

**Cultural heritage impact assessment for
THE DEVELOPMENT OF THE PROPOSED PROTEA SOLAR POWER PLANT ON
A PORTION OF THE FARM HARTSBOOM 734, VRYBURG REGION,
NORTH WEST PROVINCE**

CULTURAL HERITAGE IMPACT ASSESSMENT FOR THE DEVELOPMENT OF THE PROPOSED PROTEA SOLAR POWER PLANT ON A PORTION OF THE FARM HARTSBOOM 734, VRYBURG REGION, NORTH WEST PROVINCE

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Declaration:

I, J.A. van Schalkwyk, declare that I do not have any financial or personal interest in the proposed development, nor its developers or any of their subsidiaries, apart from the provision of heritage assessment and management services, for which a fair numeration is charged.



J A van Schalkwyk (D Litt et Phil)
Heritage Consultant
January 2016

EXECUTIVE SUMMARY

CULTURAL HERITAGE IMPACT ASSESSMENT FOR THE DEVELOPMENT OF THE PROPOSED PROTEA SOLAR POWER PLANT ON A PORTION OF THE FARM HARTSBOOM 734, VRYBURG REGION, NORTH WEST PROVINCE

Protea Solar Power Plant (RF) (Pty) Ltd intends to develop up to 115MW solar power plant and associated infrastructure on the farm Hartsboom 734, Registration Division HN, North West situated within the Naledi Local Municipality area of jurisdiction.

In accordance with Section 38 of the NHRA, an independent heritage consultant was appointed by Protea Solar Power Plant (RF) (Pty) Ltd to conduct a cultural heritage assessment to determine if the prospecting activities would have an impact on any sites, features or objects of cultural heritage significance.

The cultural landscape qualities of the region is made up of a pre-colonial element consisting of limited Stone Age occupation, as well as a much later colonial (farmer) component, which gave rise to an urban component.

Identified sites

- A small isolated area where a very low density of Middle Stone Age and Later Stone Age stone tools occur was identified in the study area.

Impact assessment

Impact analysis of cultural heritage resources under threat of the proposed development, is based on the present understanding of the development:

- Due to the low density of the Stone Age material, the overall impact on the site is seen as acceptable and the proposed mitigation measures to be incorporated into the EMP will provide the necessary actions to address impacts.
 - This site is seen to be fully recorded after inclusion in this report and no further action is required.

Reasoned opinion as to whether the proposed activity should be authorised:

- From a heritage point of view it is recommended that the proposed development be allowed to continue.

Conditions for inclusion in the environmental authorisation:

- Should archaeological sites or graves be exposed during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.



J A van Schalkwyk
Heritage Consultant
January 2016
Revised: August 2016

TECHNICAL SUMMARY

Property details						
Province	North West					
Magisterial district	Vryburg					
Local municipality	Naledi					
Topo-cadastral map	2724BA, 2724BB					
Farm name	Hartsboom 734					
Closest town	Vryburg					
Coordinates	Centre point					
	No	Latitude	Longitude	No	Latitude	Longitude
	1	S 27.07120	E 24.74580			

Development criteria in terms of Section 38(1) of the NHR Act	Yes/No
Construction of road, wall, power line, pipeline, canal or other linear form of development or barrier exceeding 300m in length	No
Construction of bridge or similar structure exceeding 50m in length	No
Development exceeding 5000 sq m	Yes
Development involving three or more existing erven or subdivisions	No
Development involving three or more erven or divisions that have been consolidated within past five years	No
Rezoning of site exceeding 10 000 sq m	Yes
Any other development category, public open space, squares, parks, recreation grounds	No

Development	
Description	Development of a solar power plant
Project name	Protea Solar Power Plant (RF) (Pty) Ltd

Land use	
Previous land use	Farming
Current land use	Farming

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GLOSSARY OF TERMS AND ABBREVIATIONS

TERMS

Study area: Refers to the entire study area as indicated by the client in the accompanying Fig. 1 - 2.

Stone Age: The first and longest part of human history is the Stone Age, which began with the appearance of early humans between 3-2 million years ago. Stone Age people were hunters, gatherers and scavengers who did not live in permanently settled communities. Their stone tools preserve well and are found in most places in South Africa and elsewhere.

Early Stone Age	2 000 000 - 150 000 Before Present
Middle Stone Age	150 000 - 30 000 BP
Later Stone Age	30 000 - until c. AD 200

Iron Age: Period covering the last 1800 years, when new people brought a new way of life to southern Africa. They established settled villages, cultivated domestic crops such as sorghum, millet and beans, and they herded cattle as well as sheep and goats. As they produced their own iron tools, archaeologists call this the Iron Age.

Early Iron Age	AD 200 - AD 900
Middle Iron Age	AD 900 - AD 1300
Late Iron Age	AD 1300 - AD 1830

Historical Period: Since the arrival of the white settlers - c. AD 1840 - in this part of the country.

ABBREVIATIONS

ADRC	Archaeological Data Recording Centre
ASAPA	Association of Southern African Professional Archaeologists
CS-G	Chief Surveyor-General
EIA	Early Iron Age
ESA	Early Stone Age
LIA	Late Iron Age
LSA	Later Stone Age
HIA	Heritage Impact Assessment
MSA	Middle Stone Age
NASA	National Archives of South Africa
NHRA	National Heritage Resources Act
PHRA	Provincial Heritage Resources Agency
SAHRA	South African Heritage Resources Agency

CULTURAL HERITAGE IMPACT ASSESSMENT FOR THE DEVELOPMENT OF THE PROPOSED PROTEA SOLAR POWER PLANT ON A PORTION OF THE FARM HARTSBOOM 734, VRYBURG REGION, NORTH WEST PROVINCE

1. INTRODUCTION

Protea Solar Power Plant (RF) (Pty) Ltd intends to develop up to 115MW solar power plant and associated infrastructure on the farm Hartsboom 734, Registration Division HN, North West situated within the Naledi Local Municipality area of jurisdiction.

South Africa's heritage resources, also described as the 'national estate', comprise a wide range of sites, features, objects and beliefs. However, according to Section 27(18) of the National Heritage Resources Act (NHRA), No. 25 of 1999, no person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of any heritage site without a permit issued by the heritage resources authority responsible for the protection of such site.

