to be of Generally Protected C (Grade 4C), which represents a Low Significance. This indicates that the site may be destroyed without any further mitigation taking place.

Figure 13 – General view of the excavated area where the raw materials such as clay and coal used in the manufacture of bricks were obtained.

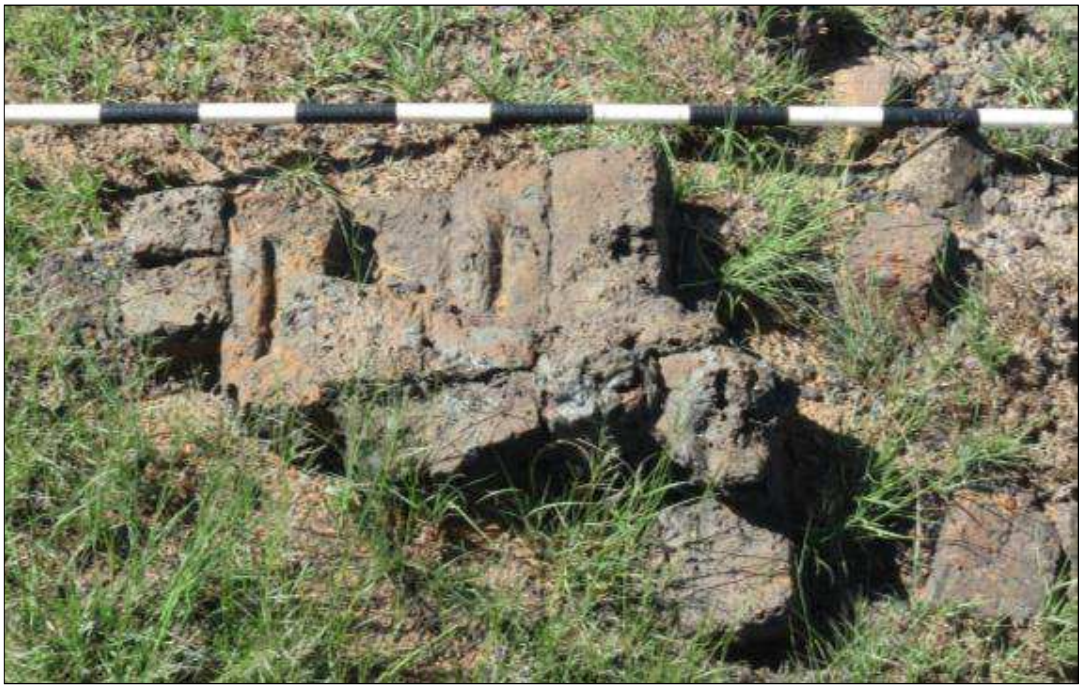


Figure 14 – One of the brick mounds from the lower end of the site. It is evident from this photograph that the bricks were fused together during the brick making process. The effects of extreme heat during the firing process can clearly be seen on these bricks.

Figure 15 – The small circular dam-like structure identified in between the two excavation areas. It seems likely that this structure was used in the processing of excavated clay.

6.1.2 Site 2

Site Coordinates:

S 26° 02' 24.6"
E 29° 13' 13.0"

Site Description:

A rectangular structure was identified a short distance south-east of the brick manufacturing site and might have been associated with it. The structure comprises a stone foundation with lower wall sections of brick and measures roughly 5 m by 3 m.

Six glass fragments from a single bottle were observed on the surface of the site. One of these items is a partial base fragment containing a triangle within which the letters “CGW” appears. This latter motif indicates that the bottle was manufactured by the Consolidated Glass Works, which in turn dates the bottle to the period between May 1946 the present. Another one of the fragments has the words “AL WATER” embossed on it. This appears to be derived from the phrase “MINERAL WATER”. One of the few mineral water companies from the Witbank area is the Witbank Mineral Water Company which existed between c. 1917 and c. 1980. The company had been known by different names over time, including the Witbank Mineral Water Works, Witbank Mineral Water Co Ltd and Witbank Mineral Water Co (Pty) Ltd (Lastovica, 2000).

The presence of the datable bottle fragments at the site suggests that it can be dated to the period after 1946. This relatively recent date is supported by the depiction of a hut in this locality on the first edition of the 2629AA topographical sheet that was surveyed in 1954. This hut is not depicted on the 1913 map, and coupled with the indicated age derived from the associated glass fragments, the structure can be dated to the period between 1946 and 1954. As a result it is between 69 and 61 years old.

Based on the information that is presently available, it would appear that the structure was built and used by black people. Past experience has shown that in some cases stillborn babies were buried in close proximity to such black homesteads and aspecially along the sides of the parents’ dwelling. This seems to be especially true for older sites and such stillborn graves have been identified at homesteads within close proximity to the present site. As this site was

abandoned some time ago, no direct information with regards to the presence (or not) of stillborn graves are currently available.

The structure is 15 m from its nearest point on Alternative 1, and 22.8 m from the nearest corner where a pylon must be erected if Alternative 1 was to be chosen for construction. The site is located roughly 60 m from the nearest pylon position on the Preferred Alternative.

Site Significance:

Until such time that the presence of graves here has been confirmed or disproved, the site must be viewed as containing graves. All graves have high levels of emotional, religious and in some cases historical significance. As such the site is of Generally Protected A (GP. 4A) which equals a High/Medium Significance. This indicates that the site may not be impacted upon without prior mitigation. The mitigation measures to be undertaken for the site can be found below.

Figure 16 – General view of the structure.

6.2 Heritage Sites Identified in Proximity to the Study Area

This category consists of all identified heritage sites located more than 25 m from any of the four development alternatives. A total of six sites are located within this category and with the exception of Site 8, all these sites are situated closest to the Alternative 1.

ALL HERITAGE SITES IDENTIFIED MORE THAN 25m FROM THE DEVELOPMENT				
No.	**Description**	**Significance**	**Relative Location**	**Coordinates**
Site 3	Rectangular foundation structure of what appears to have been a wagon-shed. The site is associated with a number of other sites situated along a sandstone ridge which appears to have comprised a single historic farmstead. The structure is certainly older than 60 years and quite likely older than 100 years as well.	**Medium**	Alternative 1 is situated 234 m to the south-east.	S 26° 02' 18.4" E 29° 13' 05.5"

Figure 17 – General view of a section of the structure.

Site 4	Rectangular foundation structure which seems to have been a farmhouse. It is associated with a number of other sites situated along a sandstone ridge which may have comprised a single farmstead. The site is certainly older than 60 years and quite likely older than 100 years.	**Medium**	Alternative 1 is situated 318 m to the south-east.	S 26° 02' 16.8" E 29° 13' 01.3"

Figure 18 – General view of a section of the structure.

