ARCHAEOLOGICAL IMPACT ASSESSMENT REPORT

FOR THE PROPOSED WOODHOUSE SOLAR 2 PV FACILITY CLOSE TO VRYBURG NORTH WEST PROVINCE

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Project Reference:

216047

Report date:

April 2016

DOCUMENT PROGRESS
Archaeological Impact Assessment

Document status

Document Version	**V1**
Report Purpose	**Draft for review Savannah Environmental (Pty) Ltd**
Report Ref. No.	**216047**

Distribution List

Date	Report Reference number	Document Distribution	Number of Copies
2016/04/20	216047	Savannah Environmental (Pty) Ltd	Electronic copy

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EXECUTIVE SUMMARY

Site name and location: Woodhouse Solar 2 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 2 (Pty) Ltd.

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

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Date of Report: 20 April 2016

Findings of the Assessment:

Savannah Environmental (Pty) Ltd, on behalf of Genesis Woodhouse Solar 2 (Pty) Ltd, appointed Heritage Contracts and Archaeological Consulting CC (HCAC) to conduct an Archaeological Impact Assessment for the proposed Woodhouse Solar 2 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 PV Facility and the Woodhouse Solar 2 PV Facility), this report focuses on the Woodhouse Solar 2 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), no structures were recorded in the Woodhouse Site Alternative 1and Site Alternative 2 footprint.

In terms of the archaeological component of Section 35, Early Stone Age (ESA), Middle Stone Age (MSA) and Later Stone Age (LSA) artefacts were recorded scattered in varying densities across most of the proposed footprint of 2Site Alternative 1. These sites are associated with the large quantities of raw material available in the area and where the apedal soils are eroded away exposing glacial gravels that were exploited in antiquity. Almost the entire Stone Age sequence was recorded here apart from the Oldowan. Artefacts associated with the Fauresmith technocomplex up to LSA were recorded in the footprint of Site Alternative 1. Mostly MSA and some LSA material were recorded in Site Alternative 2 .

Graves (Section 36) can be expected anywhere on the landscape although none were recorded in either alternative. 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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CONTENTS

FIGURES

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 2 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 utilized 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 study area 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 sites 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 as significant areas; and

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

Reporting

Report on the identification of anticipated and cumulative impacts 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 2 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 characterized 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