In accordance with Section 38 of the NHRA, an independent heritage consultant was appointed by Protea Solar Power Plant (RF) (Pty) Ltd to conduct a cultural heritage assessment to determine if the proposed development would have an impact on any sites, features or objects of cultural heritage significance.

This report forms part of the Environmental Impact Assessment (EIA) as required by the EIA Regulations in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended and is intended for submission to the South African Heritage Resources Agency (SAHRA).

2. TERMS OF REFERENCE

This report does not deal with development projects outside of or even adjacent to the study area as is presented in Section 5 of this report. The same holds true for heritage sites, except in a generalised sense where it is used to create an overview of the heritage potential in the larger region.

2.1 Scope of work

The aim of this study is to determine if any sites, features or objects of cultural heritage significance occur within the boundaries of the area where the solar power plant is to be developed.

This includes:

- Conducting a desk-top investigation of the area;
- A visit to the proposed development site,

The objectives were to

- Identify possible archaeological, cultural and historic sites within the proposed development areas;
- Evaluate the potential impacts of construction, operation and maintenance of the proposed development on archaeological, cultural and historical resources;
- Recommend mitigation measures to ameliorate any negative impacts on areas of archaeological, cultural or historical importance.

2.2 Limitations

The investigation has been influenced by the following factors:

- It is assumed that the description of the proposed project, provided by the client, is accurate.
- No subsurface investigation (i.e. excavations or sampling) were undertaken, since a permit from SAHRA is required for such activities.
- It is assumed that the public consultation process undertaken as part of the Environmental Impact Assessment (EIA) is sufficient and that it does not have to be repeated as part of the heritage impact assessment.
- The unpredictability of buried archaeological remains.
- This report does not consider the palaeontological potential of the site.

3. HERITAGE RESOURCES

3.1 The National Estate

The NHRA (No. 25 of 1999) defines the heritage resources of South Africa which are of cultural significance or other special value for the present community and for future generations that must be considered part of the national estate to include:

- places, buildings, structures and equipment of cultural significance;
- places to which oral traditions are attached or which are associated with living heritage;
- historical settlements and townscapes;
- landscapes and natural features of cultural significance;
- geological sites of scientific or cultural importance;
- archaeological and palaeontological sites;
- graves and burial grounds, including-
 - ancestral graves;
 - royal graves and graves of traditional leaders;
 - graves of victims of conflict;
 - graves of individuals designated by the Minister by notice in the Gazette;
 - historical graves and cemeteries; and
 - other human remains which are not covered in terms of the Human Tissue Act, 1983 (Act No. 65 of 1983);
- sites of significance relating to the history of slavery in South Africa;
- movable objects, including-
 - objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
 - objects to which oral traditions are attached or which are associated with living heritage;
 - ethnographic art and objects;
 - military objects;
 - objects of decorative or fine art;

- objects of scientific or technological interest; and
- books, records, documents, photographic positives and negatives, graphic, film or video material 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).

3.2 Cultural significance

In the NHRA, Section 2 (vi), it is stated that “cultural significance” means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance. This is determined in relation to a site or feature’s uniqueness, condition of preservation and research potential.

According to Section 3(3) of the NHRA, a place or object is to be considered part of the national estate if it has cultural significance or other special value because of

- its importance in the community, or pattern of South Africa's history;
- its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
- its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
- its importance in demonstrating a high degree of creative or technical achievement at a particular period;
- its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
- its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and
- sites of significance relating to the history of slavery in South Africa.

A matrix was developed whereby the above criteria were applied for the determination of the significance of each identified site (see Appendix 1). This allowed some form of control over the application of similar values for similar identified sites.

4. STUDY APPROACH AND METHODOLOGY

4.1 Extent of the Study

This survey and impact assessment covers the area as presented in Section 6 below and illustrated in Figure 2.

4.2 Methodology

4.2.1.1 Survey of the literature

A survey of the relevant literature was conducted with the aim of reviewing the previous research done and determining the potential of the area. In this regard, various anthropological, archaeological and historical sources were consulted – see list of references in Section 9.

- Information on events, sites and features in the larger region were obtained from these sources.

4.2.1.2 Data bases

The *Heritage Atlas Database*, the *Environmental Potential Atlas*, the *Chief Surveyor General* and the *National Archives of South Africa* were consulted.

- Database surveys produced a number of sites located in the larger region of the proposed development.

4.2.1.3 Other sources

Aerial photographs and topocadastral and other maps were also studied - see the list of references below.

- Information of a very general nature were obtained from these sources

4.2.2 Field survey

The field survey was done according to generally accepted archaeological practices, and was aimed at locating all possible sites, objects and structures. The area that had to be investigated was identified by Protea Solar Power Plant (RF) (Pty) Ltd by means of maps and .kml files indicating the development area. This was loaded onto a Nexus 7 tablet and used in Google Earth during the field survey to access the areas.

The site was visited on 20 January 2016 and 4 August 2016. The area was investigated by travelling transects across it, giving special attention to features such as hills, outcrops and clumps of trees – see Fig. 1 below. During the site visit the archaeological visibility was good due to the intense drought that the region experienced over the past few years.

