ARCHAEOLOGICAL IMPACT ASSESSMENT REPORT

FOR THE PROPOSED WOODHOUSE SOLAR 1 PV FACILITY CLOSE TO VRYBURG NORTH WEST PROVINCE

Client:

Savannah Environmental (Pty) Ltd

Client Contact:

Lisa Opperman

Cell: 011 656 3237

Email: Lisa.o@savannahsa.com

HCAC - Heritage Consultants

Private Bag X 1049

Suite 34

Modimolle

0510

Tel: 082 373 8491

Fax: 086 691 6461

E-Mail: jaco.heritage@gmail.com

Report Author:

Mr. J. van der Walt

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Heritage Contracts and Archaeological Consulting

Professional Member of the Association of Southern African Professional Archaeologist (#159)

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EXECUTIVE SUMMARY

Site name and location: Woodhouse Solar 1 PV Facility located on the Remaining Extent of the Farm Woodhouse 729, near Vryburg in the North West Province.

1: 50 000 Topographic Map: 2624 DD.

EIA Consultant: Savannah Environmental (Pty) Ltd.

Developer: Genesis Woodhouse Solar 1 (Pty) Ltd.

Heritage Consultant: Heritage Contracts and Archaeological Consulting CC (HCAC).

Contact person: Jaco van der Walt Tel: +27 82 373 8491 E –mail jaco.heritage@gmail.com.

Date of Report: 20 April 2016

Findings of the Assessment:

Savannah Environmental (Pty) Ltd, on behalf of Genesis Woodhouse Solar 1 (Pty) Ltd, appointed Heritage Contracts and Archaeological Consulting CC (HCAC) to conduct an Archaeological Impact Assessment for the proposed Woodhouse Solar 1 PV Facility. Two PV facilities are proposed to be developed within the Remaining Extent of the Farm Woodhouse 729 (known as the Woodhouse Solar 1 and Woodhouse Solar 2 PV Facilities), this report focuses on the Woodhouse Solar 1 PV Facility.

It is important to note that the entire farm was not surveyed but only the footprint of the proposed solar facility, on foot and by vehicle. In terms of the built environment (Section 34 of the NHRA), several farm labourer ruins were recorded in the Woodhouse Solar 1 footprint. In terms of the archaeological component of Section 35, Middle Stone Age (MSA) and Later Stone Age (LSA) artefacts were recorded scattered in varying densities across the proposed footprint. Most of these artefacts are scattered too sparsely to be of any significance apart from noting their presence, which has been done in this report. However discreet knapping sites (**Field no 407 – 408**) were recorded at an existing quarry in the north eastern portion of the proposed footprint.

Graves (Section 36) can be expected anywhere on the landscape. Several stone cairns were noted close the recorded farm labourer ruins that could indicate graves. No significant cultural landscape elements were noted. Visual impacts to scenic routes and sense of place are not assessed to be high from a heritage perspective but are assessed independently by a visual specialist as part of the EIA process.

The impacts to heritage resources by the proposed development are considered to be acceptable if the correct mitigation measures are implemented. If the recommendations made in this report are adhered to and based on the approval from SAHRA we are of the opinion that the project can proceed after implementation of the recommended mitigation measures.

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ABBREVIATIONS

AIA: Archaeological Impact Assessment
ASAPA: Association of South African Professional Archaeologists
BIA: Basic Impact Assessment
CRM: Cultural Resource Management
ECO: Environmental Control Officer
EIA: Environmental Impact Assessment*
EIA: Early Iron Age*
EIA Practitioner: Environmental Impact Assessment Practitioner
EMP: Environmental Management Plan
ESA: Early Stone Age
GPS: Global Positioning System
HIA: Heritage Impact Assessment
LIA: Late Iron Age
LSA: Late Stone Age
MEC: Member of the Executive Council
MIA: Middle Iron Age
MPRDA: Mineral and Petroleum Resources Development Act
MSA: Middle Stone Age
NEMA: National Environmental Management Act
PRHA: Provincial Heritage Resource Agency
SADC: Southern African Development Community
SAHRA: South African Heritage Resources Agency

**Although EIA refers to both Environmental Impact Assessment and the Early Iron Age both are internationally accepted abbreviations and must be read and interpreted in the context it is used.*

GLOSSARY

Archaeological site (remains of human activity over 100 years old)

Early Stone Age (~ 2.6 million to 250 000 years ago)

Middle Stone Age (~ 250 000 to 40-25 000 years ago)

Later Stone Age (~ 40-25 000, to recently, 100 years ago)

The Iron Age (~ AD 400 to 1840)

Historic (~ AD 1840 to 1950)

Historic building (over 60 years old)

1 BACKGROUND INFORMATION

HCAC (Heritage Contracts and Archaeological Consulting CC) was contracted by Savannah Environmental (Pty) Ltd to conduct an Archaeological Impact Assessment for the proposed Woodhouse Solar 1 PV Facility, located south east of Vryburg, North West Province (Figure 1).

The aim of the study is to identify cultural heritage sites, document, and assess their importance within local, provincial and national context. It serves to assess the impact of the proposed project on non-renewable heritage resources, and to submit appropriate recommendations with regard to the responsible cultural resources management measures that might be required to assist the developer in managing the discovered heritage resources in a responsible manner. It is also conducted to protect, preserve, and develop such resources within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999).

The report outlines the approach and methodology utilised before and during the survey, which includes: Phase 1, a desktop study (van der Walt 2015) that includes collection from various sources and consultations; Phase 2, the physical surveying of the development footprint on foot and by vehicle; Phase 3, reporting the outcome of the study.

During the survey several heritage significant sites were identified. General site conditions and features on site were recorded by means of photographs, GPS locations, and site descriptions. Possible impacts were identified and mitigation measures are proposed in the following report.

This report must also be submitted to the SAHRA for review.

1.1 Terms of Reference

Field study

Conduct a field study to:

a) Visit the proposed development footprint to locate, identify, record, photograph and describe sites of archaeological, historical or cultural interest;

b) Record GPS points of identified significant areas; and

c) Determine the levels of significance of the various types of heritage resources affected by the proposed PV facility.

Reporting

Report on the identification of anticipated and cumulative impacts that the operational units of the proposed project activity may have on the identified heritage resources for all 3 phases of the project; i.e., construction, operation and decommissioning phases. Consider alternatives, should any significant sites be impacted adversely by the proposed project. Ensure that all studies and results comply with Heritage legislation and the code of ethics and guidelines of ASAPA.

To assist the developer in managing the discovered heritage resources in a responsible manner, and to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999).

1.2. Archaeological Legislation and Best Practice

Phase 1, an AIA or a HIA is a pre-requisite for development in South Africa as prescribed by SAHRA and stipulated by legislation. The overall purpose of a heritage specialist input is to:

- » Identify any heritage resources, which may be affected;
- » Assess the nature and degree of significance of such resources;
- » Establish heritage informants/constraints to guide the development process through establishing thresholds of impact significance;
- » Assess the negative and positive impact of the development on these resources; and
- » Make recommendations for the appropriate heritage management of these impacts.

The AIA or HIA, as a specialist sub-section of the EIA, is required under the National Heritage Resources Act NHRA of 1999 (Act 25 of 1999), Section 23(2) (b) of the NEMA and section s.39 (3) (b) (iii) of the MPRDA.