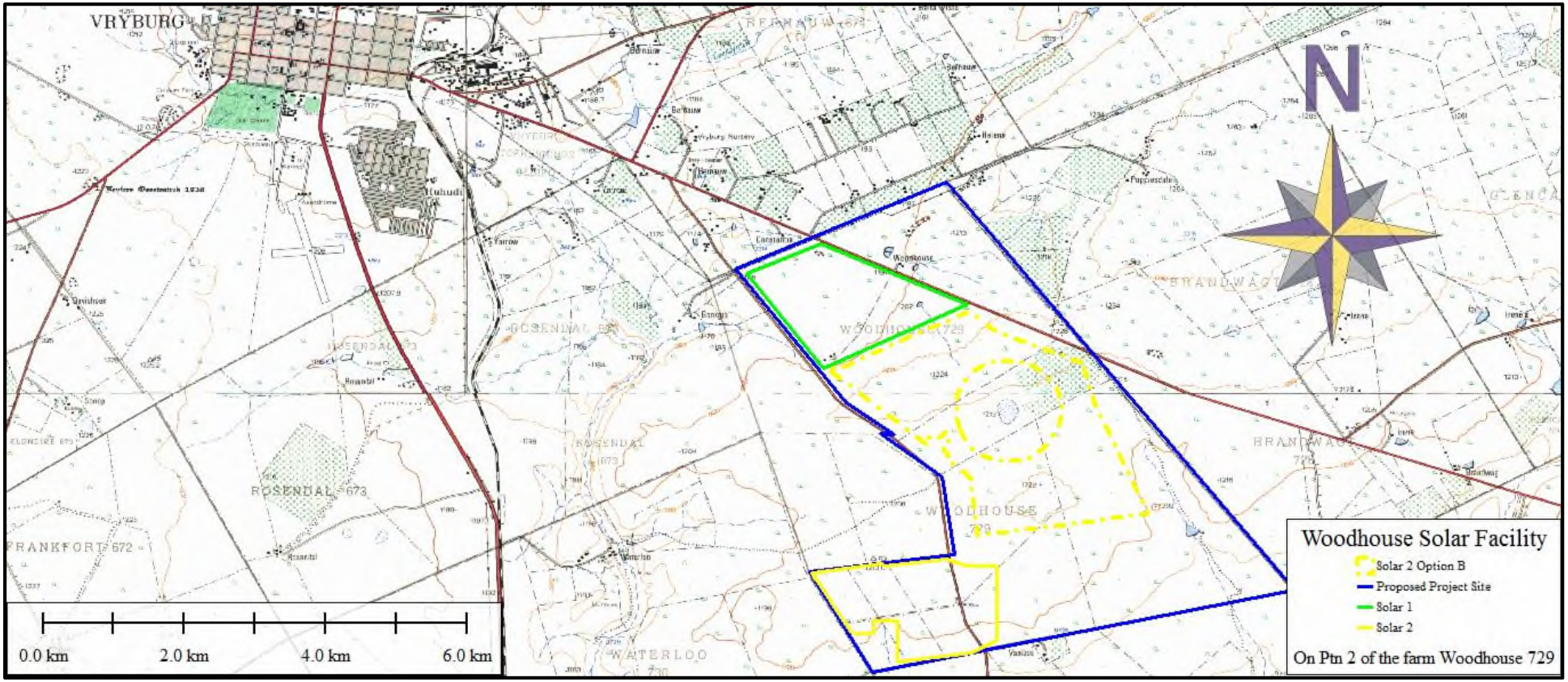

Figure 1: Location map.

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 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. During the field visit the Site Alternative 2footprint was provided as an option. This area was assessed through a high level scan. Track logs of the areas covered were taken (Figure 2).

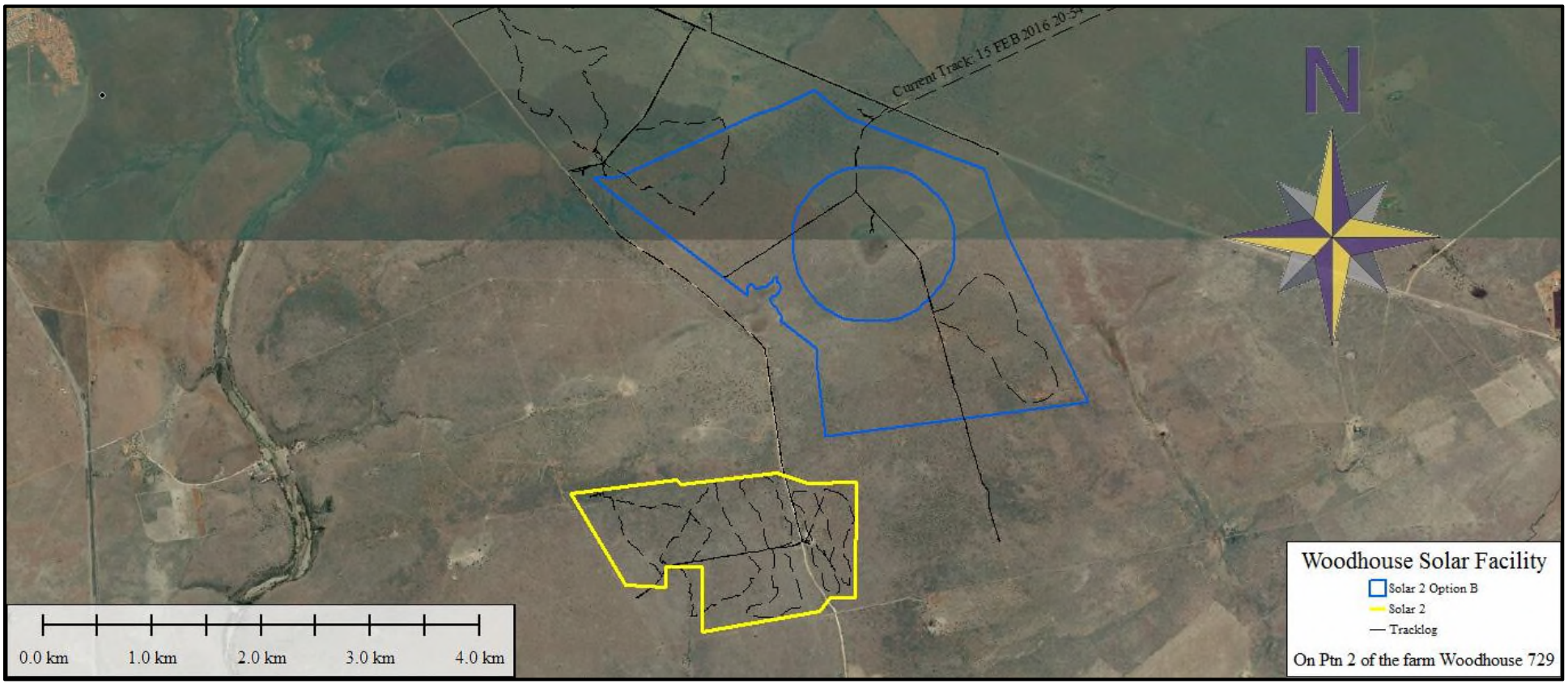

Figure 2. Track logs of the areas surveyed indicated in black.

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 Stone Age sequence in the general study 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 each 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. Three alternatives are being considered for the grid connection:
    - A direct connection to the proposed Eskom Bophirima substation to be constructed on-site, or
    - A direct connection to the existing Mookodi 400/132KV substation located to the west of the site, or
    - A connection to the existing Woodhouse 88/22KV Substation located on the boundary of the site in the north.
- 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.