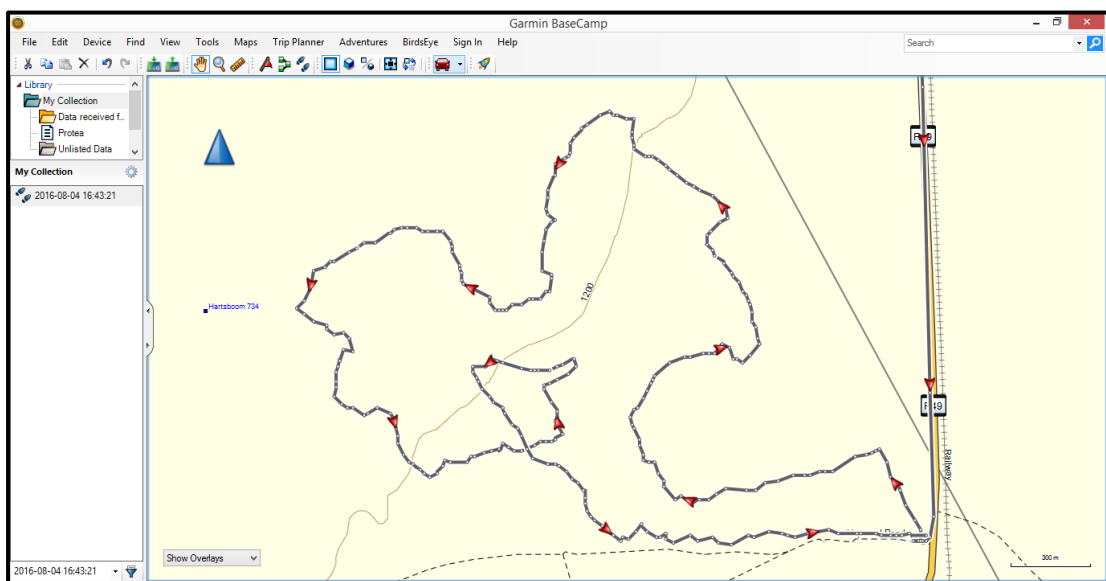


Fig. 1. Map indicating the track log of the field survey.
(See Appendix 6 for a Statistical Analysis of this track log)

4.2.3 Documentation

All sites, objects and structures that are identified are documented according to the general minimum standards accepted by the archaeological profession. Coordinates of individual localities are determined by means of the *Global Positioning System* (GPS) and plotted on a map. This information is added to the description in order to facilitate the identification of each locality.

The track log and identified sites were recorded by means of a Garmin Oregon 550 handheld GPS device. Photographic recording was done by means of a Canon EOS 550D digital camera.

Map datum used: Hartebeeshoek 94 (WGS84).

5. SITE SIGNIFICANCE AND ASSESSMENT

5.1 Heritage assessment criteria and grading

The National Heritage Resources Act, Act no. 25 of 1999, stipulates the assessment criteria and grading of heritage sites. The following grading categories are distinguished in Section 7 of the Act:

- **Grade I:** Heritage resources with qualities so exceptional that they are of special national significance;
- **Grade II:** Heritage resources which, although forming part of the national estate, can be considered to have special qualities which make them significant within the context of a province or a region; and
- **Grade III:** Other heritage resources worthy of conservation on a local authority level.

A matrix was developed whereby the criteria, as set out in Sections 3(3) and 7 of the NHRA, were applied for each identified site (see Appendix 1). This allowed some form of control over the application of similar values for similar sites.

The occurrence of sites with a Grade I significance will demand that the development activities be drastically altered in order to retain these sites in their original state. For Grade II and Grade III sites, the applicable of mitigation measures would allow the development activities to continue.

5.2 Methodology for the assessment of potential impacts

All impacts identified during the EIA stage of the study will be classified in terms of their significance. Issues were assessed in terms of the following criteria:

- The **nature**, a description of what causes the effect, what will be affected and how it will be affected;
- The physical **extent**, wherein it is indicated whether:
 - 1 - the impact will be limited to the site;
 - 2 - the impact will be limited to the local area;
 - 3 - the impact will be limited to the region;
 - 4 - the impact will be national; or
 - 5 - the impact will be international;
- The **duration**, wherein it is indicated whether the lifetime of the impact will be:
 - 1 - of a very short duration (0–1 years);

- 2 - of a short duration (2-5 years);
- 3 - medium-term (5–15 years);
- 4 - long term (> 15 years); or
- 5 - permanent;
- The **magnitude** of impact, quantified on a scale from 0-10, where a score is assigned:
 - 0 - small and will have no effect;
 - 2 - minor and will not result in an impact;
 - 4 - low and will cause a slight impact;
 - 6 - moderate and will result in processes continuing but in a modified way;
 - 8 – high, (processes are altered to the extent that they temporarily cease); or
 - 10 - very high and results in complete destruction of patterns and permanent cessation of processes;
- The **probability** of occurrence, which describes the likelihood of the impact actually occurring and is estimated on a scale where:
 - 1 - very improbable (probably will not happen);
 - 2 - improbable (some possibility, but low likelihood);
 - 3 - probable (distinct possibility);
 - 4 - highly probable (most likely); or
 - 5 - definite (impact will occur regardless of any prevention measures);
- The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high;
- The **status**, which is described as either positive, negative or neutral;
- The degree to which the impact can be reversed;
- The degree to which the impact may cause irreplaceable loss of resources; and
- The degree to which the impact can be mitigated.

The **significance** is determined by combining the criteria in the following formula:

$$S = (E+D+M) \times P; \text{ where}$$

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The **significance weightings** for each potential impact are calculated as follows:

Table 1: Significance ranking

Significance of impact					
Extent	Duration	Magnitude	Probability	Significance	Weight
-	-	-	-	-	-

Points	Significant Weighting	Discussion
< 30 points	Low	where this impact would not have a direct influence on the decision to develop in the area
31-60 points	Medium	where the impact could influence the decision to develop in the area unless it is effectively mitigated
> 60 points	High	where the impact must have an influence on the decision process to develop in the area

6. PROJECT DESCRIPTION

6.1 Site location

The town of Vryburg is located approximately 12km north of the proposed development in the Naledi Local Municipality of North West Province (Fig. 2). For more information, see the Technical Summary on p. iii above.