The AIA should be submitted, as part of the EIA, BIA or EMP, to the PHRA if established in the province or to SAHRA. SAHRA will be ultimately responsible for the professional evaluation of Phase 1 AIA reports upon which review comments will be issued. 'Best practice' requires Phase 1 AIA reports and additional development information, as per the EIA, BIA/EMP, to be submitted in duplicate to SAHRA after completion of the study. SAHRA accepts Phase 1 AIA reports authored by professional archaeologists, accredited with ASAPA or with a proven ability to do archaeological work.

Minimum accreditation requirements include an Honours degree in archaeology or related discipline and 3 years post-university CRM experience (field supervisor level).

Minimum standards for reports, site documentation and descriptions are set by ASAPA in collaboration with SAHRA. ASAPA is based in South Africa, representing professional archaeology in the SADC region. ASAPA is primarily involved in the overseeing of ethical practice and standards regarding the archaeological profession. Membership is based on proposal and secondment by other professional members.

Phase 1 AIAs are primarily concerned with the location and identification of sites situated within a proposed development area. Identified sites should be assessed according to their significance. Relevant conservation or Phase 2 mitigation recommendations should be made. Recommendations are subject to evaluation by SAHRA.

Conservation or Phase 2 mitigation recommendations, as approved by SAHRA, are to be used as guidelines in the developer's decision making process.

Phase 2 archaeological projects are primarily based on salvage/mitigation excavations preceding development destruction or impact on a site. Phase 2 excavations can only be conducted with a permit, issued by SAHRA to the appointed archaeologist. Permit conditions are prescribed by SAHRA and includes (as minimum requirements) reporting back strategies to SAHRA and deposition of excavated material at an accredited repository.

In the event of a site conservation option being preferred by the developer, a site management plan, prepared by a professional archaeologist and approved by SAHRA, will suffice as minimum requirement.

After mitigation of a site, a destruction permit must be applied for from SAHRA by the client before development may proceed.

Human remains older than 60 years are protected by the National Heritage Resources Act, with reference to Section 36. 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 the jurisdiction of 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 this age category, located inside a formal cemetery administrated by a local authority, require the same authorisation as set out for graves younger than 60 years, in addition to 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.

Human remains that are less than 60 years old are protected 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 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. 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).

1.3 Description of Study Area

1.3.1 Location Data

Woodhouse Solar 1 PV Facility is located on the Remaining Extent of the Farm Woodhouse 729, near Vryburg in the North West Province. The development falls in a Renewable Energy Development Zone (REDZ).

The town of Vryburg (including the Huhudi township), is located approximately 2 km north west of the proposed development. The topography of the general area includes plains, gently undulating slopes, low ridges and a palaeo drainage channel that roughly traverses the study area in the centre from north to south and natural depressions or small pans (Figure 2).

The study area falls within the Eastern Kalahari Bushveld Bioregion in a Savannah Biome as described by Mucina *et al* (2006) with the vegetation described as Ghaap Plateu Vaalbosveld. Land use in the general area is characterised by agriculture, dominated by cattle farming. The study area is mostly underlain by dolomite, sandstone and shale of the Campbell and Griquastad Groups of the Griqualand West Sequence (Geological Survey, 1984). The area was extensively used for grazing in the past.

1.3.2. Location Map

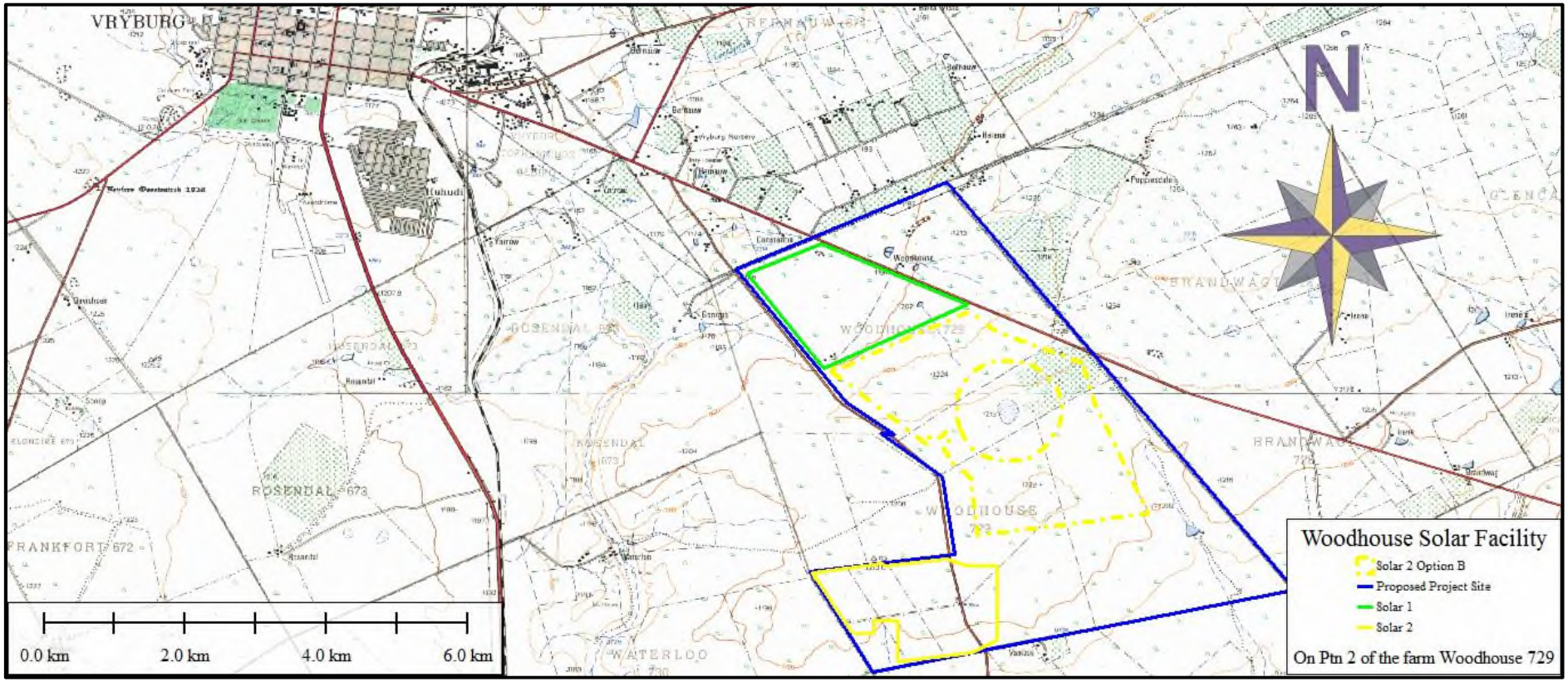

Figure 1: Location map.

2. APPROACH AND METHODOLOGY

The aim of the study is to cover archaeological databases to compile a background of the archaeology that can be expected in the study area followed by field verification; this was accomplished by means of the following phases.

2.1 Phase 1 - Desktop Study

The first phase comprised a scoping study, scanning existing records for archaeological sites, historical sites, graves, architecture (structures older than 60 years) of the area (van der Walt 2015). The following approached was followed for the compilation of the scoping report.

2.1.1 Literature Search

Utilising data for information gathering stored in the national archives and published reports relevant to the area. The aim of this is to extract data and information on the area in question.

2.1.2 Information Collection

SAHRIS was consulted to collect data from previously conducted CRM projects in the region to provide a comprehensive account of the history of the study area.

2.1.3 Consultation

No public consultation was done during the study as this was done as part of the EIA. The team did however consult with the farm owner Mr David Webber regarding graves or sites of archaeological and historical significance.

2.1.4 Google Earth and Mapping Survey

Google Earth and 1:50 000 maps of the area were utilised to identify possible places where sites of heritage significance might be located.