Site 5	A massive oak tree appears to be associated with the historic farmstead. Three sandstone blocks observed at the base of the tree were used as weights in a historic method of tanning leather.	**Medium**	Alternative 1 is situated 255 m to the south-east.	S 26° 02' 19.6" E 29° 12' 59.5"

Figure 19 – General view of the old oak tree. Note two adult figures as scale.

Site 6	The remains of a rectangular farm worker structure are located here. The structure is 5 m by 3 m in extent and has a smaller structure to its west. Past experience has shown the cultural practice of burying stillborn babies in or adjacent to the homes of the parents. The possibility therefore exists for stillborn babies to lie buried here.	**Medium**	Alternative 1 is situated 50 m to the south.	S 26° 02' 26.2" E 29° 13' 00.8"

Figure 20 – General view of a section of the structure.

Site 7	An upright stone with a flat stone adjacent to it is located here. The stones appear to be old farm boundary posts. The site position is roughly 17 m from the boundary fence between the farms Klipplaat and Kleinkopje. From available archival and historical maps it would appear that this boundary line was only established between 1901 and 1913. This is said as the boundary line between the two farms as shown on the 1901 map is further to the south-west than what is indicated on the 1913 and later maps. It is clear that the site dates to between 1901 and 1913 old and is therefore between 102 and 114 years old.	**Medium**	Alternative 1 is situated 73 m to the north.	S 26° 02' 31.7" E 29° 12' 56.9"

Figure 21 – General view of the upright stone which would have been used as a farm boundary marker.

Site 8	A historic to recent cemetery is located here. The cemetery comprises roughly 20 graves.	**High**	The Preferred Alternative is located 193 m to the north-west.	S 26° 03' 09.3" E 29° 12' 35.6"

Figure 22 – General view of the cemetery.

7 PALAEONTOLOGY FINDINGS

7.1 Phase 1 Palaeontological Impact Assessment Study

This section was obtained from the Phase 1 Palaeontological Impact Assessment Report compiled by Dr. Gideon Groenewald.

Dr. Groenewald was appointed by PGS Heritage to undertake a Phase 1 Palaeontological Impact Assessment, assessing the potential palaeontological impact of the power line project near the town of Phola, near Witbank, Municipality, Mpumalanga Province. The power line is approximately 4km long and this study refers to areas where the palaeontology might be impacted on by the construction of the power line. As an experienced fieldworker, he visited the study area on Tuesday 2 December 2014 and Wednesday 3 December 2014 to assess the potential impact of the construction of the power line on the palaeontological heritage of the site. The topography of the study area is undulating, with the coal deposits associated with near horizontal bedding of shale beds, interbedded with the coarse-grained sandstone.

The proposed route of the power line is underlain by Permian aged sandstone and interbedded shale as well as very well developed coal beds of the Vryheid Formation, Ecca Group, Karoo Supergroup. Minor trace fossils are present in the deeply weathered coarse-grained sandstone layers. Well-defined plant remains were observed in the less-coalified deposits, mainly associated with the contact zones between shale beds and coal seams. The potential for finding well-defined plant fossils still remains high during excavation of pylon foundations in areas underlain by shale and the main shale zone have been allocated a High Palaeontological significance and it would be preferable that these areas are excluded when planning for the placing of pylons. Areas where excavation of pylon foundations might expose fossil-rich shale beds are allocated a Moderate Palaeontological significance and in areas where excavation will most probably only expose sandstone, a Low Palaeontological significance is allocated.

The Vryheid Formation is well-known for the occurrence of coal beds that resulted from the accumulation of plant material over long periods of time. Plant fossils described by Bamford (2011) from the Vryheid Formation are; *Azaniodendron fertile, Cyclodendron leslii, Sphenophyllum hammanskraalensis, Annularia sp., Raniganjia sp., Asterotheca spp., Liknopetalon enigmata, Glossopteris > 20 species, Hirsutum 4 spp., Scutum 4 spp., Ottokaria 3 spp., Estcourtia sp., Arberia 4 spp., Lidgetonnia sp., Noeggerathiopsis sp. and Podocarpidites sp.*

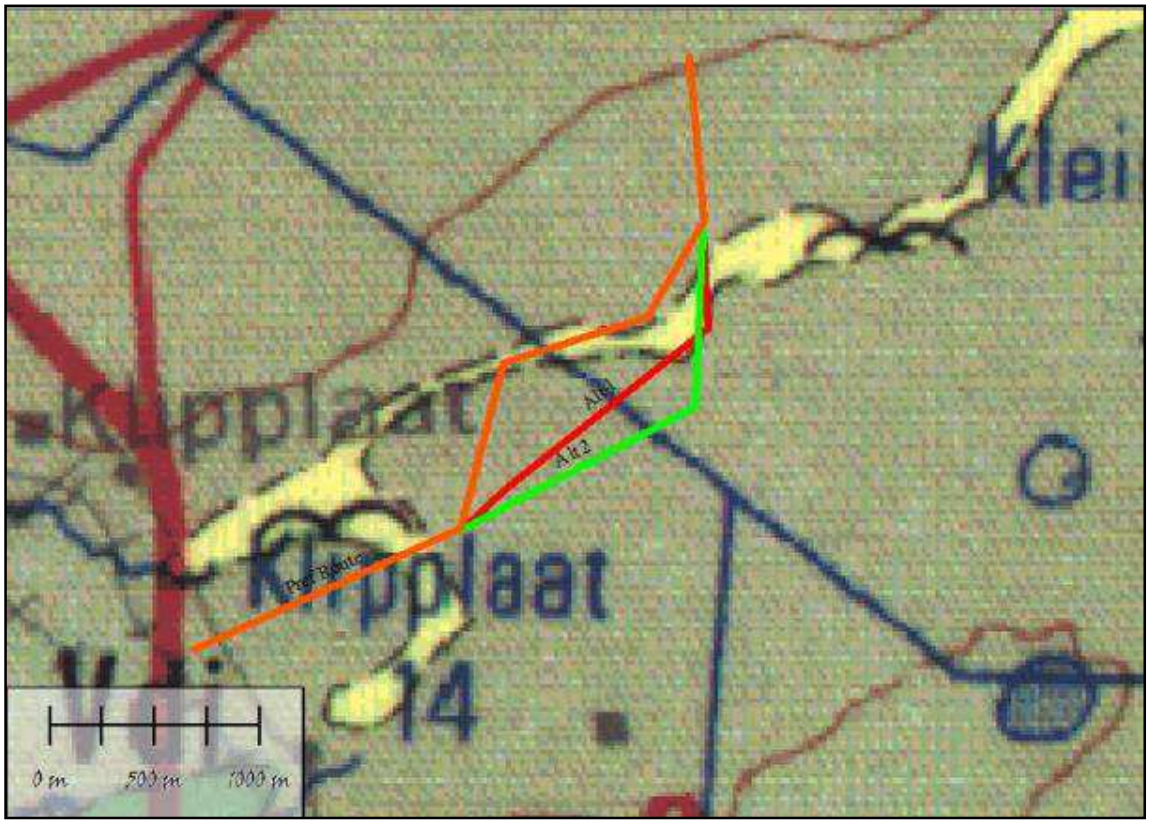


Figure 23 – Overlay of the three development alternatives relative to the geology of the area.