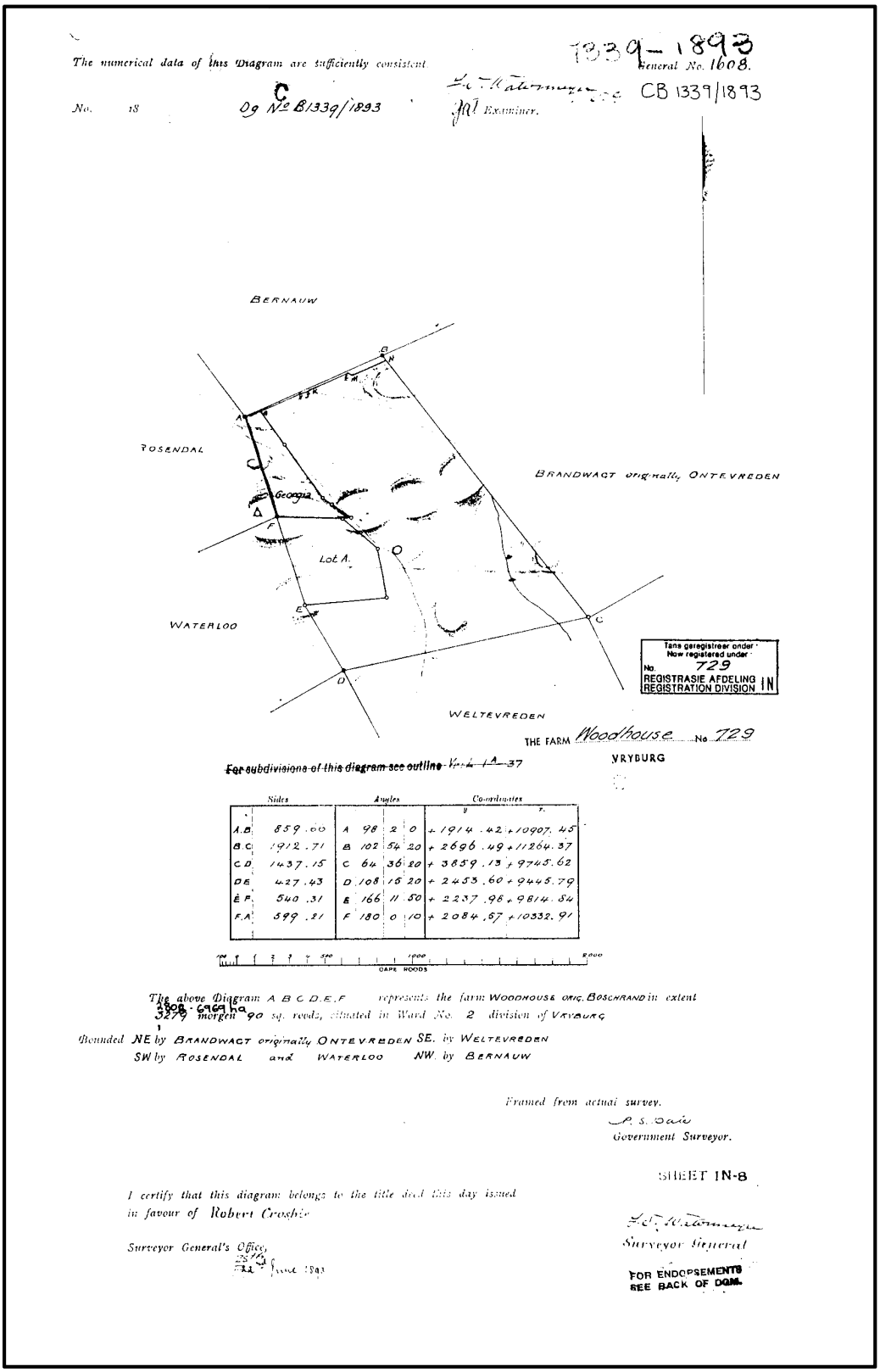

Figure 3: A Diagram issued by the Chief Surveyor General in 1893 indicating the holder of the title deed of the farm as one Robert Croshie.