2.1.5 Genealogical Society of South Africa

The database of the Genealogical Society was consulted to collect data on any known graves in the area.

2.2 Phase 2 - Physical Surveying

A field survey of the study area was conducted. The survey focussed on the development footprint and access routes. The field survey for the Woodhouse Solar 1 facility was conducted over 5 days. The study area was surveyed by means of vehicle and extensive surveys on foot during the week of 15 March 2016 and again on the 13th April 2016. The survey was aimed at covering the proposed infrastructure, but also focused on specific areas on the landscape that would be more likely to contain archaeological and/or other heritage remains like drainage lines, rocky outcrops as well as slight elevations in the natural topography. These areas were searched more intensively, but many other areas were walked in order to confirm expectations in those areas. Track logs of the areas covered were taken (Figure 2).

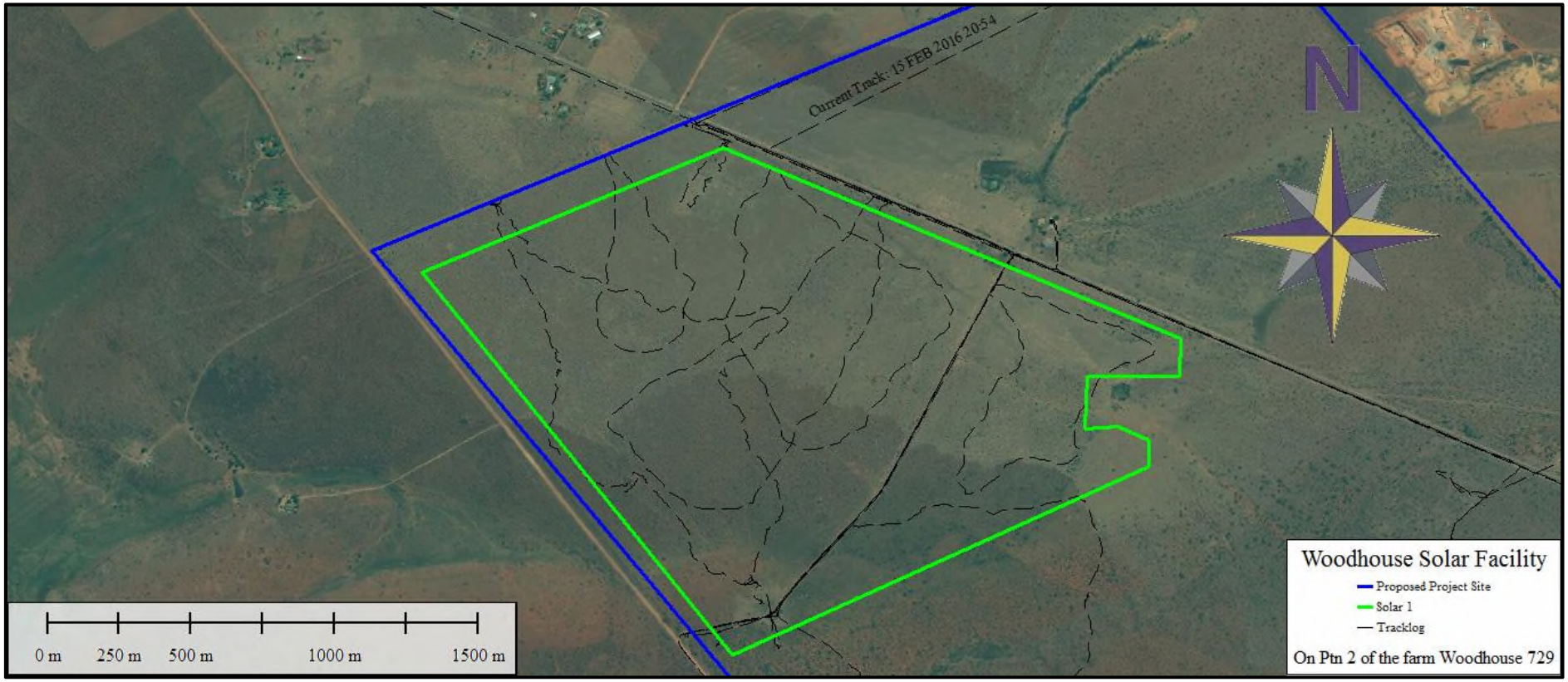

Figure 2. Track logs of the areas surveyed indicated in black.

2.3. Restrictions

Due to the fact that most cultural remains may occur below surface, the possibility exists that some features or artefacts may not have been discovered / recorded during the survey. Low ground visibility of parts of the study area is due to sand cover and vegetation, and the possible occurrence of unmarked graves and other cultural material cannot be excluded. Only the footprint of the development was surveyed as indicated in the location map, and not the entire farm. This study does not claim to have recorded every artefact cluster due the size of the study area and widespread occurrence of artefact in the study area. We are of the opinion that the field survey was extensive enough to establish the cultural sequence in the area.

This study did not assess living or intangible heritage or the impact on the palaeontology of the area. Although HCAC surveyed the area as thoroughly as possible, it is incumbent upon the developer to stop operations and inform the relevant heritage agency should further cultural remains, such as stone tool scatters, artefacts, bones or fossils, be exposed during the process of development.

3. NATURE OF THE DEVELOPMENT

Infrastructure associated with the facility will include:

- Arrays of PV panels with a capacity of up to 100MW
- Mounting structures to support the PV panels.
- On-site inverters to convert the power from a direct current to an alternating current the power and a substation to facilitate the connection between the solar energy facility and the Eskom electricity grid.
- A new 132kV power line between the on-site substation and the Eskom grid connection point. Four alternatives are being considered for the grid connection:
    - Alternative 1: a direct connection to the authorised Eskom Bophirima Substation to be constructed within the northern portion of the affected property;
    - Alternative 2: a direct connection to the existing Woodhouse 88/22kV Substation located north of the boundary of the affected property;
    - Alternative 3: a turn-in turn-out connection to the existing Delareyville Munic / Vryburg 1 88kV Feeder located along the northern boundary of the affected property; and
    - Alternative 4: A turn-in turn-out connection to the authorised 132kV Eskom Bophirima–Mookodi power line to be constructed by Eskom.
- Cabling between the project components, to be laid underground where practical.
- Offices and workshop areas for maintenance and storage.
- Temporary laydown areas.
- Internal access roads and fencing around the development area.

4. HISTORICAL AND ARCHAEOLOGICAL BACKGROUND OF THE STUDY AREA

A detailed scoping report was compiled for this project (van der Walt 2015). The scoping comprised a complete desktop study and below is a short summary of the findings.

4.1 Databases Consulted

SAHRA Report Mapping Project

Four previous CRM studies were conducted in the immediate vicinity by van Schalkwyk (2008, 2012a, 2012b) and Van der Walt (2013). Van Schalkwyk's 2008 survey was conducted directly North West of the current project area and recorded Stone Age material ascribed to the MSA. The 2012a study was conducted on a neighbouring farm, Waterloo 730, to the west of the current study area and recorded stromatolites and MSA material, the 2012b study recorded MSA material also on the farm Waterloo. Van der Walt (2013) recorded several Stone Age occurrences and a MSA and LSA site of significance included in a 'No Go' Zone to the West on the farm Waterloo.

Genealogical Society and Google Earth Monuments

Neither the Genealogical Society nor the monuments database at Google Earth (Google Earth also include some archaeological sites and historical battlefields) have any recorded sites in the study area.