According to Bamford (2011), little data has been published on these potentially fossiliferous deposits. Good fossil material is likely around the coal mines and yet in other areas the exposures may be too poor to be of interest. When they do occur fossil plants are usually abundant and it would not be feasible to preserve and maintain all the sites. In the interests of heritage and science, however, such sites should be well recorded, sampled and the fossils kept in a suitable institution.

Although no vertebrate fossils have been recorded from the Vryheid Formation, invertebrate trace fossils have been described in some detail by Mason and Christie (1986). It should be noted, however, that the aquatic reptile, *Mesosaurus*, which is the earliest known reptile from the Karoo Basin, as well as fish (*Palaeoniscus capensis*), have been recorded in equivalent-aged strata in the Whitehill Formation in the southern part of the basin (MacRae, 1999). Indications are that the Whitehill Formation in the main basin might be correlated with the mid-Vryheid Formation. If this assumption proves correct, there is a possibility that Mesosaurus could be found in the Vryheid Formation.

The late Carboniferous to early Jurassic Karoo Supergroup of South Africa includes economically important coal deposits within the Vryheid Formation of Natal. The Karoo sediments are almost entirely lacking in body fossils but ichnofossils (trace fossils) are locally abundant. Modern sedimentological and ichnofaunal studies suggest that the north-eastern part of the Karoo basin was marine. In KwaZulu-Natal a shallow basin margin accommodated a prograding fluviodeltaic complex forming a broad sandy platform on which coal-bearing sediments were deposited. Ichnofossils include U-burrows (formerly *Corophioides*) which are assigned to ichnogenus *Diplocraterion* (Mason and Christie, 1986).

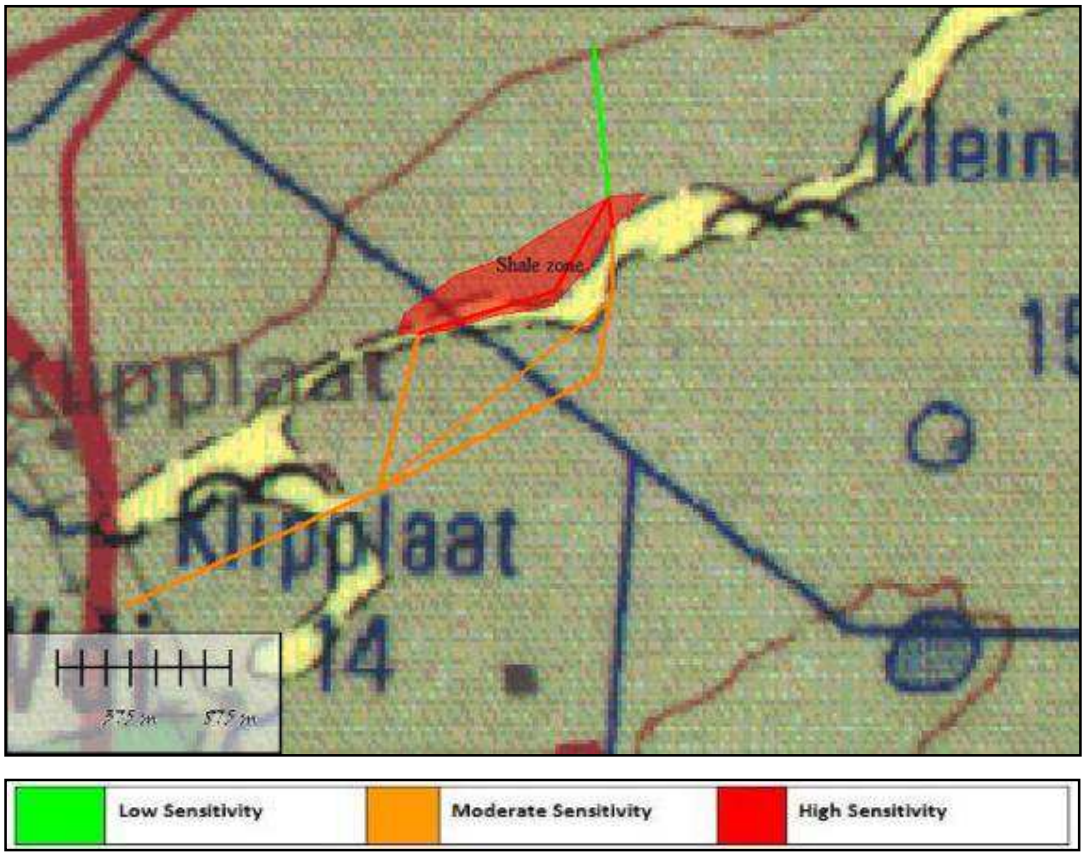


Figure 24 – Palaeosensitivity of the three development alternatives.

The preferred route for the new power line is the alternative that will ensure that no pylons are constructed in areas underlain by sensitive shale or wetland areas. At the time, three alternative routes were proposed for the development of the power line. The following mitigation measures will be needed for the different routes:

- The Preferred Route (now known as Alternative 1) is specifically underlain by the sensitive shale zone and mitigation along the route will require the appointment of a

professional palaeontologist who will have to apply for a collection and destruction permit for fossils from excavations sites for pylon foundations in the shale zones, on-site inspection of excavation and arranging for proper curation of fossils at an institute suggested by SAHRA.

- Alternatives 1 and 2 (now known as Alternatives 2 and 3) exclude the sensitive shale zone but shale might still be exposed during the excavation for pylon foundations. The mitigation proposed for these alternative routes is that the ECO should be informed of the possibility of sensitive shale being exposed during excavation of pylon foundations. If fossils are recorded during the excavation process, the palaeontologist must be informed and the appropriate applications made for permits from SAHRA as well as arrangements for the curation of fossils at the suggested institute.

Following the field investigation it is recommended that the best route to follow will be the option where no pylons are placed on the sensitive shale zone along the route. This route corresponds to Alternative Route 2 (now known as Alternative 3). It is recommended that pylons be placed outside of the shale zones as well as the wetland areas. If excavation for pylon foundations do expose shale of the Vryheid Formation, the ECO must inspect the sites and if fossils are recorded, the palaeontologist must be informed for appropriate action to get SAHRA permission for the collection and, if necessary, destruction of fossils and appropriate curation thereof at an accredited institution.

Figure 25 – Preferred route for the power line where least impact will be made on the palaeontological heritage.