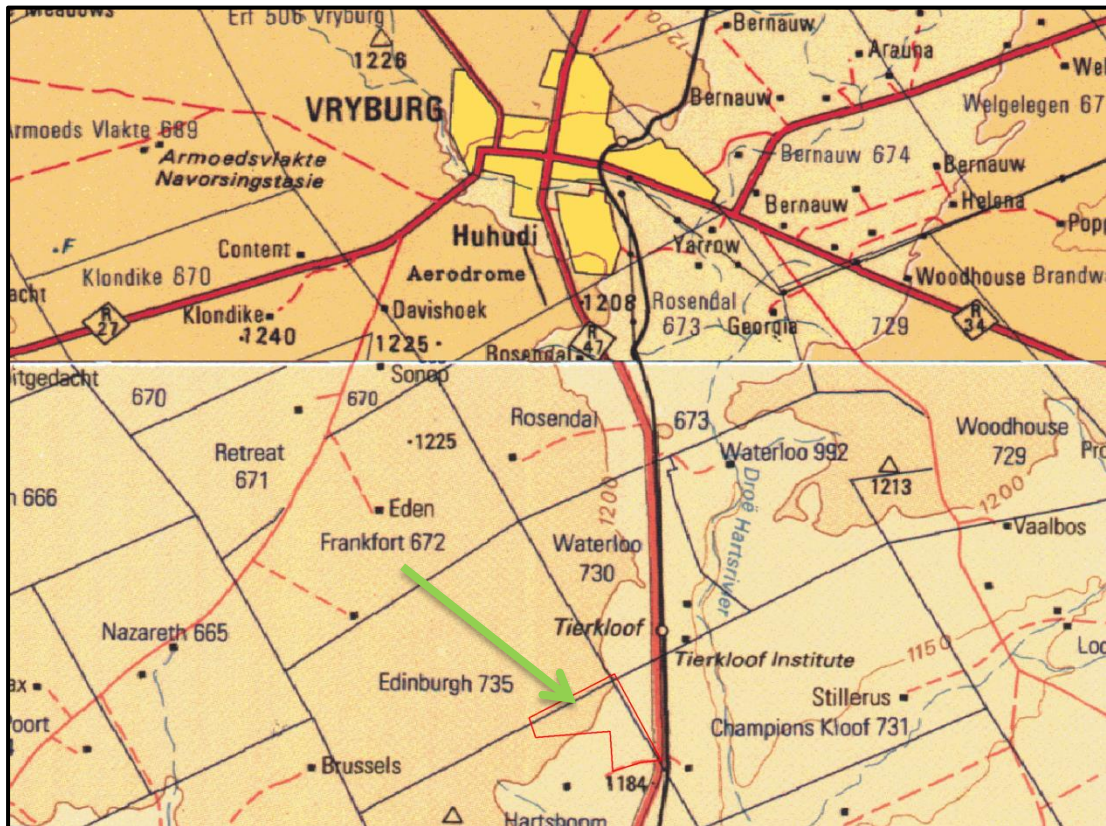


Fig. 2. Location of the study area (red outline) in regional context. (Map 2624, 2724: Chief Surveyor-General)

6.2 Development proposal

Protea Solar Power Plant (RF) (Pty) Ltd. intends to develop up to 115MW solar power plant and associated infrastructure on Remaining Extent of the Farm Hartsboom 734, HN Registration Division, Province of the North-West, measuring 2035,9834 (two thousand and thirty deed seven comma nine eight three four) hectares, Title Deed No.: 258/2000.

The proposed project will cover an approximate area of 204 hectares (ha). The preferred site will be assessed in the EIA Phase. The preferred site includes 240 ha of land. Due to the fact that this project only requires 204 ha of land, there is scope to avoid major environmental constraints through the final design of the facility. The site was identified as being highly desirable due to its suitable climatic conditions, topography (i.e. in terms of slope), environmental conditions (i.e. agricultural potential, ecological sensitivity and archaeology), proximity to a grid connection point (i.e. for the purpose of electricity evacuation), as well as

site access (i.e. to facilitate the movement of machinery, equipment, infrastructure and people during the construction phase)."

The proposed grid connection will be the loop in loop out (LiLo) connection from the site into the 132kv line that runs from the Mookodi to Mogopela, which runs through the farm.

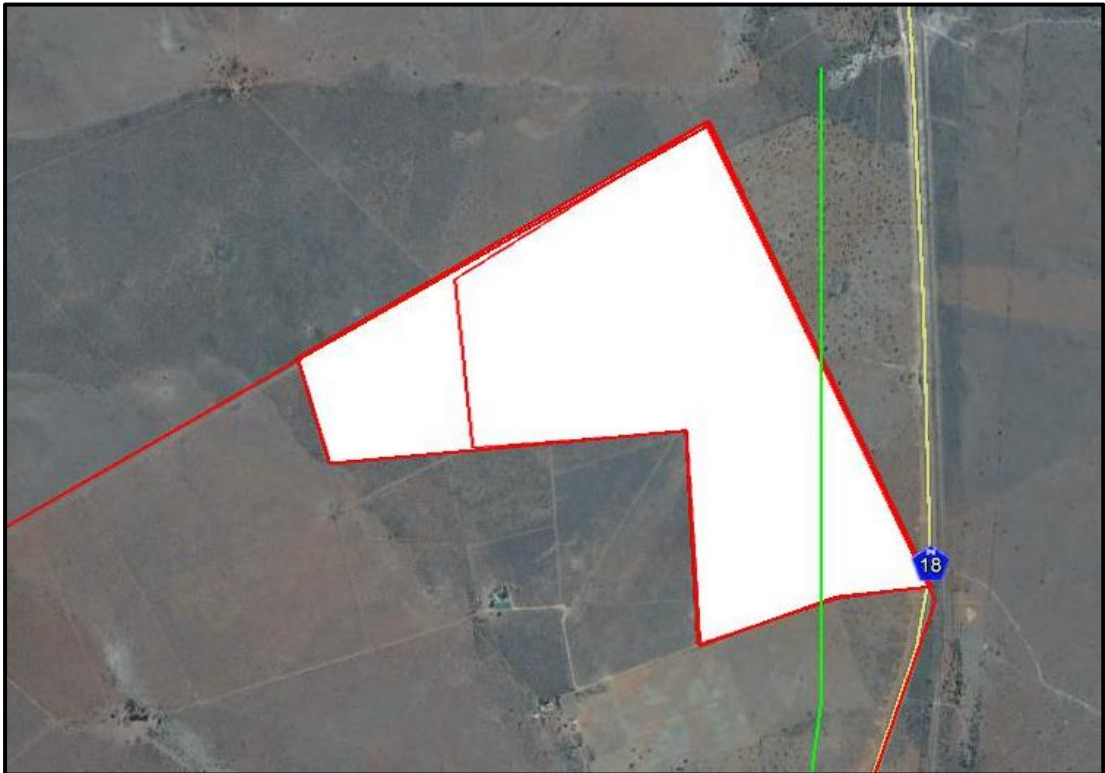


Fig. 3. Layout of the proposed development.
(Image: Google Earth)

7. DESCRIPTION OF THE AFFECTED ENVIRONMENT

7.1 Site description

The geology is made up of sand, changing to dolomite in the west. The original vegetation is classified as Kalahari Plateau Bushveld. The topography is described as undulating plains and pans. The Dry Harts River passes about 2km to the east of the study area.

The current land use is grazing and, apart from a few farming related features such as water points, no previous development seemed to have taken place on the site. Formerly, a large section of the site has been used for cultivation purposes, which would have had a negative impact on any material of heritage significance that might have occurred here.