4.2. A Brief History of Human Settlement in the Study Area

A farm does not exist in isolation, and it is important to understand the social history of the surrounding area. It is essential to consider the history of towns in the vicinity of the property under investigation, since these social centres would have affected those individuals living in the rural areas. In the case if Vryburg it is interesting to note that this town was once the capital of an independent republic – Stella Land.

The area was initially under the control of competing Griqua and Tswana groups (Rolang), while the United Kingdom laid claim to it as part of the emerging protectorate of British Bechuanaland. One of the indigenous groups was under the leadership of chief Mankoroane of the Thlaping who were loyal to the British and another one under the leadership of chief Massouw of the Korana (they were loyal to the Boers). When a feud erupted between Mankoroane and Massouw, each side resorted to recruiting volunteers, promising them land in return for their assistance. More than 300 Boer Soldiers joined Massouw, with the promise of being paid in land for their services as mercenaries. Massauw and his army soon had the overhand and subsequently a peace agreement was signed by Mankoroane on 26 June 1882. The Boer volunteers would as per this agreement be granted land and the boundaries of their areas would be determined by both Mankuroane and Massouw. In September 1882 the town of Vryburg was laid out. Work was halted as Makuroane did not name a representative but the town was nonetheless laid out by the end of 1882. The Republic of Stellaland was proclaimed by GJ van Niekerk on 6 August 1883.

The neighbouring land Goshen had a similar tale – Moshwete and Montshiwa took up arms against each other in 1881. Moshwete also made use of Boer volunteer soldiers under leadership of Gey van Pittius. On 11 January 1882 they entered into a formal agreement with Moshwete where the volunteers would each receive a farm for their efforts. Two days later the volunteers declared themselves an independent community. The war against Montshiwa continued, but ended in a peace agreement on 24 October 1882. Both the independent community (they appointed a management body) and Montshiwa appointed commissions to establish boundaries of the new area. However due to a lack of cooperation between the commissions and the Rolang's negativity towards the Boer volunteers the final arrangements were never made. It was also clear that Moshwete was unwilling to cooperate.

The two states later unified and were known as the United States of Stellaland. In 1884 the existence of the two states were under threat from Britain as the Convention of London determined that the boundaries of the Transvaal were moved to such an extent that the western border of the Transvaal now went through the middle of both Stellaland and Goshen. Montshiwa also determined that due to this, he was no longer bound by the provisions of the peace agreement and there were some skirmishes between Montshiwa and his followers and the Goshenites. The future of the area was no longer in the hands of either party when in 1885 Sir Charles Warren and his army of 4000 men were sent to defend the western border of the Transvaal. Without one shot being fired what remained of Goshen and Stellaland were reclaimed as part of British Bechuanaland and Warren proclaimed this on 30 September 1885.

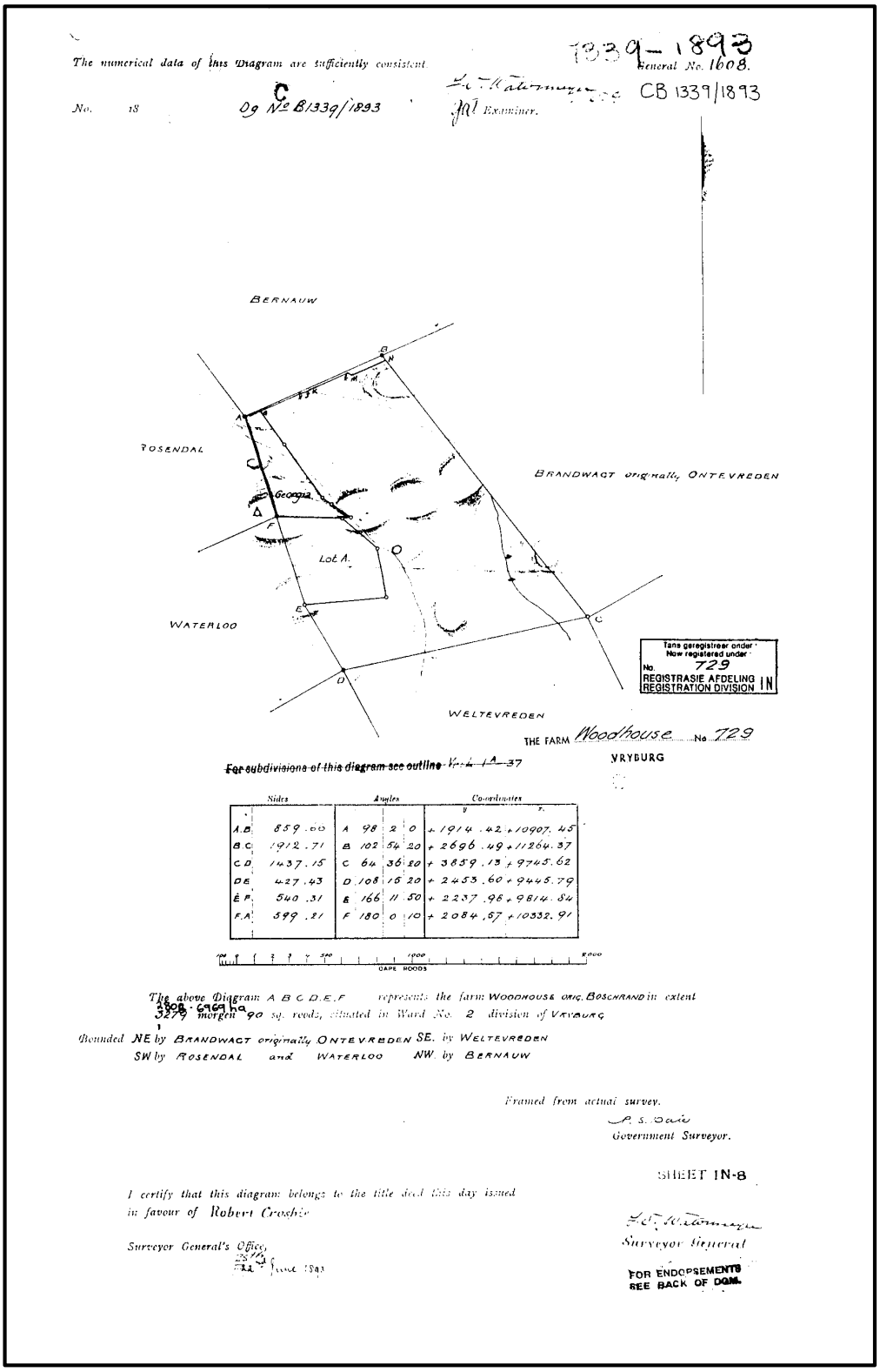

Figure 3: A Diagram issued by the Chief Surveyor General in 1893 indicating the holder of the title deed of the farm as one Robert Croshie.

4.3. Archaeological Background

4.3.1. Stone Age Background of the study area

The Stone Age is divided in Early; Middle and Late Stone Age and refers to the earliest people of South Africa who mainly relied on stone for their tools.