In conclusion it can be stated that the proposed route of the power line is underlain by Permian aged sandstone and interbedded shale as well as very well developed coal beds of the Vryheid Formation, Ecca Group, Karoo Supergroup. Minor trace fossils are present in the deeply weathered coarse-grained sandstone layers. Well-defined plant remains were observed in the less-coalified deposits, mainly associated with the contact zones between shale beds and coal seams. The potential for finding well-defined plant fossils still remains high during excavation of pylon foundations in areas underlain by shale and the main shale zone have been allocated a High Palaeontological significance. It would be preferable that these areas are excluded when planning for the placing of pylons. Areas where excavation of pylon foundations might expose fossil-rich shale beds are allocated a Moderate Palaeontological significance and in areas where excavation will most probably only expose sandstone, a Low Palaeontological significance is allocated.

From a palaeontological view the preferred route for the new power line is Alternative 2 (now known as Alternative 3).

It was recommended that:

1. The ECO of the project be informed of the possibility of finding well-defined plant fossils in the areas underlain by shale.
2. An application for a collection and destruction permit be made to SAHRA to allow for the collection and destruction of plant fossils during excavation of pylon foundations in areas underlain by shale.
3. If any exceptionally well-defined fossils are observed during excavations, the developer must employ a qualified palaeontologist to record these fossils and collect representative samples of these fossils for further study at an appropriate institute such as the Origins Centre at WITS University.

7.2 Palaeontological Monitoring during Geotechnical Assessment

Following the Phase 1 field assessment it was recommended that a field assessment must be made during the geotechnical investigations to assess the actual palaeontological sensitivity of the preferred route. This report summarizes the observations made by David Groenewald, an experienced field worker, during the geotechnical investigation on Tuesday, 3 March 2015.

Figure 26 – The Preferred Route (new alignment) assessed during the study is depicted in red

Observations made during the investigation include the plant fossils associated with the highly coalified seams consists mainly of carbonised wood fragments and secondly that no significant fossils were observed during this investigation. The subsequent report came to the following conclusion: *"The desktop study suggests that the study area is underlain by sedimentary deposits of the Permian aged Vryheid Formation of the Ecca Group, Karoo Supergroup, and it was expected that it would thus be highly sensitive from a palaeontological heritage perspective. Due to the lack of outcrop, it was recommended that a palaeontological investigation must be done during the geotechnical investigations in areas of potentially high palaeontological significance. This investigation confirmed that, although plant fossils are associated with the coal seams, they are not well preserved and therefore of lesser palaeontological significance as predicted. Any well-defined plant fossils that are observed during excavation of foundations for the pylons, must however be reported to the ECO."*

The second palaeontological report also provided the following recommendations:

"1. The ECO of the project be informed of the slight possibility of finding well-defined plant fossils in the areas underlain by shale.

2. No further mitigation for Palaeontological heritage is needed.

3. If any exceptionally well-defined fossils are observed during excavations, the developer must employ a qualified palaeontologist to record these fossils and collect representative samples of these fossils for further study according to SAHRA recommendations."

8 IMPACT OF PROPOSED DEVELOPMENT ON HERITAGE RESOURCES

In this section the relative impacts of the proposed developments on the two sites that were identified in proximity to the footprint areas will be calculated.

8.1 Development Impact of the Preferred Alternative on the Identified Heritage Resources

8.1.1 Risk Calculation for the Development Impact of the Preferred Alternative on Site 1

In this section the impact of the proposed development of the Preferred Alternative on Site 1 will be established. As shown elsewhere, Site 1 is located on both sides of the Preferred Alternative route.

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

$$\text{Impact Risk} = \frac{(2 + 2 + 3)}{3} \times \frac{3}{5}$$

IMPACT RISK = 1.4

Table 10: Risk Calculation for Development Impact of the Preferred Alternative on Site 1

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	Low	Study Area	Medium-Term	Could Happen	**Low**
Impact on Site 1	2	2	3	3	**1.4**

This calculation has revealed that the impact risk of the proposed development of the Preferred Alternative on Site 1 falls within Impact Class 2, which represents a Low Impact Risk. As a result no mitigation would be required.

8.1.2 Risk Calculation for the Development Impact of the Preferred Alternative on Site 2

In this section the impact of the proposed development of the Preferred Alternative on Site 2 will be established. As shown elsewhere, Site 2 is located 30 m from its nearest point on the Preferred Alternative, and is 60 m from a corner on this line alternative where a pylon will have to be erected.

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

$$\text{Impact Risk} = \frac{(4 + 4 + 3)}{3} \times \frac{2}{5}$$

IMPACT RISK = 2.2

Table 10: Risk Calculation for Development Impact of the Preferred Alternative on Site 2

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	High	Regional / Provincial	Medium-Term	Unlikely	**Low**
Impact on Site 2	4	4	3	2	**1.5**

This calculation has revealed that the impact risk of the proposed development of the Preferred Alternative on Site 2 falls within Impact Class 2, which represents a Low Impact Risk. As a result no mitigation would be required.

8.2 Development Impact of Alternative 1 on the Identified Heritage Resources

8.2.1 Risk Calculation for the Development Impact of the Alternative 1 on Site 1

In this section the impact of the proposed development of the Alternative 1 on Site 1 will be established. As shown elsewhere, Site 1 is located on both sides of the Alternative 1 route.

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

$$\text{Impact Risk} = \frac{(2 + 2 + 3)}{3} \times \frac{3}{5}$$

IMPACT RISK = 1.4

Table 10: Risk Calculation for Development Impact of the Alternative 1 on Site 1

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	Low	Study Area	Medium-Term	Could Happen	**Low**
Impact on Site 1	2	2	3	3	**1.4**

This calculation has revealed that the impact risk of the proposed development of Alternative 1 on Site 1 falls within Impact Class 2, which represents a Low Impact Risk. As a result no mitigation would be required.

8.2.2 Risk Calculation for the Development Impact of Alternative 1 on Site 2

In this section the impact of the proposed development of Alternative 1 on Site 2 will be established. As shown elsewhere, Site 2 is located 15 m from its nearest point on the Alternative 1 route, and is 22.8 m from a corner on this line alternative where a pylon will have to be erected.

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

$$\text{Impact Risk} = \frac{(4 + 4 + 3)}{3} \times \frac{3}{5}$$

IMPACT RISK = 2.2

Table 10: Risk Calculation for Development Impact of the Alternative 1 on Site 2

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	High	Regional / Provincial	Medium-Term	Could Happen	**Moderate**
Impact on Site 2	4	4	3	3	**2.2**

This calculation has revealed that the impact risk of the proposed development of Alternative 1 on Site 2 falls within Impact Class 3, which represents a Moderate Impact Risk. As a result mitigation would be required. Refer Section 9 for more details.

8.3 Development Impact of Alternative 2 on the Identified Heritage Resources

No heritage resources were identified within or in close proximity to Alternative 2. As a result this impact risk is zero.