Fig. 4. Views over the study area.



Fig. 5. Aerial view of the development site
(Photo: Google Earth)

7.2 Overview of the region

The aim of this section is to present an overview of the history of the larger region in order to eventually determine the significance of heritage sites identified in the study area, within the context of their historic, aesthetic, scientific and social value, rarity and representivity – see Section 3.2 and Appendix 1 for more information.

The cultural landscape qualities of the region essentially consist of a two components. The first is a rural area in which the human occupation is made up of a pre-colonial (Stone Age) occupation and a much later colonial (farmer) component. The second component is an urban one consisting of a number of smaller towns, most of which developed during the last 150 years or less.

Geology

The lower strata of the Transvaal sequence comprise mostly of dolomite (with some chert and tillite interspersed in places) while the upper strata appear to be more varied in constituents. Dolomite consists largely of calcium carbonate and is hence vulnerable to solution, especially by the carbonic acid found in rainwater percolating downwards. The dissolution of dolomite can lead to the formation of underground caverns and horizontal chambers often filled with large volumes of groundwater.

Tillite is the result of sediment (till) that was deposited as a consequence of glacial actions and, due to subsequent burial, became solidified into solid rock.

Malmame Dolomite appears to be one of the main elements of the Transvaal sequence. It contains abundant algal stromatolites, evidence of an aquatic environment in ancient times. The algal stromatolites have a number of distinctive shapes such as domes, columns and spheres, their shape being governed by the environment in which they were formed. It is believed that the dolomites were laid down in shallow inter-tidal or sub-tidal zone of open water seas. Although these features are said to occur over a wide area, it is apparently only in a few places where they outcrop and are visible to the naked eye.

Early history

Very little habitation of the central highveld area took place during Stone Age times. Tools dating to the Early Stone Age period are mostly found in the vicinity of larger watercourses, e.g. the Vaal River or the Harts River and especially in sheltered areas such as at the Taung fossil site. During Middle Stone Age (MSA) times (c. 150 000 – 30 000 BP), people became more mobile, occupying areas formerly avoided. In many cases, tools dating to this period are found on the banks of the many pans that occur all over. The MSA is a technological stage characterized by flakes and flake-blades with faceted platforms, produced from prepared cores, as distinct from the core tool-based ESA technology.

Late Stone Age (LSA) people had even more advanced technology than the MSA people and therefore succeeded in occupying even more diverse habitats. Some sites are known to occur in the region. These are mostly open sites located near river and pans. For the first time we also get evidence of people's activities derived from material other than stone tools. Ostrich eggshell beads, ground bone arrowheads, small bored stones and wood fragments with incised markings are traditionally linked with the LSA. The LSA people have also left us with a rich legacy of rock art, which is an expression of their complex social and spiritual beliefs. Some of the farms in the Vryburg region known to have rock engravings are Bernauw,

Content, Gemsbok Laagte, Klipfontein, Kinderdam, Melalarig, Schatkist, Verdwaal Vlakte and Wonderfontein, to mention but a few.

Iron Age people started to settle in southern Africa c. AD 300, with one of the oldest known sites at Broederstroom south of Hartebeespoort Dam dating to AD 470. Having only had cereals (sorghum, millet) that need summer rainfall, Early Iron Age (EIA) people did not move outside this rainfall zone, and neither did they occupy the central interior highveld area. Because of their specific technology and economy, Iron Age people preferred to settle on the alluvial soils near rivers for agricultural purposes, but also for firewood and water.

The occupation of the larger geographical area (including the study area) did not start much before the 1500s. By the 16th century things changed, with the climate becoming warmer and wetter, creating condition that allowed Late Iron Age (LIA) farmers to occupy areas previously unsuitable, for example the treeless plains of the Free State and North West Province.

The earliest Iron Age settlers who moved into the North West Province region were Tswana-speakers such as the Tlhaping, Hurutshe, Fokeng, Kgatla and Rolong. In the region of the study area, it was mostly the booRapulana and booRatlou sections of the Rolong (Breutz 1959).

Stone walled sites dating to the Late Iron Age and which can be linked to the Tswana occupation of the area, are found on a number of farms in the region, e.g. Waai Hoek and Brul Pan. However, the historic most important one, named Dithakong, is located some distance to the north-west. This site was first visited by early travellers such as Lichtenstein and John Campbell in the early part of the 19th century.

Historic period

Many early travellers, hunters and missionaries (Burchell 1824, Campbell 1822, Smith 1834-1836 (Lye 1975), Moffat 1842 and Harris 1852) either passed through the area or close to it. Their writings leave us a tantalising description of what life was in these communities before large-scale interaction with white settlers took place. Some of the first whites to settle here were the missionaries Samuel Broadbent and Thomas Hodgson, who settled some distance to the east of what later became known as Wolmaransstad.



Fig. 6. 1881 map of the region showing the absence of regional development. (Wangemann 1881)

White settlers moved into the area during the first half of the 19th century. They were largely self-sufficient, basing their survival on cattle/sheep farming and hunting. Few towns were established and it remained an undeveloped area.

During the 1880s the white settlers exploited conflict between the different Tswana chiefdoms to obtain more land (Legassick 2010). Chief David Massouw gave some land to some whites in recognition for their help in his fight against the Batlhapin chief Mankoroane Molehabanque. From this developed the Republic of Stellaland, which was named for a comet (“stella” in Latin) that was visible in 1882. The town of Vryburg was to be the capital of the republic. However, due to British intervention in the area as a result of the discovery of diamonds, the republic was very short-lived.

The last chapter in the history of the region was its incorporation under the policy of homeland development, into the Republic of Bophuthatswana. This was a very fragmented ‘State’ and it would have needed permanent support by the central government to keep it in place. Since 1994, this has fallen away and the people and the region were reincorporated into the larger Republic of South Africa

Vryburg

This town was founded in 1883 as the capital of the Republic of Stellaland, an independent Boer republic. The Boers that inhabited the area styled themselves as free citizens, or *vryburgers*, in Dutch, from which the name of the town was derived. The town achieved municipal status in 1896.

According to available data bases this town has 5 buildings listed as of provincial significance. In addition some cemeteries and monuments also occur. During the Anglo Boer War (1899-1902) a large concentration camp was established on the outskirts of the town.