- » Early Stone Age (ESA): The period from ± 2.5 million yrs. - ± 250 000 yrs. ago. Acheulean stone tools are dominant. No Acheulean sites are on record near the project area, but isolated finds may be possible. However, isolated finds have little value. Therefore, the project is unlikely to disturb a significant site.
- » Middle Stone Age (MSA): The Middle Stone Age includes various lithic industries in South Africa dating from ± 250 000 yrs. – 25 000 yrs. before present. This period is first associated with archaic Homo sapiens and later Homo sapiens sapiens. Material culture includes stone tools with prepared platforms and stone tools attached to handles. MSA materials are found scattered widely across southern Africa and a significant factory site is recorded on the farm Woodhouse (van Schalkwyk 2012) with Middle Stone Age recorded to the west by Van der Walt (2013) on the farm Waterloo 730.
- » Late Stone Age (LSA): The period from ± 25 000-yrs before present to the period of contact with either Iron Age farmers or European colonists. This period is associated with Homo sapiens sapiens. Material culture from this period includes: microlithic stone tools; ostrich eggshell beads and rock art. Sites in the open are sometimes poorly preserved and therefore have less value than sites in caves or rock shelters. A Large factory site was recorded in the Van der Walt (2013) study to the west on the farm Waterloo 730. For the wider region an important LSA site is located to the north west of Stella at Thaba Sione and later used by Tswana people as a rainmaking site with several engraved boulders. Around Vryburg there are various rock engraving sites (Bergh 1999).

4.3.2. Iron Age

The Iron Age as a whole represents the spread of Bantu speaking people and includes both the pre-Historic and Historic periods. It can be divided into three distinct periods:

- » The Early Iron Age: Most of the first millennium AD.
- » The Middle Iron Age: 10th to 13th centuries AD
- » The Late Iron Age: 14th century to colonial period.

The Iron Age is characterised by the ability of these early people to manipulate and work Iron ore into implements that assisted them in creating a favourable environment to make a better living.

No Sites dating to the Early or Middle Iron Age have been recorded or are expected for the study area. The same goes for the Later Iron Age period where the study area is situated outside the western periphery of distribution of Late Iron Age settlements in the North West Province, although Breutz (1959) indicates that in the larger area stone walling associated with the Tswana occupation of the area can be expected and it is not impossible to encounter Iron Age Settlements.

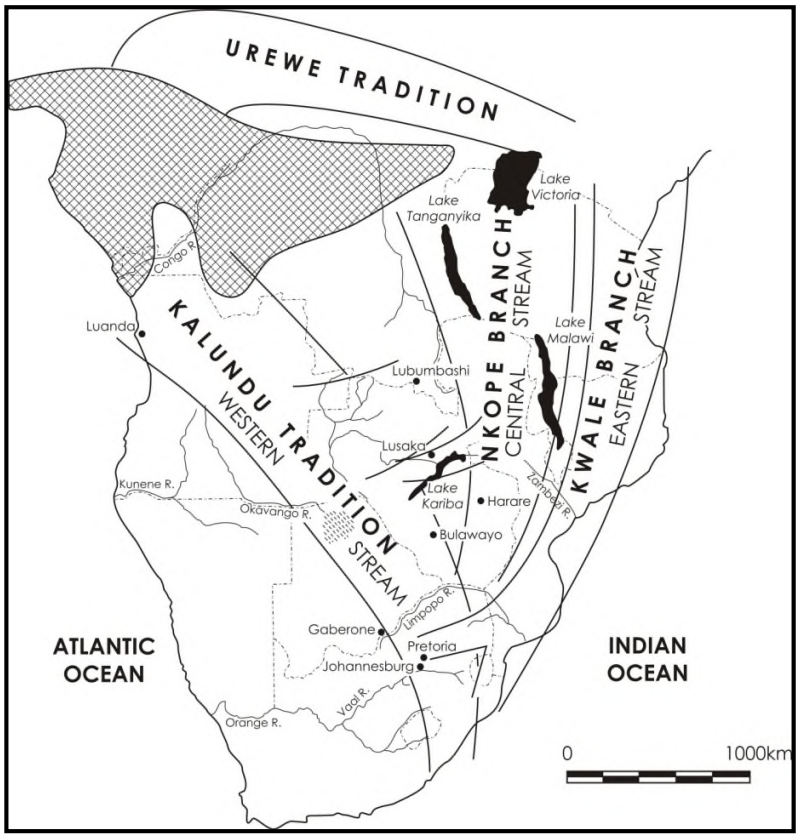

Figure 4: Movement of Bantu speaking farmers (Huffman 2007)

5. HERITAGE SITE SIGNIFICANCE AND MITIGATION MEASURES

The presence and distribution of heritage resources define a 'heritage landscape'. In this landscape, every site is relevant. In addition, because heritage resources are non-renewable, heritage surveys need to investigate an entire project area, or a representative sample, depending on the nature of the project. In the case of the proposed solar energy facility the local extent of its impact necessitates a representative sample and only the footprint of the area demarcated for development were surveyed. In all initial investigations, however, the specialists are responsible only for the identification of resources visible on the surface.

This section describes the evaluation criteria used for determining the significance of archaeological and heritage sites. The following criteria were used to establish site significance:

- The unique nature of a site;
- The integrity of the archaeological/cultural heritage deposits;
- The wider historic, archaeological and geographic context of the site;
- The location of the site in relation to other similar sites or features;
- The depth of the archaeological deposit (when it can be determined/is known);
- The preservation condition of the sites; and
- Potential to answer present research questions.

Furthermore, the National Heritage Resources Act (Act No 25 of 1999, Sec 3) distinguishes nine criteria for places and objects to qualify as 'part of the national estate' if they have cultural significance or other special value. These criteria are:

- Its importance in/to 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.

5.1. Field Rating of Sites

Site significance classification standards prescribed by SAHRA (2006), and acknowledged by ASAPA for the SADC region, were used for the purpose of this report. The recommendations for each site should be read in conjunction with section 7 of this report.

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

5.2 Impact Rating of Assessment

The criteria below are used to establish the impact rating of sites as per the impact rating methodology employed by Savannah environmental:

» The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.

» The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):

» The **duration**, wherein it will be indicated whether:

- the lifetime of the impact will be of a very short duration (0-1 years), assigned a score of 1;
- the lifetime of the impact will be of a short duration (2-5 years), assigned a score of 2;
- medium-term (5-15 years), assigned a score of 3;
- long term (> 15 years), assigned a score of 4; or
- permanent, assigned a score of 5;

» The **magnitude**, quantified on a scale from 0-10 where; 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.

» The **probability of occurrence**, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1-5 where; 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).

» The **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and

» the **status**, which will be 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.

» the *degree* to which the impact can be mitigated.

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

S=(E+D+M)P

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

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

» < 30 points: Low (i.e., where this impact would not have a direct influence on the decision to develop in the area),

» 30-60 points: Medium (i.e., where the impact could influence the decision to develop in the area unless it is effectively mitigated),

» > 60 points: High (i.e., where the impact must have an influence on the decision process to develop in the area).

6. BASELINE STUDY-DESCRIPTION OF SITES

It is important to note that the entire farm Woodhouse RE/729 was not surveyed but only the footprint of the proposed solar facility, which was surveyed on foot and by vehicle (Figure 1 & 2). The proposed Woodhouse Solar 1 PV facility measures less than 230 ha and is characterised by Apedal soils on top of a calcrete sub strata (visible in the eastern portion) with knee high grass cover and shrubs (Figure 5). In the south eastern portion of the study area is low running ridge but apart from this feature the study site is flat with no major landscape features like pans or rocky outcrops.

Figure 5: General site conditions.

The geology of the study site consists of shale, mudstone with dropstones and fluvioglacial gravel. To the south of Solar 1 are quartzitic sandstone, mudrock, andesitic/ basaltic lava, siltstone, clastic dolomite/limestone, minor conglomerate, tuff and chert. Most of these are used as raw material.