8.4 Development Impact of Alternative 3 on the Identified Heritage Resources

No heritage resources were identified within or in close proximity to Alternative 3. As a result this impact risk is zero.

8.5 Summary of Impact Risk Assessments

The impact risks calculated in this section have resulted in the following conclusions:

- The development of the Preferred Alternative will have a Low Impact Risk on Site 1. As a result no mitigation would be required.
- The development of the Preferred Alternative will have a Low Impact Risk on Site 2. As a result no mitigation would be required.
- The development of Alternative 1 will have a Low Impact Risk on Site 1. As a result no mitigation would be required.
- The development of Alternative 1 will have a Moderate Impact Risk on Site 2. As a result mitigation would be required.
- The development of Alternative 2 will have a Zero Impact Risk on the identified Heritage Resources. No mitigation would be required.
- The development of Alternative 3 will have a Zero Impact Risk on the identified Heritage Resources. No mitigation would be required.

It is clear from this section that the Preferred Alternative, Alternative 2 as well as Alternative 3 will represent the lowest impact on any of the identified heritage resources. The development of Alternative 1 will result in the highest impact risk.

9 MITIGATION MEASURES AND GENERAL RECOMMENDATIONS

9.1 Mitigation Measures Required for the Identified Heritage Resources

The following mitigation measures are required in terms of Identified Heritage Sites. As it is only Alternative 1 which has the potential to represent a moderate impact on any of the identified sites (Site 2), the mitigation measures required for this site in terms of this

development alternative will be outlined below. If any of the other three alternatives are decided upon, the mitigation measures for Site 2 outlined below will not be required.

9.1.1 Mitigation Measures Required for the Development Impact Risk on Site 2

- Preliminary social consultation to attempt to identify the former residents of the homestead. This process may include the use of bilingual site notices, bilingual newspaper notices as well as consultation with local residents. This process may result in one of three outcomes.

    - If the social consultation process identified the presence of one or more infant burials at a particular homestead, a formal grave relocation process must be undertaken which would include obtaining permission from the family of the deceased for the relocation to take place, the necessary permit applications, excavation as well as reburial to a municipal cemetery.
    - If the social consultation process revealed that no infant burials are located at a particular homestead, no further mitigation measures would be required there.
    - If no information with regard to the former residents of these homesteads is revealed by way of the preliminary social consultation, Ground Penetrating Radar Scans augmented by archaeological test excavations must be undertaken around the homestead structure to assess whether any infant burials are located here.

9.2 Mitigation Measures Required for Palaeontology

The mitigation measures outlined here would be relevant for any of the alternatives:

- The ECO of the project must be informed of the slight possibility of finding well-defined plant fossils in the areas underlain by shale.

- No further mitigation for Palaeontological heritage is needed.

- If any exceptionally well-defined fossils are observed during excavations, the developer must employ a qualified palaeontologist to record these fossils and collect representative samples of these fossils for further study according to SAHRA recommendations.

10 CONCLUSIONS

PGS Heritage was appointed by Aurecon to undertake a Heritage Impact Assessment (HIA) which forms part of the Environmental Impact Assessment (EIA) for the proposed rerouting of a section of the Hendrina - Kriel Transmission Line located on Portions of the farms Klipplaat 14 IS and Kleinkopje 15 IS, Nkangala District Municipality, Mpumalanga Province.

At the moment four development alternatives are proposed, namely the Preferred Alternative (Alternative 1a), Alternative 1, Alternative 2 and Alternative 3. All four alternatives were assessed as part of this heritage impact assessment study.

An archival and historical desktop study was undertaken which was used to compile a historical layering of the study area within its regional context. This component indicated that the landscape within which the project area is located has a rich and diverse history and included aspects relating to the farming and mining history of the area.

The desktop study work was followed by fieldwork, which comprised a walkthrough of the study area by an archaeologist as well as a palaeontologist. The archaeologist identified eight heritage sites including an old brickyard, two farm worker dwellings, an old shed, the remains of an old farmhouse, an old oak tree as well as a cemetery. Two of these sites were found to be located within 25 m of the proposed transmission line footprints, namely the old brickyard as well as one of the two farm worker dwellings.

The palaeontological fieldwork has revealed that the study area is underlain by Permian aged sandstone and interbedded shale as well as very well developed coal beds of the Vryheid Formation, Ecca Group, Karoo Supergroup. Minor trace fossils are present in the deeply weathered coarse-grained sandstone layers. Well-defined plant remains were observed in the less-coalified deposits, mainly associated with the contact zones between shale beds and coal seams. At the time of the field assessment, the potential for finding well-defined plant fossils during excavation of pylon foundations in areas underlain by shale was estimated to be high and the main shale zone had been allocated a High Palaeontological significance. The Phase 1 Palaeontological Report recommended that it would be preferable that these areas are excluded when planning for the placing of pylons. At the time those areas where excavation of pylon foundations might expose fossil-rich shale beds were allocated a Moderate

Palaeontological significance and in areas where excavation will most probably only expose sandstone, a Low Palaeontological significance is allocated.

However, a Palaeontological Field Assessment was conducted during the geotechnical investigation of the pylon positions of the Preferred Alternative. The subsequent report came to the following conclusion: *"The desktop study suggests that the study area is underlain by sedimentary deposits of the Permian aged Vryheid Formation of the Ecca Group, Karoo Supergroup, and it was expected that it would thus be highly sensitive from a palaeontological heritage perspective. Due to the lack of outcrop, it was recommended that a palaeontological investigation must be done during the geotechnical investigations in areas of potentially high palaeontological significance. This investigation confirmed that, although plant fossils are associated with the coal seams, they are not well preserved and therefore of lesser palaeontological significance as predicted. Any well-defined plant fossils that are observed during excavation of foundations for the pylons, must however be reported to the ECO."*

The second palaeontological report also provided the following recommendations:

> *"1. The ECO of the project be informed of the slight possibility of finding well-defined plant fossils in the areas underlain by shale.*
> *2. No further mitigation for Palaeontological heritage is needed.*
> *3. If any exceptionally well-defined fossils are observed during excavations, the developer must employ a qualified palaeontologist to record these fossils and collect representative samples of these fossils for further study according to SAHRA recommendations."*

Impact risk calculations were undertaken on the expected impact of the four development alternatives on the identified heritage sites. Based on this mitigation measures were proposed.

It is clear from this section that the Preferred Alternative, Alternative 2 as well as Alternative 3 will represent the lowest impact on any of the identified heritage resources. The development of Alternative 1 will result in the highest impact risk.

On the condition that the recommendations made in this report are adhered to, no heritage reasons can be given for the development not to continue.

11 REFERENCES

Published References

Bergh, J.S. 1995. We Must Never Forget Where We Come From: The Bafokeng and Their Land in 19th Century Transvaal. *History in Africa*, Vol. 32 (2005), pp. 95 – 115.