The Tierkloof Institute, located to the south of Vryburg, on the farm Waterloo, was established in 1904 and served as centre for higher education for Tswana-speaking people, especially for children of the various royal families.

Cecil John Rhodes had the ambition to construct a railway line that would link Cape Town with Cairo. The section from Kimberley to Mafikeng via Vryburg was completed in 1890 (Weinthal 1922). However, it has been upgraded over the years - the road bed improved and made higher, new tracks installed, as well as the bridges improved and made higher and strengthened due to the fact of carrying much heavier rolling stock than when it was originally constructed. I have surveyed sections of this line and dates found on sections of the track goes back to 1936 and 1953 and 1955 – the latter ones also carried the name YSKOR, implying that it was locally made. Most of the stations are derelict and vandalised.

7.3 Identified sites

The following sites, features and objects of cultural significance were identified in the study area – see Appendix 5 for a discussion of each individual site.

In terms of Section 7 of the NHRA, all the sites currently known or which are expected to occur in the study area are evaluated to have a grading as identified in the table below.

Table 2. Summary of identified heritage resources in the study area.

Identified heritage resources		
Category according to NHRA	Number	Coordinates
Formal protections (NHRA)		

National heritage site (Section 27)	None	
Provincial heritage site (Section 27)	None	
Provisional protection (Section 29)	None	
Place listed in heritage register (Section 30)	None	
General protections (NHRA)		
Structures older than 60 years (Section 34)	None	
Archaeological site or material (Section 35)	7.3.1	S 27.07247, E 24.73808
Palaeontological site or material (Section 35)	None	
Graves or burial grounds (Section 36)	None	
Public monuments or memorials (Section 37)	None	
Other		
Any other heritage resources (describe)	None	

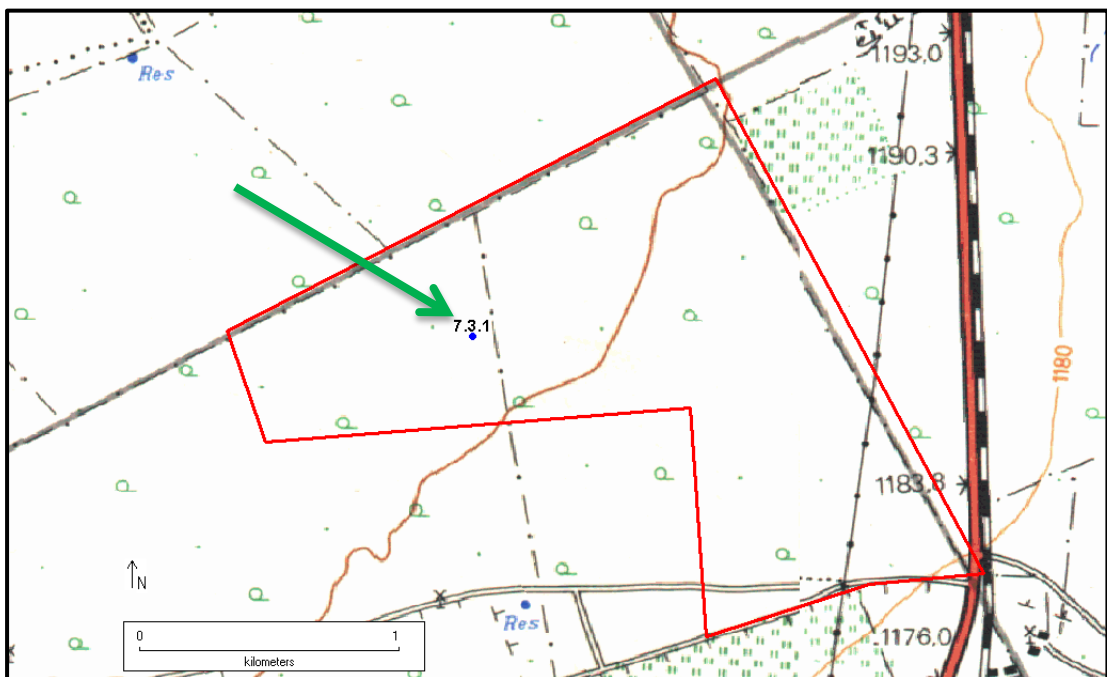


Fig. 7. Location of the identified sites.

7.3.1 Stone Age

- One area where a low density of Middle Stone Age and Later Stone Age tools and flakes occur was identified – see Appendix 5 for more information.

7.3.2 Iron Age

- No sites, features or objects dating to the Iron Age were identified in the study area.

7.3.3 Historic period

- No sites, features or objects dating to the historic period were identified in the study area.

7.4 Impact assessment

Heritage impacts are categorised as:

- Direct or physical impacts, implying alteration or destruction of heritage features within the project boundaries
- Indirect impacts, e.g. restriction of access or visual intrusion concerning the broader environment
- Cumulative impacts that are combinations of the above

The impacts of the proposed development could be direct or physical but will not be indirect and cumulative.

Impact can be managed through one or a combination of the following measures:

- Mitigation
- Avoidance
- Compensation
- Enhancement (positive impacts)
- Rehabilitation
- Interpretation
- Memorialisation

Impact analysis of cultural heritage resources under threat of the proposed development, is based on the present understanding of the development:

- Due to the low density of the Stone Age material, the overall impact on the site is seen as acceptable and the proposed mitigation measures to be incorporated into the EMP will provide the necessary actions to address impacts.
 - This site is seen to be fully recorded after inclusion in this report and no further action is required.

7.5 Visual impact assessment

This study was completed by Botha (2016). The study took the following visual receptors into consideration:

- Area receptors, e.g. towns
- Linear receptors, e.g. roads and railway lines
- Point receptors, e.g. farmsteads, lodges, etc.

Based on an analysis of the above, the following conclusion was reached:

“Taking into account all positive factors of such a development including economic factors, social factors and sustainability factors, the visual impact of the proposed development will be insignificant and (it) is suggested that the development commence, from a visual impact point of view.”

8. RECOMMENDATIONS

The aim of the survey was to locate, identify, evaluate and document sites, objects and structures of cultural significance found within the area in which the development is proposed.

The cultural landscape qualities of the region is made up of a pre-colonial element consisting of limited Stone Age occupation, as well as a much later colonial (farmer) component, which gave rise to an urban component.