MSA artefacts are observed in low densities scattered over most of the study area. In most areas the artefacts are covered by apedal soils and more artefacts could occur sub surface. Low density (less than 2 artefacts per 5m²) isolated artefacts were recorded as find spots although discreet Stone Age sites were also recorded. In the south western portion of the study area several rectangular stone ruins were recorded with associated stone cairns. All of the recorded features were given field numbers (Table 1). GPS points were taken at such places and selections of artefacts were photographed. A short description of recorded finds follows:

Table 1. Recorded features with Coordinates

Field Number	Type Site	Description	Longitude	Latitude	Elevation	Gps Accuracy
402	MSA	MSA flakes with faceted striking platforms	24° 47' 21.6671" E	26° 59' 16.0620" S	1187.927856	4 Meters
403	MSA	MSA flakes with faceted striking platforms	24° 47' 24.6264" E	26° 59' 30.0623" S	1187.367188	4 Meters
404	MSA	MSA flakes with faceted striking platforms	24° 47' 29.4685" E	26° 59' 31.2865" S	1188.999756	4 Meters
405	Stone Cairn	Stone cairn, orientated east to west. Measures approximately 1 m x 50 cm.	24° 47' 46.6151" E	26° 59' 14.1109" S	1194.541138	4 Meters
406	MSA	MSA flakes with faceted striking platforms	24° 47' 18.8735" E	26° 59' 05.2332" S	1191.095459	4 Meters
407	MSA & LSA	Alongside an existing quarry. High concentration of MSA artefacts. LSA also present. Huge range of raw material, majority is done quartzite. MSA consist mostly of large flakes with few formal tools. On the western side of the quarry artefacts are covered by red wind-blown sand. Calcrete present just below the surface.	24° 47' 40.1749" E	26° 58' 55.3908" S	1192.049927	4 Meters
408	MSA & LSA (Quarry)	Alongside an existing quarry. High concentration of MSA artefacts. LSA also present. Wide range of raw material, majority is done quartzite. MSA consist mostly of large flakes with few formal tools although some cores are noted. On the western side of the quarry artefacts are covered by red wind-blown sand. Calcrete present just below the surface. Material is scattered around the quarry over an area of 1.5 ha.	24° 47' 37.2660" E	26° 58' 59.5380" S	1194.404297	4 Meters
409	MSA	Low concentration of MSA flakes with faceted striking platforms.	24° 47' 45.9349" E	26° 59' 45.9167" S	1200.472778	4 Meters
410	Ruin	Rectangular cement and stone ruin. Walls are plastered very little of the structure remains intact.	24° 47' 44.7216" E	26° 59' 44.2861" S	1198.60144	4 Meters
411	Stone Cairn	Stone Cairn measuring 1 meter by 50 cm. Aligned roughly North-West to South-East. Could be a possible grave.	24° 47' 44.4660" E	26° 59' 42.5616" S	1197.646118	4 Meters
412	Stone Foundation	Rectangular stone foundation measuring approximately 2 x 6 meters.	24° 47' 42.8927" E	26° 59' 42.4249" S	1196.887573	4 Meters
413	Stone Foundation	Square stone foundation measuring approximately 4 x 4 meters.	24° 47' 43.6739" E	26° 59' 41.3917" S	1197.182983	4 Meters
414	Stone Foundation	Large rectangular stone foundation. Approximately 8 x 4 meter	24° 47' 46.5215" E	26° 59' 49.2360" S	1200.703003	4 Meters
415	Stone Foundation	Large square stone foundation. Approximately 4 x 4 Meters	24° 47' 42.3348" E	26° 59' 46.6189" S	1196.889404	4 Meters
416	Stone Cairns	Overgrown Stone cairns. 3 Cairns aligned roughly east to west. On the periphery of the development.	24° 47' 40.0668" E	26° 59' 48.5881" S	1197.160767	4 Meters

6.1. Stone Age Find spots (Field No 402, 403, 404, 406, 409)

Isolated Middle Stone Age artefacts are scattered over the project area in low densities (less than 3 artefacts per 5m²). More artefacts can be expected sub surface but is now covered with apedal soils. These low density scatters are of low significance and are found over large areas. Artefacts consist mostly of miscellaneous flakes and broken pointed flakes with faceted striking platforms. Raw material consists of quartzite andesitic/ basaltic lava and chert.

Heritage significance: Generally Protected C (GP.C)

6.2. Stone Age Site (Field No 407 - 408)

The site is located in the southern eastern portion of Solar 1 and a direct impact is foreseen on the site. The site is marked by an existing quarry where a calcrete substrata is visible under the apedal soils. (Figure 8). Artefacts are scattered around this quarry on top of the calcrete and consist of both MSA and LSA lithics (Figure 15). As MSA and LSA material is not well dated in this area the site is of slightly higher significance as the calcrete matrix in which the stone tools occur can be dated.

Heritage significance: Generally Protected B (GP.B).

Figure 6: MSA flakes and a core on quartzite.

Figure 7: Range of raw material.

Figure 8: Calcrete substrata

Figure 9: Site viewed from the west. Note red apedal soils capping the calcrete

6.3. Ruins (Field No 410, 412 -415)

Several ruins were recorded in the south western portion of the site. Apart from the fairly recent ruin (Field No 410) the others consist of ephemeral single row rectangular and square stone wall foundations. It must be remembered that sites like these might contain unmarked graves

Heritage significance: Generally Protected B (GP.B)

The ruins are of low significance but it should be noted that structures like these are often associated with informal graves. Graves are of high social significance.

Figure 10: Ruin at Field no 410 viewed from the west

Figure 11: Ephemeral stone foundations at Field No 412

Figure 12 Ephemeral stone foundations at Field No 413

Figure 13: Ephemeral stone foundations at Field No 414

6.4. Stone Cairns (Field No 405, 411 and 416)

These stone cairns are located close to the recorded ruins, the purpose of these cairn are unknown but could be grave dressings marking graves. Field no 411 very much resembles a grave. The farm owner was consulted regarding graves and although the farm is in their family for at least three generations he is not aware of any graves.