4.3. Stone Age 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.

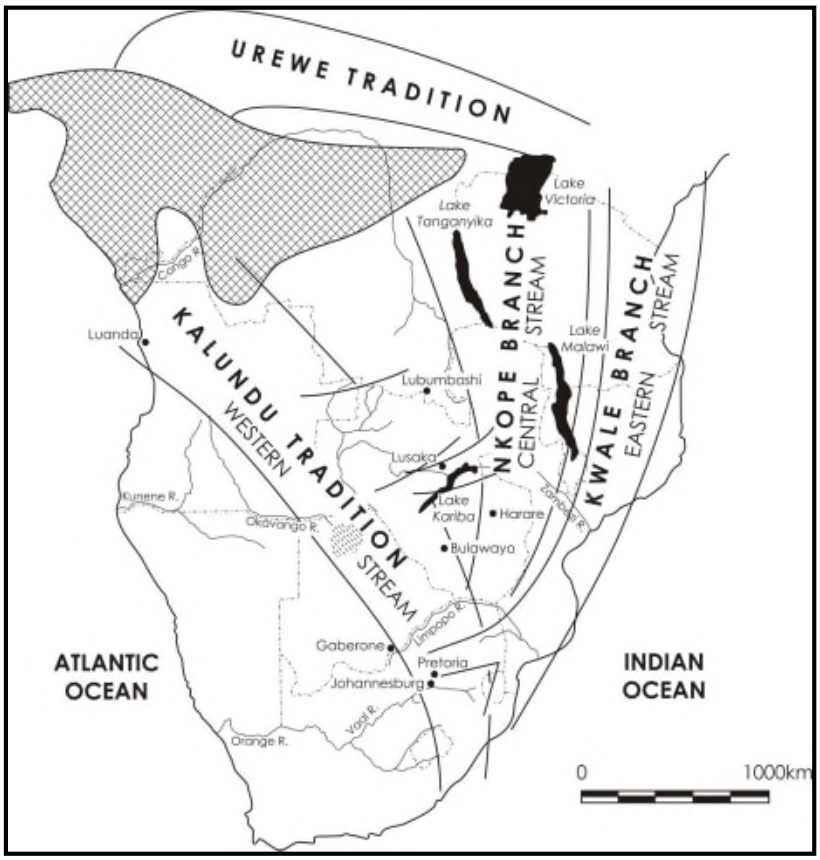

Figure 4: Movement of Bantu speaking farmers (Huffman 2007)

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 wind energy facility the local extent of its impact necessitates a representative sample and only the footprint of the areas 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 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 2 facility measures less than 231 ha and Option B less than 505 ha. The site is characterised by Apedal soils on top of glacial gravel that produced a wide variety of raw material for the manufacture of stone tools. Grass cover and shrubs are knee high (Figure 5). Area 2 is flat with no major landscape features like pans or hills. Option 2B is characterised by a large pan in the middle and several quartzite ridges and basaltic lava outcrops.