Identified sites

- A small isolated area where a very low density of Middle Stone Age and Later Stone Age stone tools occur was identified in the study area.

Impact assessment

Impact analysis of cultural heritage resources under threat of the proposed development, is based on the present understanding of the development:

- Due to the low density of the Stone Age material, the overall impact on the site is seen as acceptable and the proposed mitigation measures to be incorporated into the EMP will provide the necessary actions to address impacts.
 - This site is seen to be fully recorded after inclusion in this report and no further action is required.

Reasoned opinion as to whether the proposed activity should be authorised:

- From a heritage point of view it is recommended that the proposed development be allowed to continue.

Conditions for inclusion in the environmental authorisation:

- Should archaeological sites or graves be exposed during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.

9. REFERENCES

9.1 Data bases

Chief Surveyor General
Environmental Potential Atlas, Department of Environmental Affairs and Tourism.
Heritage Atlas Database, Pretoria.
National Archives of South Africa
SAHRA Archaeology and Palaeontology Report Mapping Project (2009)

9.2 Literature

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Weinthal, L. (ed.). 1922. *The Story of the Cape to Cairo Railway Line and River Route, from 1887 to 1922*. London: The Pioneer Publishing Co. (4 volumes + 1).

Wilson, M.G.C. & Anhaeusser, C.R. 1998. *The Mineral Resources of South Africa*. Sixth Edition. Handbook 16. Pretoria: Council for Geosciences.

9.3 Maps and aerial photographs

1: 50 000 Topocadastral maps
Google Earth

APPENDIX 1: CONVENTIONS USED TO ASSESS THE IMPACT OF PROJECTS ON HERITAGE RESOURCES

Significance

According to the NHRA, Section 2(vi) the **significance** of a heritage sites and artefacts is determined by it aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technical value in relation to the uniqueness, condition of preservation and research potential. It must be kept in mind that the various aspects are not mutually exclusive, and that the evaluation of any site is done with reference to any number of these.

Matrix used for assessing the significance of each identified site/feature

1. Historic value				
Is it important in the community, or pattern of history				
Does it have strong or special association with the life or work of a person, group or organisation of importance in history				
Does it have significance relating to the history of slavery				
2. Aesthetic value				
It is important in exhibiting particular aesthetic characteristics valued by a community or cultural group				
3. Scientific value				
Does it have potential to yield information that will contribute to an understanding of natural or cultural heritage				
Is it important in demonstrating a high degree of creative or technical achievement at a particular period				
4. Social value				
Does it have strong or special association with a particular community or cultural group for social, cultural or spiritual reasons				
5. Rarity				
Does it possess uncommon, rare or endangered aspects of natural or cultural heritage				
6. Representivity				
Is it important in demonstrating the principal characteristics of a particular class of natural or cultural places or objects				
Importance in demonstrating the principal characteristics of a range of landscapes or environments, the attributes of which identify it as being characteristic of its class				
Importance in demonstrating the principal characteristics of human activities (including way of life, philosophy, custom, process, land-use, function, design or technique) in the environment of the nation, province, region or locality.				
7. Sphere of Significance		High	Medium	Low
International				
National				
Provincial				
Regional				
Local				
Specific community				
8. Significance rating of feature				
1.	Low			
2.	Medium			
3.	High			

Significance of impact:

- low where the impact will not have an influence on or require to be significantly accommodated in the project design
- medium where the impact could have an influence which will require modification of the project design or alternative mitigation
- high where it would have a “no-go” implication on the project regardless of any mitigation

Certainty of prediction:

- Definite: More than 90% sure of a particular fact. Substantial supportive data to verify assessment
- Probable: More than 70% sure of a particular fact, or of the likelihood of that impact occurring
- Possible: Only more than 40% 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

Recommended management action:

For each impact, the recommended practically attainable mitigation actions which would result in a measurable reduction of the impact, must be identified. This is expressed according to the following:

- 1 = no further investigation/action necessary
- 2 = controlled sampling and/or mapping of the site necessary
- 3 = preserve site if possible, otherwise extensive salvage excavation and/or mapping necessary
- 4 = preserve site at all costs

Legal requirements:

Identify and list the specific legislation and permit requirements which potentially could be infringed upon by the proposed project, if mitigation is necessary.

APPENDIX 2. RELEVANT LEGISLATION

All archaeological and palaeontological sites, and meteorites are protected by the National Heritage Resources Act (Act no 25 of 1999) as stated in Section 35:

(1) Subject to the provisions of section 8, the protection of archaeological and palaeontological sites and material and meteorites is the responsibility of a provincial heritage resources authority: Provided that the protection of any wreck in the territorial waters and the maritime cultural zone shall be the responsibility of SAHRA.

(2) Subject to the provisions of subsection (8)(a), all archaeological objects, palaeontological material and meteorites are the property of the State. The responsible heritage authority must, on behalf of the State, at its discretion ensure that such objects are lodged with a museum or other public institution that has a collection policy acceptable to the heritage resources authority and may in so doing establish such terms and conditions as it sees fit for the conservation of such objects.

(3) Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.

(4) No person may, without a permit issued by the responsible heritage resources authority-

- (a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
- (b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
- (c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or
- (d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.

In terms of cemeteries and graves the following (Section 36):

(1) Where it is not the responsibility of any other authority, SAHRA must conserve and generally care for burial grounds and graves protected in terms of this section, and it may make such arrangements for their conservation as it sees fit.

(2) SAHRA must identify and record the graves of victims of conflict and any other graves which it deems to be of cultural significance and may erect memorials associated with the grave referred to in subsection (1), and must maintain such memorials.

(3) No person may, without a permit issued by SAHRA or a provincial heritage resources authority-

- (a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;
- (b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
- (c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.

(4) SAHRA or a provincial heritage resources authority may not issue a permit for the destruction or damage of any burial ground or grave referred to in subsection (3)(a) unless it is satisfied that the applicant has made satisfactory arrangements for the exhumation and re-interment of the contents of such graves, at the cost of the applicant and in accordance with any regulations made by the responsible heritage resources authority.