Figure 14 Stone cairn at field no 405

Figure 15: Stone cairn at field no 411

Figure 16: Stone feature at field no 416

Figure 17: Stone cairn at field no 416

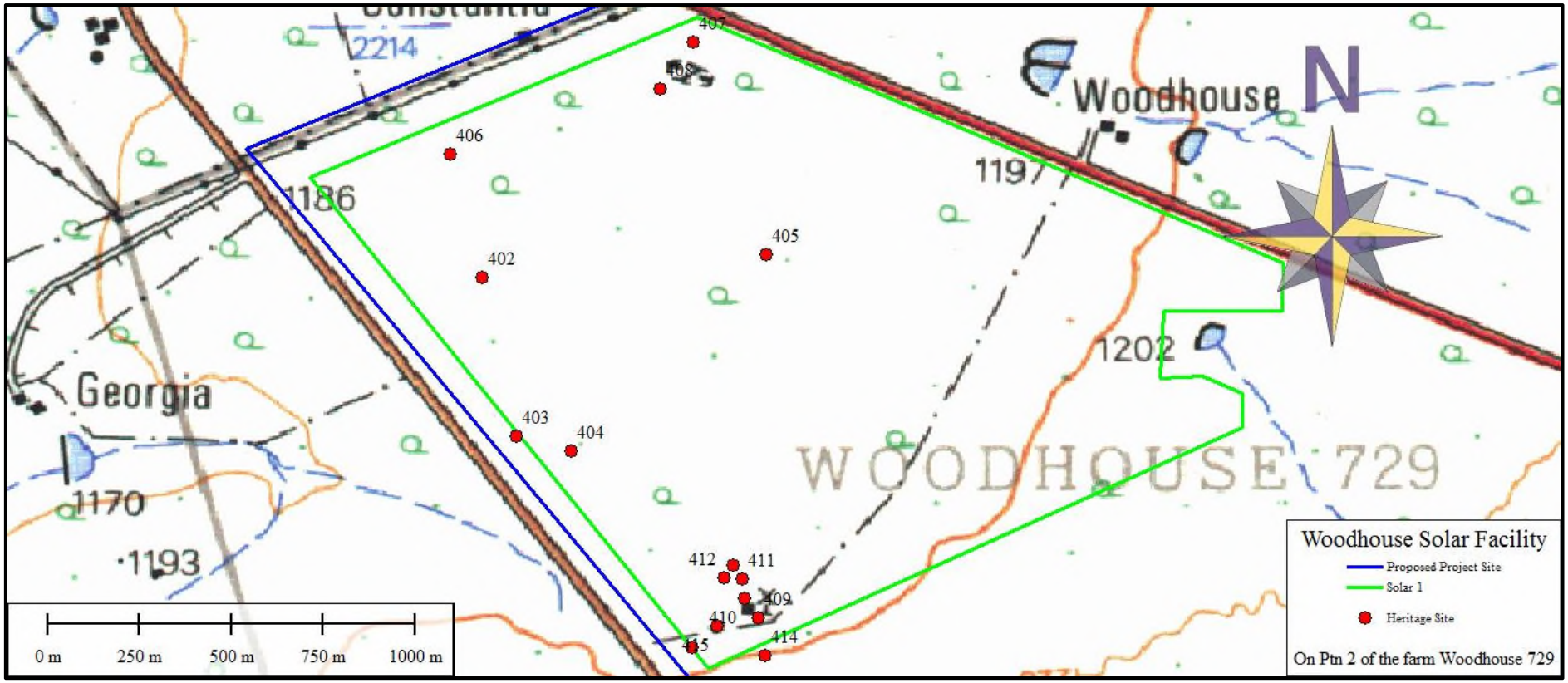

Figure 18: Distribution of recorded features in Solar 1.

6.5. Impact evaluation of the proposed project on heritage resources

Power line route alternatives

In order for the facility to evacuate the generated electricity into the Eskom national grid four grid connection options are being considered which includes the following:

- Alternative 1: a direct connection to the authorised Eskom Bophirima Substation to be constructed within the northern portion of the affected property;
- Alternative 2: a direct connection to the existing Woodhouse 88/22kV Substation located north of the boundary of the affected property;
- Alternative 3: a turn-in turn-out connection to the existing Delareyville Munic / Vryburg 1 88kV Feeder located along the northern boundary of the affected property; and
- Alternative 4: a turn-in turn-out connection to the authorised 132kV Eskom Bophirima–Mookodi power line to be constructed by Eskom[1].

Four alternative power line routes are being considered to connect the facility via the a 132kV power line to the national grid (see **Figure 7** below).

[1] In the event that Eskom is unable to complete the construction of the proposed 132kV Eskom Bopirima-Mookodi Overhead Line Genesis Eco-Energy Developments would consider undertaking the construction of the authorised power line within the authorised corridor (DEA Ref.: 12/12/20/1929) to connect the PV Facility via the completed 132kV power line to the existing Mookodi 400/132KV Substation located to the west of the project site.

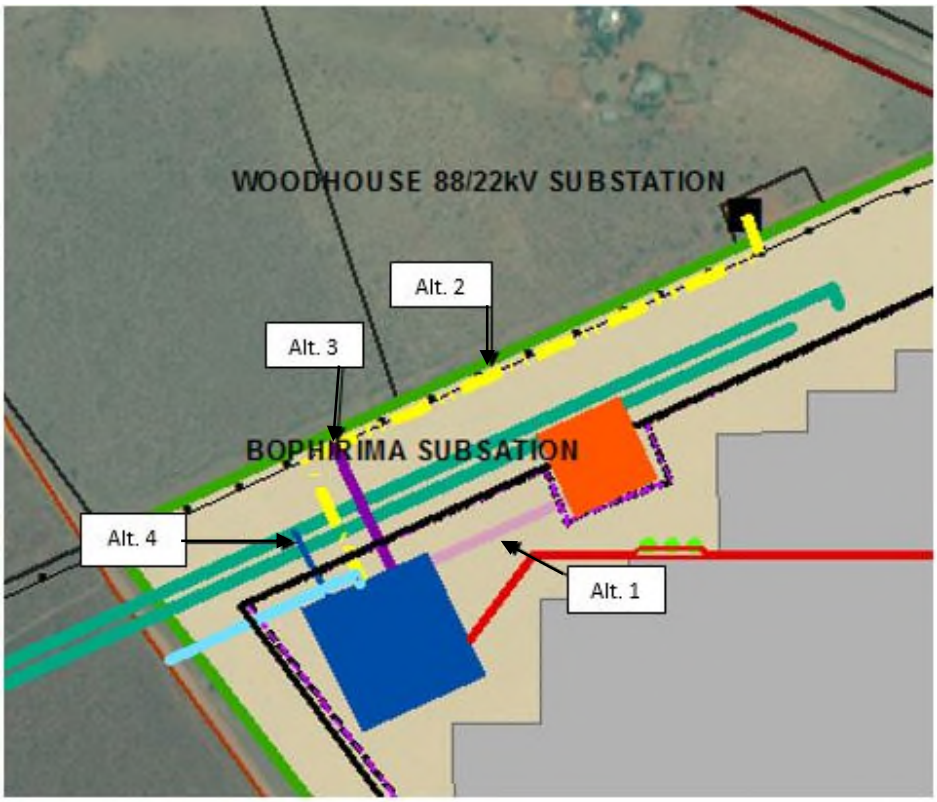

Figure 7. An illustration of the alternative power line routes showing where the power line will be connected at the on-site substation and where it connects to the grid connection alternative.

The power line alternative routes have been considered from an archaeological perspective to identify the impact of each power line route on the archaeological resources. Table 1 considers the power line alternatives in a comparative assessment.

Aspect	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Archaeology/heritage	Acceptable – • Artefacts identified are scattered too sparsely to be of any significance. • No significant heritage finds	Acceptable – • Artefacts identified are scattered too sparsely to be of any significance. • No significant heritage finds	Acceptable – • • Artefacts identified are scattered too sparsely to be of any significance. • No significant heritage finds	Acceptable – • • Artefacts identified are scattered too sparsely to be of any significance. • No significant heritage finds

After the consideration of the power line alternatives it is considered that all the proposed power line routes are acceptable and appropriate from an archaeological perspective and can all be considered as feasible options with the implementation of appropriate mitigation measures.

Stone Age Scatter Find Spots

Nature: During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (1)	Low (1)
Probability	Most Likely (4)	Most Likely (4)
Significance	28 (Low)	28 (low)
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	**Yes – limited mitigation required**	
Mitigation:	No preconstruction mitigation needed. The artefacts within the study area are scattered too sparsely to be of any significance apart from noting their presence, which has been done in this report.	
Cumulative impacts:	Archaeological sites are non-renewable and impact on any archaeological context or material will be permanent and destructive.	
Residual Impacts:	Depletion of archaeological record of the area**.**	

Stone Age Site

Nature: During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)

Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Low (1)
Probability	Most Likely (4)	Likely (3)
Significance	40 (Medium)	21 (low)
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	**Yes**	
Mitigation: If the site cannot be preserved *in-situ* it is recommended that a surface sample is collected and that the site is dated (possibly the calcrete matrix in which the tools are found) prior to applying for a destruction permit from the SAHRA.		
Cumulative impacts: Archaeological sites are non-renewable and impact on any archaeological context or material will be permanent and destructive.		
Residual Impacts: Depletion of archaeological record of the area**.**		

Ruins

Nature: During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects.