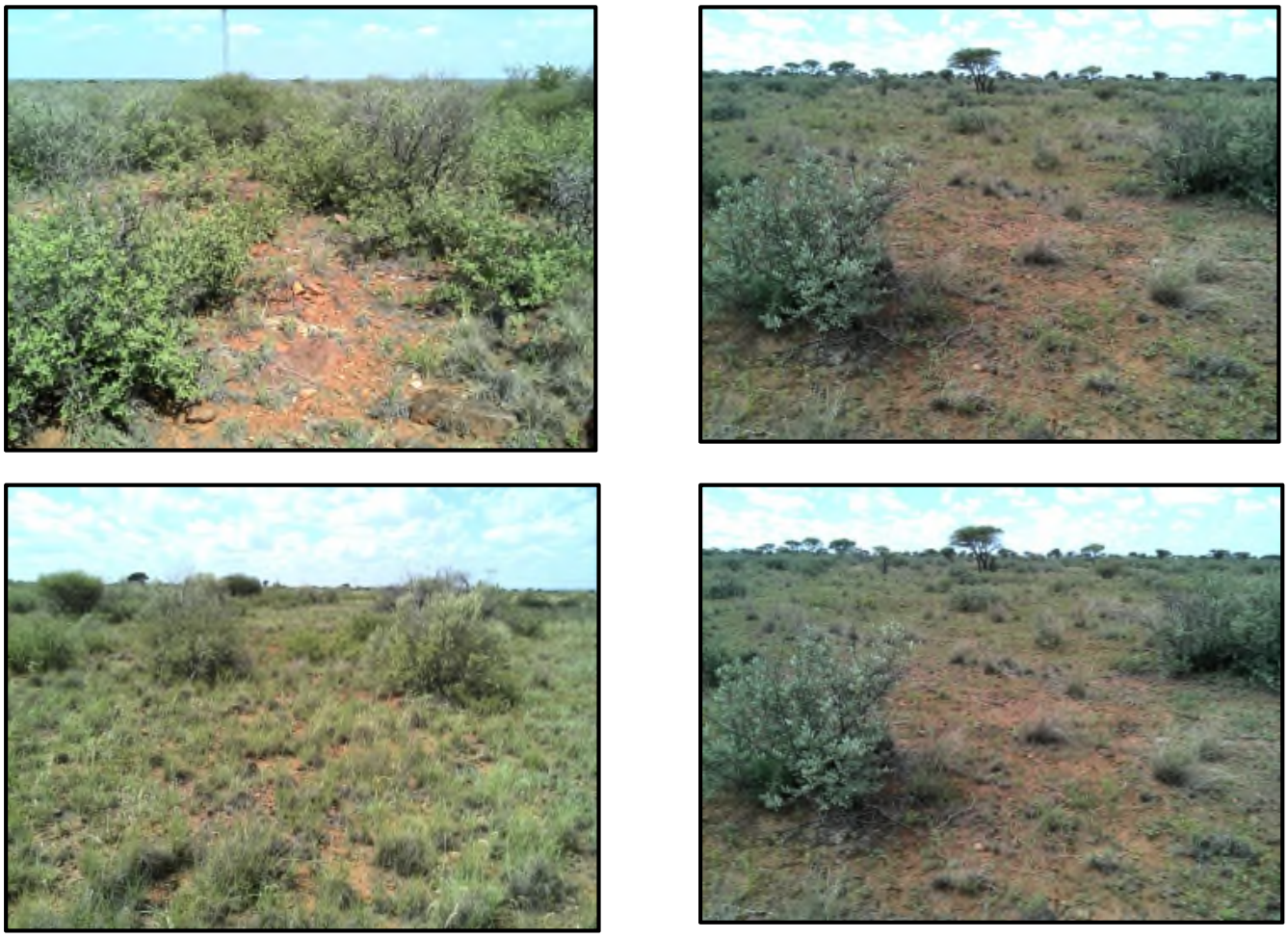

Figure 5: General site conditions.

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

Stone Age artefacts are found over most of the study. Fluvioglacial gravel is eroding out of a thin layer of apedal soils and more artefacts occur sub surface. The widespread occurrence of Stone Age tools also means that not every artefact or cluster was recorded. Low density (less than 2 artefacts per 5m²) isolated artefacts were recorded as find spots although discreet Stone Age sites (knapping sites) and high concentrations of artefacts were also recorded.

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 in Woodhouse Solar 2- Site Alternative 1

Field Number	Type Site	Description	LONGITUDE	LATITUDE	ELEVATION	GPS Accuracy
381	MSA	MSA flake with faceted striking platform	24° 47' 57.1775" E	27° 01' 53.5367" S	1208.26709	4 Meters
382	MSA	MSA flake with faceted striking platform	24° 48' 03.2795" E	27° 01' 48.6587" S	1207.434204	4 Meters
383	MSA	MSA flake with faceted striking platform	24° 47' 53.5128" E	27° 01' 37.8156" S	1212.081909	4 Meters
384	MSA	MSA flake with faceted striking platform	24° 47' 46.8529" E	27° 01' 24.6144" S	1214.214478	4 Meters
385	MSA & LSA	Scattered over an area of 30 x 20 m. Range of raw material including chert and quartzite. Artefact ratio 20 artefacts per m². Artefacts consist of discoid cores, flakes with secondary retouch, blades and thumbnail scrapers.	24° 47' 43.2889" E	27° 01' 24.0779" S	1214.240112	4 Meters
386	MSA Quarry	MSA flake with faceted striking platform	24° 47' 59.8667" E	27° 01' 27.9120" S	1216.458618	4 Meters
387	MSA	MSA flake with faceted striking platform	24° 48' 11.6137" E	27° 01' 29.3700" S	1215.724487	4 Meters
388	MSA	MSA Flakes with faceted striking platform. Levallois point, blades and adzes. Scattered along drainage line. Distributed over a large area of approximately 8 ha in various densities. 1 artefact per 2 - 3 m². Located just outside development footprint.	24° 48' 11.7719" E	27° 01' 50.3509" S	1208.86853	4 Meters
389	MSA	MSA flake with faceted striking platform	24° 48' 19.4112" E	27° 01' 56.2045" S	1207.31665	4 Meters
390	MSA	MSA flake with faceted striking platform, scrapers, adzes and blades.	24° 48' 26.6797" E	27° 01' 53.4719" S	1209.622559	4 Meters
391	MSA & LSA	MSA flakes with faceted striking platform, scrapers, adzes and blades.	24° 48' 30.2401" E	27° 01' 48.4212" S	1211.324829	4 Meters
392	MSA	MSA flakes with faceted striking platform, some with dorsal scars.	24° 48' 22.6583" E	27° 01' 31.0873" S	1216.919067	4 Meters
393	MSA	MSA artefacts consisting of broken blades and flakes	24° 48' 04.8636" E	27° 01' 44.3856" S	1210.639648	4 Meters
394	MSA	MSA artefacts consisting of broken blades, Levallois points	24° 48' 04.9249" E	27° 01' 44.4900" S	1208.780884	4 Meters
395	MSA	MSA artefacts close to cattle kraal. Artefact density 2 artefacts per 4 m². Artefacts consist of large chunks and flakes. Some with Dorsal Scarring. Outside of development footprint.	24° 48' 47.0339" E	27° 01' 37.4735" S	1212.088013	4 Meters
396	MSA	MSA Faceted Flakes	24° 48' 47.2104" E	27° 01' 37.4520" S	1210.627441	4 Meters
397	MSA & LSA	High concentration of MSA and LSA artefacts on top of ridge. Artefacts consist of cores, flakes, blades and scrapers.	24° 48' 51.2713" E	27° 01' 41.3651" S	1210.086304	4 Meters