Bergh, J.S. (ed.). 1999. *Geskiedenis Atlas van Suid-Afrika: Die Vier Noordelike Provinsies*. J.L. van Schaik. Pretoria.

Carruthers, V. 2007. The Magaliesberg. Protea Book House, Pretoria.

Erasmus, B.J. *On Route in South Africa*. Jonathan Ball Publishers, Johannesburg.

Huffman, T.N. 2007. *Handbook to the Iron Age: The archaeology of Pre-Colonial Farming Societies in Southern Africa*. University of KwaZulu-Natal Press, Scottsville.

Machens, E.W. 2009. *Platinum, Gold and Diamonds: The adventure of Hans Merensky's discoveries*. Protea Book House, Pretoria.

Mason, R.J. 1973. Iron Age Research in the Western Transvaal, South Africa. *Current Anthropology*, Vol. 14, No. 4 (Oct. 1973), pp. 485-487.

Mbenga, B. & A. Manson. 2010. *People of the Dew: A History of the Bafokeng of Rustenburg District, South Africa from Early Times to 2000*. Jacana Media (Pty) Ltd, Johannesburg.

Mokgatle, N. 1971. *The Autobiography of an Unknown South African*. London.

Pistorius, J.C.C. 1999. Spatial identity and expressions in a stone walled complex on Kroondal. *South African Journal of Ethnology,* 22(3), pp. 116 – 128.

Rosenthal, E. 1979. *Rustenburg Romance: The History of a Voortrekker Town*. Perskor Publishers, Johannesburg.

South African Mining Yearbook, 1941/2. *The South African Mining Journal Syndicate*, Johannesburg.

Hall, S., Anderson, M, Boeyens, J. & F. Coetzee. 2008. Towards an outline of the oral geography, historical identity and political economy of the Late Precolonial Tswana in the Rustenburg region in Swanepoel, N., Esterhuizen, A. & P. Bonner. 2008. *Five Hundred Years Rediscovered: Southern African Precedents and Prospects*. Wits University Press, Johannesburg.

Johannesburg Consolidated Investment Company, 1965. *The Story of 'Johnnies': 1889 - 1964*. JCI, Johannesburg.

Wagner, P.A. 1973. *Platinum Deposits and Mines of South Africa*. C. Struik (Pty) Ltd, Cape Town.

Wulfsohn, L. 1992. *Rustenburg at War: The Story of Rustenburg and its Citizens in the First and Second Anglo-Boer Wars*. L.M. Wulfsohn, Rustenburg.

Unpublished References

ARM, 2005. *The Archaeology of the Anglo Platinum Lease Area*. An unpublished report by Professor Tom Huffman of Archaeological Resources Management, University of the Witwatersrand. On file at SAHRA.

National Cultural History Museum, 1997. *A Survey of Cultural Resources on the Farm Kroondal 304 JQ, East of Rustenburg*. An unpublished report by Dr. J.A. van Schalkwyk and A. Pelser of the National Cultural History Museum, Pretoria. On file at SAHRA.

Archival References

MNW, 876, MM804/27

Historic Topographic Maps

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

Google Earth

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

Appendix A

LEGISLATIVE REQUIREMENTS – TERMINOLOGY AND ASSESSMENT CRITERIA

General principles

In areas where there has not yet been a systematic survey to identify conservation worthy places, a permit is required to alter or demolish any structure older than 60 years. This will apply until a survey has been done and identified heritage resources are formally protected.

Archaeological and palaeontological sites, materials, and meteorites are the source of our understanding of the evolution of the earth, life on earth and the history of people. In terms of the heritage legislation, permits are required to damage, destroy, alter, or disturb them. Furthermore, individuals who already possess heritage material are required to register it. The management of heritage resources is integrated with environmental resources and this means that, before development takes place, heritage resources are assessed and, if necessary, rescued.

In addition to the formal protection of culturally significant graves, all graves which are older than 60 years and are not located in a cemetery (such as ancestral graves in rural areas), are protected. The legislation also protects the interests of communities that have an interest in the graves: they should be consulted before any disturbance takes place. The graves of victims of conflict and those associated with the liberation struggle are to be identified, cared for, protected and memorials erected in their honour.

Anyone who intends to undertake a development must notify the heritage resources authority and, if there is reason to believe that heritage resources will be affected, an impact assessment report must be compiled at the construction company's cost. Thus, the construction company will be able to proceed without uncertainty about whether work will have to be stopped if an archaeological or heritage resource is discovered.

According to the National Heritage Act (Act 25 of 1999 section 32) it is stated that:

An object or collection of objects, or a type of object or a list of objects, whether specific or generic, that is part of the national estate and the export of which SAHRA deems it necessary to control, may be declared a heritage object, including –

- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects, meteorites and rare geological specimens;

- visual art objects;
- military objects;
- numismatic objects;
- objects of cultural and historical significance;
- objects to which oral traditions are attached and which are associated with living heritage;
- objects of scientific or technological interest;
- books, records, documents, photographic positives and negatives, graphic material, film or video or sound recordings, excluding those that are public records as defined in section 1 (xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996), or in a provincial law pertaining to records or archives; and
- any other prescribed category.

Under the National Heritage Resources Act (Act No. 25 of 1999), provisions are made that deal with, and offer protection to, all historic and prehistoric cultural remains, including graves and human remains.

Graves and cemeteries

Graves younger than 60 years fall under Section 2(1) of the Removal of Graves and Dead Bodies Ordinance (Ordinance no. 7 of 1925) as well as the Human Tissues Act (Act 65 of 1983) and are under the jurisdiction of the National Department of Health and the relevant Provincial Department of Health and must be submitted for final approval to the Office of the relevant Provincial Premier. This function is usually delegated to the Provincial MEC for Local Government and Planning, or in some cases the MEC for Housing and Welfare. Authorisation for exhumation and reinternment must also be obtained from the relevant local or regional council where the grave is situated, as well as the relevant local or regional council to where the grave is being relocated. All local and regional provisions, laws and by-laws must also be adhered to. In order to handle and transport human remains, the institution conducting the relocation should be authorised under Section 24 of Act 65 of 1983 (Human Tissues Act).

Graves older than 60 years, but younger than 100 years, fall under Section 36 of Act 25 of 1999 (National Heritage Resources Act) as well as the Human Tissues Act (Act 65 of 1983) and are under the jurisdiction of the South African Heritage Resources Agency (SAHRA). The procedure for Consultation regarding Burial Grounds and Graves (Section 36(5) of Act 25 of 1999) is applicable to graves older than 60 years that are situated outside a formal cemetery administrated by a local authority. Graves in the category located inside a formal cemetery administrated by a local authority will also require the same authorisation as set out for graves younger than 60 years, over and above SAHRA authorisation.