The National Heritage Resources Act (Act no 25 of 1999) stipulates the assessment criteria and grading of archaeological sites. The following categories are distinguished in Section 7 of the Act:

- **Grade I:** Heritage resources with qualities so exceptional that they are of special national significance;
- **Grade II:** Heritage resources which, although forming part of the national estate, can be considered to have special qualities which make them significant within the context of a province or a region; and
- **Grade III:** Other heritage resources worthy of conservation, and which prescribes heritage resources assessment criteria, consistent with the criteria set out in section 3(3), which must be used by a heritage resources authority or a local authority to assess the intrinsic, comparative and contextual significance of a heritage resource and the relative benefits and costs of its protection, so that the appropriate level of grading of the resource and the consequent responsibility for its management may be allocated in terms of section 8.

Presenting archaeological sites as part of tourism attraction requires, in terms 44 of the Act, a Conservation Management Plan as well as a permit from SAHRA.

(1) Heritage resources authorities and local authorities must, wherever appropriate, co-ordinate and promote the presentation and use of places of cultural significance and heritage resources which form part of the national estate and for which they are responsible in terms of section 5 for public enjoyment, education, research and tourism, including-

- (a) the erection of explanatory plaques and interpretive facilities, including interpretive centres and visitor facilities;
- (b) the training and provision of guides;
- (c) the mounting of exhibitions;
- (d) the erection of memorials; and
- (e) any other means necessary for the effective presentation of the national estate.

(2) Where a heritage resource which is formally protected in terms of Part I of this Chapter is to be presented, the person wishing to undertake such presentation must, at least 60 days prior to the institution of interpretive measures or manufacture of associated material, consult with the heritage resources authority which is responsible for the protection of such heritage resource regarding the contents of interpretive material or programmes.

(3) A person may only erect a plaque or other permanent display or structure associated with such presentation in the vicinity of a place protected in terms of this Act in consultation with the heritage resources authority responsible for the protection of the place.

APPENDIX 3. RELOCATION OF GRAVES

If the graves are younger than 60 years, an undertaker can be contracted to deal with the exhumation and reburial. This will include public participation, organising cemeteries, coffins, etc. They need permits and have their own requirements that must be adhered to.

If the graves are older than 60 years old or of undetermined age, an archaeologist must be in attendance to assist with the exhumation and documentation of the graves. This is a requirement by law.

Once it has been decided to relocate particular graves, the following steps should be taken:

- Notices of the intention to relocate the graves need to be put up at the burial site for a period of 60 days. This should contain information where communities and family members can contact the developer/archaeologist/public-relations officer/undertaker. All information pertaining to the identification of the graves needs to be documented for the application of a SAHRA permit. The notices need to be in at least 3 languages, English, and two other languages. This is a requirement by law.
- Notices of the intention needs to be placed in at least two local newspapers and have the same information as the above point. This is a requirement by law.
- Local radio stations can also be used to try contact family members. This is not required by law, but is helpful in trying to contact family members.
- During this time (60 days) a suitable cemetery need to be identified close to the development area or otherwise one specified by the family of the deceased.
- An open day for family members should be arranged after the period of 60 days so that they can gather to discuss the way forward, and to sort out any problems. The developer needs to take the families requirements into account. This is a requirement by law.
- Once the 60 days has passed and all the information from the family members have been received, a permit can be requested from SAHRA. This is a requirement by law.
- Once the permit has been received, the graves may be exhumed and relocated.
- All headstones must be relocated with the graves as well as any items found in the grave.

Information needed for the SAHRA permit application

- The permit application needs to be done by an archaeologist.
- A map of the area where the graves have been located.
- A survey report of the area prepared by an archaeologist.
- All the information on the families that have identified graves.
- If graves have not been identified and there are no headstones to indicate the grave, these are then unknown graves and should be handled as if they are older than 60 years. This information also needs to be given to SAHRA.
- A letter from the landowner giving permission to the developer to exhume and relocate the graves.
- A letter from the new cemetery confirming that the graves will be reburied there.
- Details of the farm name and number, magisterial district and GPS coordinates of the gravesite.

APPENDIX 4. SPECIALIST COMPETENCYJohan (Johnny) van Schalkwyk

J A van Schalkwyk, D Litt et Phil, heritage consultant, has been working in the field of heritage management for more than 30 years. Based at the National Museum of Cultural History, Pretoria, he has actively done research in the fields of anthropology, archaeology, museology, tourism and impact assessment. This work was done in Limpopo Province, Gauteng, Mpumalanga, North West Province, Eastern Cape, Northern Cape, Botswana, Zimbabwe, Malawi, Lesotho and Swaziland. Based on this work, he has curated various exhibitions at different museums and has published more than 60 papers, many in scientifically accredited journals. During this period he has done more than 2000 impact assessments (archaeological, anthropological, historical and social) for various government departments and developers. Projects include environmental management frameworks, road-, pipeline-, and power line developments, dams, mining, water purification works, historical landscapes, refuse dumps and urban developments.

APPENDIX 5: INVENTORY OF IDENTIFIED CULTURAL HERITAGE SITES

A 5.1 Stone Age

NHRA Category	Archaeological and palaeontological sites – Stone Age
Protection status	General Protection - Section 35: Archaeology, palaeontology and meteorites

Location	No. 7.3.1	S 27.07247, E 24.73804
Description		
A small pan area where tools and flakes dating to both the Middle Stone Age and Later Stone Age were identified. They were made either from hardened shale (MSA) or fine-grained silicates. The density is approximately one tool/flake per 20m ² .		

Significance of site/feature	Low on a regional level – Grade III
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Impact assessment
Although it is anticipated that the site will be impacted on by the proposed development, it is impossible to determine what this impact will be.

Significance of impact					
Extent	Duration	Magnitude	Probability	Significance	Weight
1	5	4	3	30	Low

Mitigation
Due to the low density of the material, this site is seen to be fully recorded after inclusion in this report and no further action is required.

Requirements
None

References
1: 50 000 topocadastral map: 2427BA



APPENDIX 6: GPS TRIP RECORDER

Open Source software “GPS Trip Recorder” was employed as a test case to determine its usability in the logging of walked transects. The software was installed on a Nexus 7 tablet. The various statistics as recorded by this software is presented in the table below.

GPS Trip Recorder: Trip Details	
Protea	
When	04-08-2016 at 16:41
Duration	02:38:31
Movement time	01:40:41
Stand time	47:49
Distance	6.9km
Av' speed	2.8km/h
Av' Move Speed	4.1km/h
Max Speed	5.4km/h
Max Altitude	1244.5m
Points	388
Origin	Vryburg
Destination	Unnamed road