398	MSA	High concentration of MSA and LSA artefacts on top of ridge. Artefacts consist of cores, flakes, blades and scrapers.	24° 48' 58.4783" E	27° 01' 43.3920" S	1206.941162	4 Meters
399	MSA	MSA Faceted Flakes, cores and blades.	24° 48' 59.8787" E	27° 01' 32.5667" S	1214.280029	4 Meters
400	MSA & LSA	MSA and LSA blades, flakes, adzes.	24° 48' 56.9089" E	27° 01' 24.1932" S	1216.078735	4 Meters
445	Transitional ESA on quartzite	Fauresmith hand axe on quartzite.	24° 47' 56.1805" E	27° 01' 38.3555" S	1206.44812	4 Meters

Table 2. Recorded sites in Site Alternative 2

Field Number	Type Site	Description	LONGITUDE	LATITUDE	ELEVATION	GPS Accuracy
401	MSA & LSA	Low density scatter of MSA and LSA on quartzite ridge.	24° 47' 58.1316" E	26° 59' 53.5633" S	1206.921509	4 Meters
417	MSA	MSA Flakes with faceted striking platforms. Slightly higher concentration of 4 artefacts per m². Raw material is mixed. Predominantly on quartzite.	24° 49' 24.1103" E	27° 00' 30.7943" S	1218.145264	4 Meters
418	MSA & LSA Surrounding Pan	Artefacts consist of Levallois points, adzes and blades. Artefact density is approximately 4 per 2 m²	24° 49' 06.1789" E	27° 00' 00.2341" S	1220.36731	4 Meters
419	MSA on Ridge	Large MSA flakes on quartzite ridge.	24° 49' 01.0417" E	26° 59' 47.5585" S	1227.116455	4 Meters
420	MSA on Quartzite Ridge	Large MSA flakes on quartzite ridge. Raw material consists of quartzite.	24° 49' 01.0" E	26° 59' 30.0" S	1229.116354	4 Meters

Stone Age Find spots (Field No 381, 382, 383, 384, 386,387, 389, 390, 391, 392, 393, 394, 395, 396, 399, 400, 401, 445)

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 are now covered with apedal soils. These low density scatters are of low significance and are found over the entire footprint of Site Alternative 1. Artefacts consist mostly of miscellaneous flakes, adzes, side scrapers and broken pointed flakes with faceted striking platforms. Several formal tools also occur with secondary retouch and radial cores. Raw material consists of quartzite, andesitic/ basaltic lava and chert.

A Typical ESA Fauresmith hand axe (Figure 9) on quartzite was recorded at (Field No 445).

Heritage significance: Generally Protected C (GP.C)

Figure 6: Range of raw material and artefacts from Site Alternative 1

Figure 7: Ventral view of quartzite artefacts.

Figure 8: Flake with dorsal scar.

Figure 9: Fauresmith hand axe.

Stone Age Sites (Field No 385, 386, 397, 398, 417, 418, 419)

There is a marked higher concentration of artefacts in Site Alternative 1compared to Site Alternative 2. Site Alternative 2is characterised by deeper apedal soils and this is confirmed by evidence of historical agricultural activities in the area. There is also a marked contrast in raw material found in Site Alternative 1versus the raw material found in Site Alternative 2 (Figure 12 & 13).

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

Figure 10: Concentration of artefacts at Field no 385.

Figure 11: Quarry site with blade core (field no 386).

Figure 12: Ventral view of artefacts from field no 417 in 2Site Alternative 2footprint.

Figure 13: Dorsal and ventral view of artefacts from field no 397 – 398 from Site Alternative 1.