If the grave is not situated inside a formal cemetery but is to be relocated to one, permission from the local authority is required and all regulations, laws and by-laws set by the cemetery authority must be adhered to.

Appendix B

PHASE 1 PALAEONTOLOGICAL IMPACT ASSESSMENT REPORT

PHASE 1 PALAEONTOLOGICAL IMPACT ASSESSMENT DURING GEOTECHNICAL INVESTIGATION FOR THE CONSTRUCTION OF A NEW POWER LINE ON THE FARMS KLEINKOPJE 15 IS AND KLIPPLAAT 14 IS, NEAR THE TOWN OF WITBANK IN MPUMALANGA PROVINCE

For:

HIA CONSULTANTS

DATE: 4 March 2015

By

GIDEON GROENEWALD

EXECUTIVE SUMMARY

Gideon Groenewald was appointed by PSG Heritage and Grave Relocation Consultants to undertake a Phase 1 PIA during the geotechnical investigation of the preferred route of a new power line on the Farms Kleinkopje 15 IS and Klipplaat 14 IS Near Witbank, Mpumalanga Province. The power line is approximately 4km long and this study refers to areas where the palaeontology might be impacted on by the construction of the power line.

This report forms part of the Environmental Impact Assessment and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999. In accordance with Section 38 (Heritage Resources Management), a Heritage Impact Assessment (HIA) is required to assess any potential impacts to palaeontological heritage within the development footprint of the development.

Prior to this field investigation a preliminary assessment (desktop study) of the topography and geology of the study area was made using appropriate 1:250 000 geological maps (2628 East Rand) in conjunction with Google Earth. Potential fossiliferous rock units (groups, formations etc) were identified within the study area and the known fossil heritage within each rock unit was inventoried from the published scientific literature, previous palaeontological impact studies in the same region and the author's field experience. The desktop survey was followed by a detailed field assessment and Phase 1 PIA report with recommendations regarding the most sensitive routes.

Following the Phase 1 field assessment it was recommended that a field assessment must be made during the geotechnical investigations to assess the actual palaeontological sensitivity of the preferred route. This report summarizes the observations made during the geotechnical investigation.

David Groenewald, an experienced field worker, accompanied the Geotechnical team on Tuesday 3 March 2015 to investigate possible fossil finds associated with excavations into the Vryheid Formation.

The proposed route of the power line is underlain by Permian aged sandstone and interbedded shale as well as very well developed coal beds of the Vryheid Formation, Ecca Group, Karoo Supergroup. Minor trace fossils are present in the deeply weathered coarse-grained sandstone layers. Poorly defined plant remains were observed in the less-coalified deposits, mainly associated with the contact zones between shale beds and coal seams. The potential for finding well-defined plant fossils still remains relatively high during excavation of pylon foundations in areas underlain by shale and if fossils are exposed during excavation into the shale, the ECO and palaeontologist must be informed for appropriate action.

It is recommended that:

1. The ECO of the project be informed of the slight possibility of finding well-defined plant fossils in the areas underlain by shale.
2. No further mitigation for Palaeontological heritage is needed.
3. If any exceptionally well-defined fossils are observed during excavations, the developer must employ a qualified palaeontologist to record these fossils and collect representative samples of these fossils for further study according to SAHRA recommendations

TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

1.1. Background

Gideon Groenewald was appointed by PSG Heritage and Grave Relocation Consultants to undertake a Phase 1 PIA during the geotechnical investigation of the preferred route of a new power line on the Farms KLEINKOPJE 15 IS and KLIPPLAAT 14 IS Near Witbank, Mpumalanga Province. The power line is approximately 4km long and this study refers to areas where the palaeontology might be impacted on by the construction of the power line.

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Prior to this field investigation a preliminary assessment (desktop study) of the topography and geology of the study area was made using appropriate 1:250 000 geological maps (2628 East Rand) in conjunction with Google Earth. Potential fossiliferous rock units (groups, formations etc) were identified within the study area and the known fossil heritage within each rock unit was inventoried from the published scientific literature, previous palaeontological impact studies in the same region and the author's field experience. The desktop survey was followed by a detailed field assessment and Phase 1 PIA report with recommendations regarding the most sensitive routes.

Following the Phase 1 field assessment it was recommended that a field assessment must be made during the geotechnical investigations to assess the actual palaeontological sensitivity of the preferred route. This report summarizes the observations made by David Groenewald, an experienced field worker, during the geotechnical investigation on Tuesday 3 March 2015.

1. DESCRIPTION OF THE PROPOSED DEVELOPMENT

The project involves the construction of a new power line of approximately 12 km on the farms Kleinkopje 15 IS and Klipplaat 14 IS (Figure 2.1). The route preferred by the developer is indicated in red in Figure 2.1.

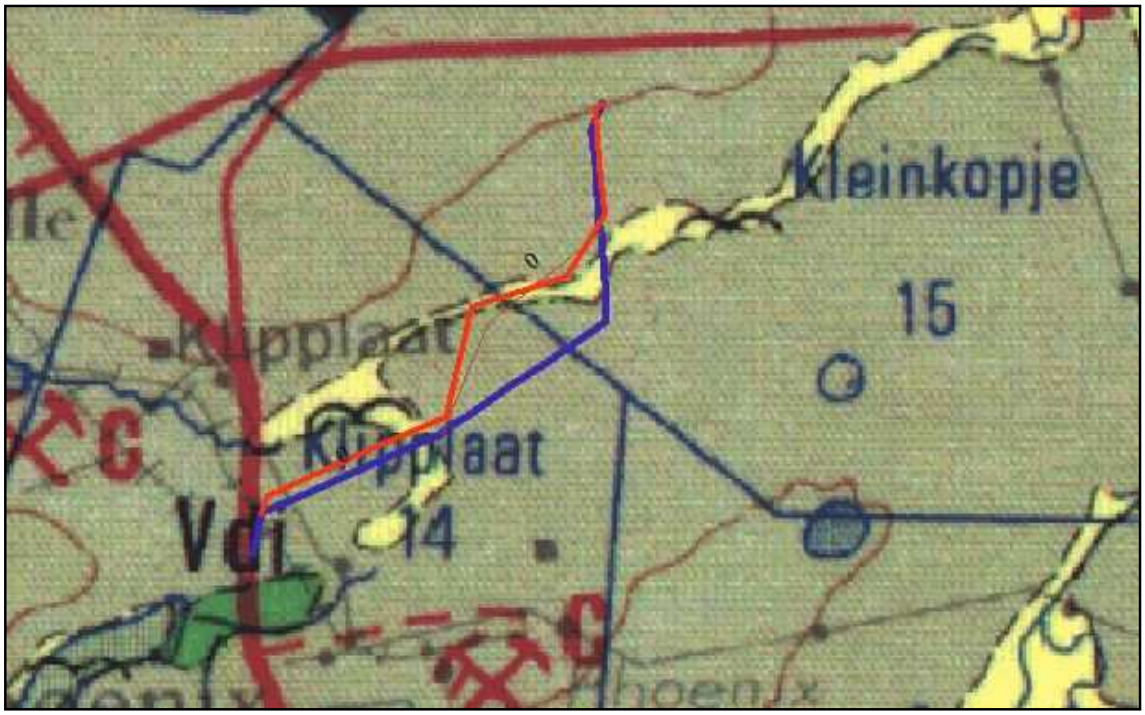

Figure 1.1 Preferred route indicated in red.