	Without mitigation	**With mitigation**
	Preferred Site	Preferred Site
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Low (1)
Probability	Most Likely (4)	Likely (3)
Significance	40 (Medium)	21 (low)
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	**Yes**	

Mitigation:

The ruins are not of high significance, but informal graves are often associated with structures like these. It is recommended that the possible presence of graves should be confirmed during the social consulting process and if graves are indicated these should be avoided or relocated following the correct procedure.

Cumulative impacts:

Heritage sites and burials are non-renewable and any impact will be permanent and destructive.

Residual Impacts:

NA

Stone Cairns

Nature: During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Low (1)
Probability	Most Likely (4)	Likely (3)
Significance	40 (Medium)	21 (low)
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	**Yes**	
Mitigation: It is recommended that the Stone Cairns should be demarcated and excluded from the development if possible. If this is not possible social consultation should confirm the presence of graves prior to construction. If graves are present they should be relocated following the correct procedures.		
Cumulative impacts: Heritage sites are non-renewable and any impact will be permanent and destructive.		
Residual Impacts: NA		

6.6. Cumulative Assessment

Through CRM studies for developments in the area heritage sites are identified and protected from accidental damage, this can be regarded as a positive impact as it adds to the heritage database of the area.

In terms of the cumulative impact of this and other developments in the Vryburg area, as there are numerous similar projects in the area the impact on the heritage landscape and sites of low heritage significance is increased as these sites area destroyed through development.

Action trigger	**Development impact**
Is the proposed action one of several similar past, present or future actions in the same geographic area?	Yes
Do other activities (whether state or private) in the region have environmental effects similar to those of the proposed action?	Yes
Will the proposed action (in combination with other planned activities) affect any natural resources, cultural resources, socio or economic units, or ecosystems of local, regional or national concern?	There is a secondary impact that can be managed through the correct mitigation.
Have any recent heritage studies of similar actions identified important adverse or beneficial cumulative effects issues?	Data on the heritage resources on the area is being collected through systematic surveys and identified resources are recorded and managed through mitigation.
Has the impact been historically significant, such that the importance of the resource is defined by past loss, gain or investments to restore resources?	Identified resources are being recorded and mitigated for projects such as these and might otherwise have remained unidentified.
Does the proposed action involve any of the following? » Loss of natural habitats or historic character through residential, commercial and industrial development » Social, economic or cultural effects on marginalised communities resulting from ongoing development	Currently the area is not inhabited. The project and others in the area will have an impact on the cultural landscape, but the social benefits of the project have been classified as beneficial.

The project aims to provide a renewable source of energy to the South Africa power grid. The power generation capacity of South Africa is presently under significant pressure. Therefor the positive impacts of the project outweigh the negative impact on heritage resources of the area that can be successfully mitigated.

Cumulative Impact Assessment

Nature: Heritage impacts associated with the establishment of PV Facilities on the archaeology of the area		
	All projects (cumulative) without mitigation	**All projects (cumulative) with mitigation (Preservation/ excavation of sites)**
Extent	Local (2)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (3)
Probability	Not probable (2)	Not Probable (2)
Significance	**22 (Low)**	**20 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes unless sites can be preserved.
Can impacts be mitigated?	Yes	Through preservation or excavation of sites.
Mitigation: Identified resources are being recorded and mitigated for projects such as these that would have otherwise remained unidentified. In terms of the impact on the cultural landscape the impact is considered low, with the correct mitigation measures as well as the vast physical area in which these projects are constructed.		

7. CONCLUSIONS AND RECOMMENDATIONS

Savannah Environmental (Pty) Ltd, on behalf of Genesis Woodhouse Solar 1 (Pty) Ltd, appointed Heritage Contracts and Archaeological Consulting CC (HCAC) to conduct an Archaeological Impact Assessment for the proposed Woodhouse Solar 1 PV Facility.

It is important to note that the entire farm was not surveyed but only the footprint of the proposed solar facility was surveyed on foot and by vehicle. In terms of the built environment (Section 34 of the NHRA), several farm labourer ruins were recorded in the Woodhouse Solar 1 footprint. The ruins are not of high significance, but informal graves are often associated with structures like these. It is recommended that the possible presence of graves should be confirmed during the social consulting process and if graves are indicated these should be avoided or relocated following the correct procedure.

In terms of the archaeological component of Section 35, Middle Stone Age (MSA) and Later Stone Age (LSA) artefacts were recorded scattered in varying densities across the proposed footprint. Most of these artefacts are scattered too sparsely to be of any significance apart from noting their presence, which has been done in this report (**Field No 402, 403, 404, 406, 409**).

An MSA and LSA site (**Field no 407 – 408**) was recorded at an existing quarry in the north eastern portion of the proposed footprint. MSA and LSA sites are not dated in this area of the western Transvaal and the correct mitigation of the site could result in filling these knowledge gaps. If the site cannot be preserved *in-situ* it is recommended that a surface sample is collected and that the site is dated (possibly the calcrete matrix in which the tools are found) prior to applying for a destruction permit from the SAHRA.

Graves (Section 36) can be expected anywhere on the landscape. Several stone cairns (**Field No 405, 411 and 416**) were noted close to the recorded farm labourer ruins (**Field No 410, 412 -415**) that could indicate graves. It is recommended that the cairns should be preserved *in situ*, if this is not possible it is recommended that through the social consultation process it should be confirmed whether the cairns represent graves, and if so the correct relocation process should be followed for the relocation with the required permits.

All ground works should be monitored and where any stratigraphic profiles in context with Stone Age material are exposed, these should be sampled and dated.

No significant cultural landscape elements were noted. The various solar developments and existing Eskom powerlines and substations already have a visual impact on scenic routes and sense of place and are not assessed to be high from a heritage perspective but are assessed independently by a visual specialist as part of the EIA process.

The impacts to heritage resources by the proposed development are not considered to be highly significant if the correct mitigation measures are implemented. Additionally it is recommended that a chance finds procedure is included within the EMP as detailed below.

Chance find procedure

This procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish

monitoring and reporting procedures to ensure compliance with this policy and its associated procedures. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below.

- If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or rock engraving, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager.

- It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area.

- The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA.

7.1 Reasoned Opinion
From a heritage perspective Solar 1 is acceptable from a heritage point of view if the above recommendations are adhered to and based on approval from SAHRA. HCAC is of the opinion that the development can continue as the impact of the development on the heritage of the Vryburg area can be mitigated.

If during the pre-construction phase or during construction, any archaeological finds are made (e.g. graves, stone tools, and skeletal material), the operations must be stopped, and the archaeologist must be contacted for an assessment of the finds. Due to the subsurface nature of archaeological material and graves the possibility of the occurrence of unmarked or informal graves and subsurface finds cannot be excluded.

8. PROJECT TEAM

Jaco van der Walt, Project Manager

9. STATEMENT OF COMPETENCY

I (Jaco van der Walt) am a member of ASAPA (no 159), and accredited in the following fields of the CRM Section of the Association: Iron Age Archaeology, Colonial Period Archaeology, Stone Age Archaeology and Grave Relocation. This accreditation is also valid for/acknowledged by SAHRA and AMAFA.

I have been involved in research and contract work in South Africa, Botswana, Zimbabwe, Mozambique, Tanzania and the DRC; having conducted more than 300 AIA's since 2000.

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