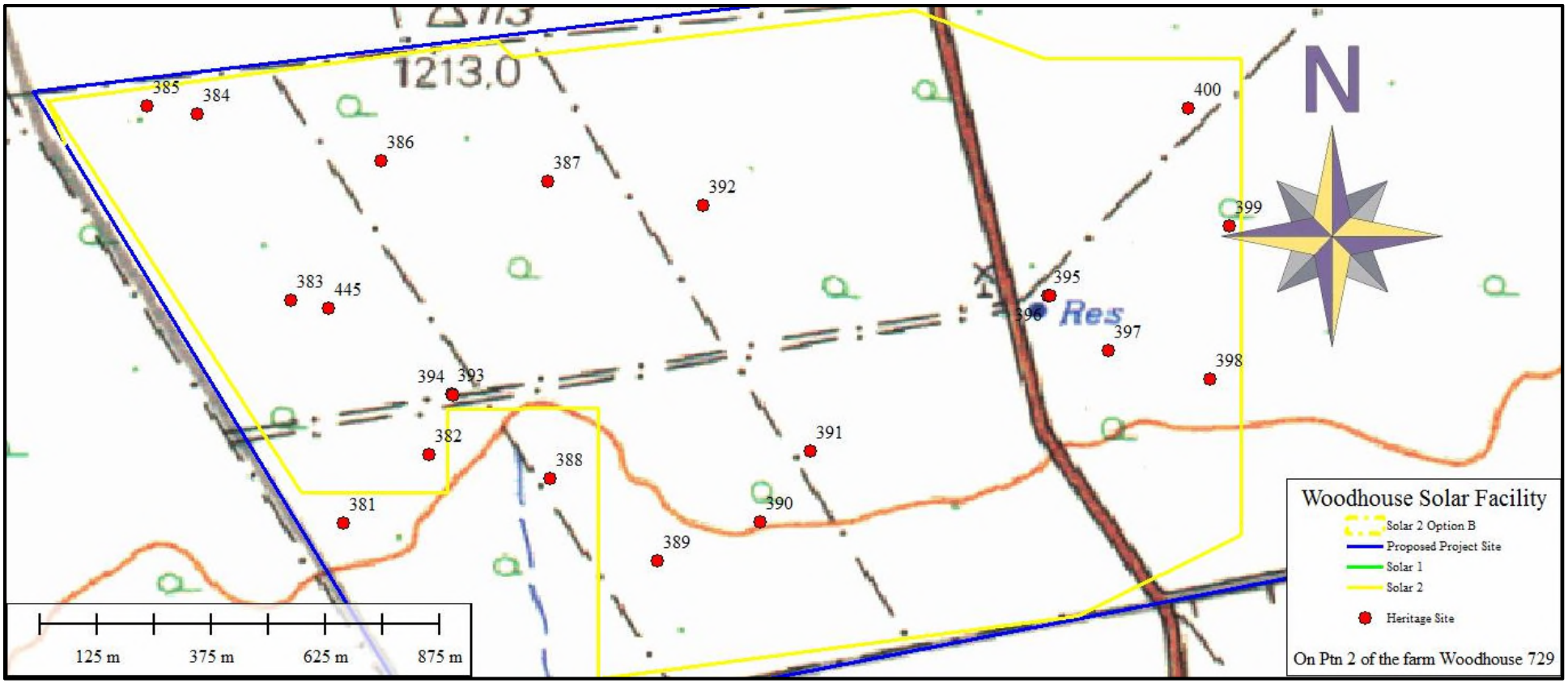

Figure 14: Distribution of recorded features in Site Alternative 1.