Observations made during the investigation include:

- Plant fossils associated with the highly coalified seams consists mainly of carbonised wood fragments.
- No significant fossils were observed during this investigation.

2. PHOTOGRAPHIC RECORD

During the field investigation a photographic record was compiled of all the observations made along the route of the power line (Table 7.1)

Table 2.1 Photographic record of observations

GPS	Photos	Description
HL1 Pylon 12 26° 01’ 45.9”S 29° 13’ 19.3”E		Deep soil. Deeply weathered shale of the Vryheid Formation
		
HL2 Pylon 12 26° 01’ 46.3”S 29° 13’ 19.5”E		Deep soil forming from the weathering of the shales in the Vryheid Formation

		Deeply weathered shale of the Vryheid Formation
HL3 Pylon 11 26° 01’ 58.8”S 29° 13’ 20.4”E		Deeply weathered shale and sandstone of the Vryheid Formation. No significant fossils observed.
HL4 Pylon 11 26° 01’ 58”S 29° 13’ 20.7”E		Deep soils on the shale of the Vryheid Formation. No significant fossils observed.
HL5 Pylon 10 26° 02’ 10.1”S 29° 13’ 21.4”E		Shallow soils <1m to bedrock. Coarse grained sandstone of the Vryheid Formation. No fossils observed.

HL6 Pylon 10 26° 02’ 1-.2”S 29° 13’ 21”E		Shallow soils <1m to bedrock. Coarse Grained sandstone. No fossils
HL7 Pylon 9 26° 02’ 19.3”S 29° 13’ 17.3”E		
		

		Carboniferous shale. Partly coalified. No significant fossils observed due to weathering
		Highly weathered shale of the Vryheid Formation.
		Coarse-grained Sandstone of the Vryheid Formation
HL8 Pylon 9 26° 02’ 19.4”S 29° 13’ 17.7”E		Deep sandy soil on the Vryheid Formation sandstone. No significant fossils observed.

		Deeply weathered sandstone of the Vryheid Formation, no significant fossils observed.
HLC Coal on surface		Coal-rich outcrop. No significant fossils observed.
HL9 Pylon 8 26° 02’ 25”S 29° 13’ 14.7”E		Deep soils on the Vryheid Formation. No significant fossils observed.
		Sandy soils on the Vryheid Formation. No significant fossils observed in the exposed sandstone.

HL10 Pylon 8 26° 02’ 25.4”S 29° 13’ 15”E		Deep sandy soils on sandstone of the Vryheid Formation. No significant fossils observed.
		Profile into deep sandy soils of the Vryheid Formation. No significant fossils observed.
HL11 Pylon 7 26° 02’ 27.4”S 29° 13’ 03.6”E		Sandstone exposed with no significant fossils.

HL12 Pylon 7 26° 02’ 27.8”E 29° 13’ 03.6”E		Excavated sandstone outcrop of the Vryheid Formation with no significant fossils.
		Deep sandy soils of the Vryheid Formation with no significant fossils.

3. PALAEONTOLOGICAL SENSITIVITY AND SIGNIFICANCE

The desktop study suggests that the study area is underlain by sedimentary deposits of the Permian aged Vryheid Formation of the Ecca Group, Karoo Supergroup, and it was expected that it would thus be highly sensitive from a palaeontological heritage perspective. Due to the lack of outcrop, it was recommended that a palaeontological investigation must be done during the geotechnical investigations in areas of potentially high palaeontological significance. This investigation confirmed that, although plant fossils are associated with the coal seams, they are not well preserved and therefore of lesser palaeontological significance as predicted.

Any well-defined plant fossils that are observed during excavation of foundations for the pylons, must however be reported to the ECO.

4. MITIGATION MEASURES

It is proposed that no further palaeontological mitigation is needed for the excavation of foundations for the power line. If any well-defined plant fossils are however exposed during excavations, the finds must be reported to the ECO and palaeontologist for appropriated action.

5. CONCLUSION AND RECOMMENDATIONS

The proposed route of the power line is underlain by Permian aged sandstone and interbedded shale as well as very well developed coal beds of the Vryheid Formation, Ecca Group, Karoo Supergroup. Minor trace fossils are present in the deeply weathered coarse-grained sandstone layers. Poorly defined plant remains were observed in the less-coalified deposits, mainly associated with the contact zones between shale beds and coal seams. The potential for finding well-defined plant fossils still remains relatively high during excavation of pylon foundations in areas underlain by shale and if fossils are exposed during excavation into the shale, the ECO and palaeontologist musty be informed for appropriate action.

It is recommended that:

1. The ECO of the project be informed of the slight possibility of finding well-defined plant fossils in the areas underlain by shale.
2. No further mitigation for Palaeontological heritage is needed.
3. If any exceptionally well-defined fossils are observed during excavations, the developer must employ a qualified palaeontologist to record these fossils and collect representative samples of these fossils for further study according to SAHRA recommendations.

6. REFERENCES

Johnson MR, Anhausser CR and Thomas RJ. 2006. The Geology of South Africa. Geological Society of South Africa.

7. QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

Dr Gideon Groenewald has a PhD in Geology from the University of Port Elizabeth (Nelson Mandela Metropolitan University) (1996) and the National Diploma in Nature Conservation from Technicon RSA (the University of South Africa) (1989). He specialises in research on South African Permian and Triassic sedimentology and macrofossils with an interest in biostratigraphy, and palaeoecological aspects. He has extensive experience in the locating of fossil material in the Karoo Supergroup and has more than 20 years of experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the southern, western, eastern and north-eastern parts of the country. His publication record includes multiple articles in internationally recognized journals. Dr Groenewald is accredited by the Palaeontological Society of Southern Africa (society member for 25 years).

8. DECLARATION OF INDEPENDENCE

I, Gideon Groenewald, declare that I am an independent specialist consultant and have no financial, personal or other interest in the proposed development, nor the developers or any of their subsidiaries, apart from fair remuneration for work performed in the delivery of palaeontological heritage assessment services. There are no circumstances that compromise the objectivity of my performing such work.

Dr Gideon Groenewald
Geologist

Appendix C

PALAEONTOLOGICAL MONITORING REPORT