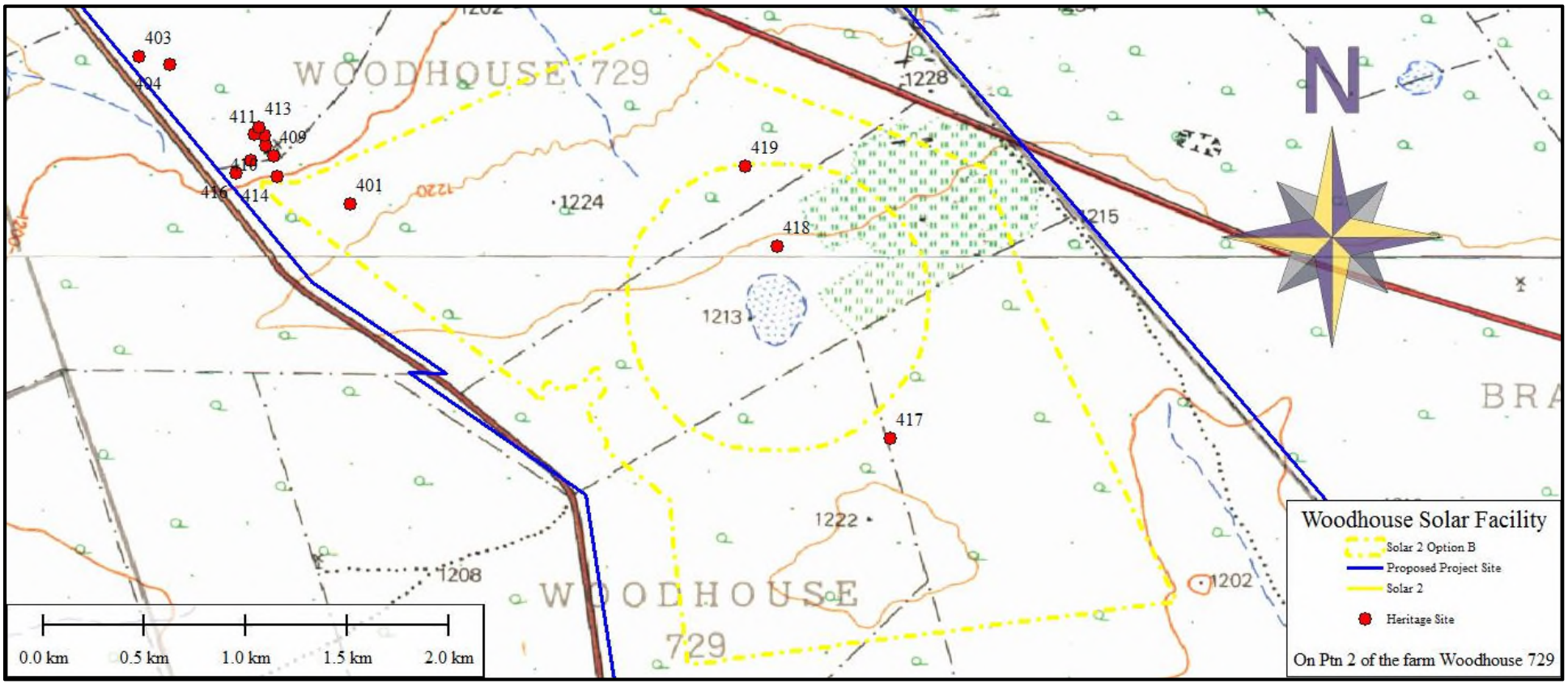

Figure 15. Distribution of recorded features in Site Alternative 1

6.1. Impact evaluation of the proposed project on heritage resources
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**	
	Site Alternative 1 (Preferred Site)	**Alternative 2**	**Site Alternative 1 (Preferred Site)**	**Alternative 2)**
Extent	Local (1)	Local (1)	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)	Permanent (5)	Permanent (5)
Magnitude	Low (1)	Low (1)	Low (1)	Low (1)
Probability	Most Likely (4)	Most Likely (4)	Most Likely (4)	Most Likely (4)
Significance	28 (low)	28 (low)	28 (low)	28 (low)
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Not reversible	Not reversible	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes	Yes	Yes
Can impacts be mitigated?	**Yes**	**Yes**		
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 Sites

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**	
	Site Alternative 1 (Preferred Site)	**Alternative 2**	**Site Alternative 1 (Preferred Site)**	**Alternative 2**
Extent	Local (2)	Local (2)	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Low (3)	Low (1)	Low (1)
Probability	Most Likely (4)	Most Likely (4)	Likely (3)	Likely (3)
Significance	40 (Medium)	40 (Medium)	21 (low)	21 (low)
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Not reversible	Not reversible	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes	Yes	Yes
Can impacts be mitigated?	**Yes**	**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**.**

6.2. 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		
	Without mitigation	**With mitigation (Preservation/ excavation of site)**
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 2 (Pty) Ltd, appointed Heritage Contracts and Archaeological Consulting CC (HCAC) to conduct an Archaeological Impact Assessment for the proposed Woodhouse solar energy facility

It is important to note that the entire farm was not surveyed but only the footprint of the proposed solar facility that was surveyed on foot and by vehicle. In terms of the built environment (Section 34 of the NHRA), no structures were recorded within the development area for Site Alternatives 1 and 2. In terms of the archaeological component of Section 35, Early Stone Age (ESA), Middle Stone Age (MSA) and Later Stone Age (LSA) artefacts were recorded scattered in varying densities across most of the proposed footprint of Solar 2. These sites are associated with the large quantities of raw material available in the area and where the apedal soils are eroded away exposing glacial gravels and basaltic lava that was exploited in antiquity. . Almost the entire Stone Age sequence was recorded here apart from the Oldowan. Artefacts associated with Fauresmith up to LSA were recorded in the footprint of Site Alternative 1. Mostly MSA and some LSA material were recorded in Site Alternative 2. What is of interest is the wide variety of raw material that was used in the study area. Based on superficial observations of a limited amount of artefacts, artefacts recorded in the area can be tentatively placed in techno complexes. This classification is tentative at least and a larger sample is needed. The following techno complexes were identified:

- ESA – MSA Transition – Fauresmith;
- MSA –Blade cores, radial cores and Levallois points possibly indicating Pre Still Bay (Mosselbaai or Klasies Rivier);
- LSA - Side scrapers and adzes possibly Oakurst.

Graves (Section 36) can be expected anywhere on the landscape although none were recorded in either alternative. No significant cultural landscape elements were noted. The various solar developments and existing Eskom powerlines and substations have already impacted on the visual impacts to 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 can be mitigated if the following recommendations are implemented:

- The footprint of Site Alternative 2 was subjected to a high level scan. If this option is decided on by the developer the impacts to heritage resources are considered to be lower compared to Site Alternative 1. The development footprint will however have to be subjected to a walkthrough and some mitigation will be required based on the outcome of the walkthrough.
- If Site Alternative 1is decided on by the developer surface samples of various concentrations of artefacts will have to be surface sampled and analysed (e.g. Field no 385 and 397 – 398). MSA and LSA sites are not dated in this area of the western Transvaal and the correct mitigation of the sites could result in filling these knowledge gaps.
- 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.
- 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.

No cultural landscape elements were noted and visual impacts to scenic routes and sense of place are also considered to be low from a heritage perspective but are assessed by a separate study by a visual specialist. In terms of the built environment (Section 34 of the NHRA), no standing buildings of significance were recorded.

7.1 Reasoned Opinion

From a heritage perspective Site Alternative 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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