

# Archaeological Impact Assessment

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For the proposed Hantam PV Solar Solar Energy Facility on the farm Narosies 228,  
Loeriesfontein, Northern Cape Province

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Prepared For  
**Savannah Environmental (Pty) Ltd**  
By



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I, Jaco van der Walt as duly authorised representative of Heritage Contracts and Archaeological Consulting CC, hereby confirm my independence as a specialist and declare that neither I nor the Heritage Contracts and Archaeological Consulting CC have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which the client was appointed as Environmental Assessment practitioner, other than fair remuneration for work performed on this project.

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## EXECUTIVE SUMMARY

**Site name and location:** Proposed Hantam PV Solar Energy Facility on the farm Narosies 228 North of Loeriesfontein, Northern Cape Province

**Purpose of the study:** Phase 1 Archaeological Impact Assessment to determine the presence of cultural heritage sites and the impact of the proposed project on these resources within the areas demarcated for the solar development.

**1:50 000 Topographic Map:** 3019 DA

**EIA Consultant:** Savannah Environmental (Pty) Ltd

**Developer:** Solar Capital (Pty) Ltd

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

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**Date of Report:** 21 December 2011

### Findings of the Assessment:

No sites of heritage significance were identified during the survey. However, from the desktop study it is clear that palaeontological sites can be expected in the area. Therefore, the following management actions are recommended to be included in the EMP for the proposed project.

- It is recommended that the construction crew be educated about the sensitivities involved in the study area, and the potential heritage resources they could encounter during the construction phase of the project. This includes basic training for construction staff on possible finds, action steps for mitigation measures, surface collections, and communication routes to follow in the case of a discovery.
- Two palaeontological studies are on record for the area (Almond, 2011a, b), both indicate that very little impact can be expected on the palaeontological resources of the area. It is therefore recommended that a qualified palaeontologist is approached to provide a letter of exemption from a paleontological impact assessment.
- In the case of any significant fossil finds (*e.g.* vertebrate teeth, bones, burrows, petrified wood) during construction, all operations should stop in the area until the finds are assessed by a palaeontologist.
- If during construction any archaeological finds are made (*e.g.* stone tools, skeletal material), the operations must be stopped, and the archaeologist must be contacted for an assessment of the find.

From a heritage point of view, there is no reason why the development cannot commence if these recommendations are adhered to.

## General

Due to extensive sand cover, ground visibility was low on portions of the site during survey. The possible occurrence of unmarked or informal graves and subsurface finds can thus not be excluded. If during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find.

**Disclaimer:** *Although all possible care is taken to identify sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the study. Heritage Contracts and Archaeological Consulting CC and its personnel will not be held liable for such oversights or for costs incurred as a result of such oversights.*

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- The results of the project;
- The technology described in any report;
- Recommendations delivered to the Client.

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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

<b><i>Kind of study</i></b>	Archaeological Impact Assessment
<b><i>Type of development</i></b>	Solar Facility
<b><i>Rezoning/subdivision of land</i></b>	Rezoning
<b><i>Developer:</i></b>	Solar Capital (Pty) Ltd
<b><i>Consultant:</i></b>	Savannah Environmental
<b><i>Farm owner:</i></b>	Unknown

A heritage scoping report was conducted by Heritage Contracts and Archaeological Consulting CC (2011), and the company was also contracted by Savannah Environmental (Pty) Ltd to conduct an Archaeological Impact Assessment for the proposed Hantam PV Solar Energy Facility. The proposed project is located on the farm Narosies 228, 47 km north of Loeriesfontein, in the Northern Cape. The Archaeological Impact Assessment report forms part of the EIA for the proposed project.

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 review of the heritage scoping report that includes collection from various sources and consultations; Phase 2, the physical surveying of the area on foot and by vehicle; Phase 3, reporting the outcome of the study.

During the survey no heritage 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 appropriate SAHRA provincial office for peer review.



## 1.1 Terms of Reference

### Field study

Conduct a field study to: a) systematically survey the proposed project area to locate, identify, record, photograph and describe sites of archaeological, historical or cultural interest; b) record GPS points of identified as significant areas; c) determine the levels of significance of the various types of heritage resources recorded in the project area.

### 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 the relevant 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;
- » 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 38(1), Section 38(8) of the NEMA and 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.

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 a legal body, 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 reinterment 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**

The study area is located 47 km north of Loeriesfontein. The site is bordered by the Loeriesfontein-Pofadder Road to the West and an Eskom power line to the north. There are various drainage lines draining the study area, all flowing in a southerly direction.

Loeriesfontein falls within the bioregion described by Mucina *et al* (2006) as the Trans-Escarpment Succulent Karoo Bioregion and within the Succulent Karoo Biome. The vegetation type which occurs on the site is described as Hantam Karoo. Land use in the study area is characterized by agriculture, dominated by sheep farming, however, the carrying capacity of the region is very low. The study area is flat with rolling topography. Larger hills are present at a distance from the site to the South-west. The climate can be described as arid to semi-arid with rainfall occurring from November to April.

### 1.3.2. Location Map

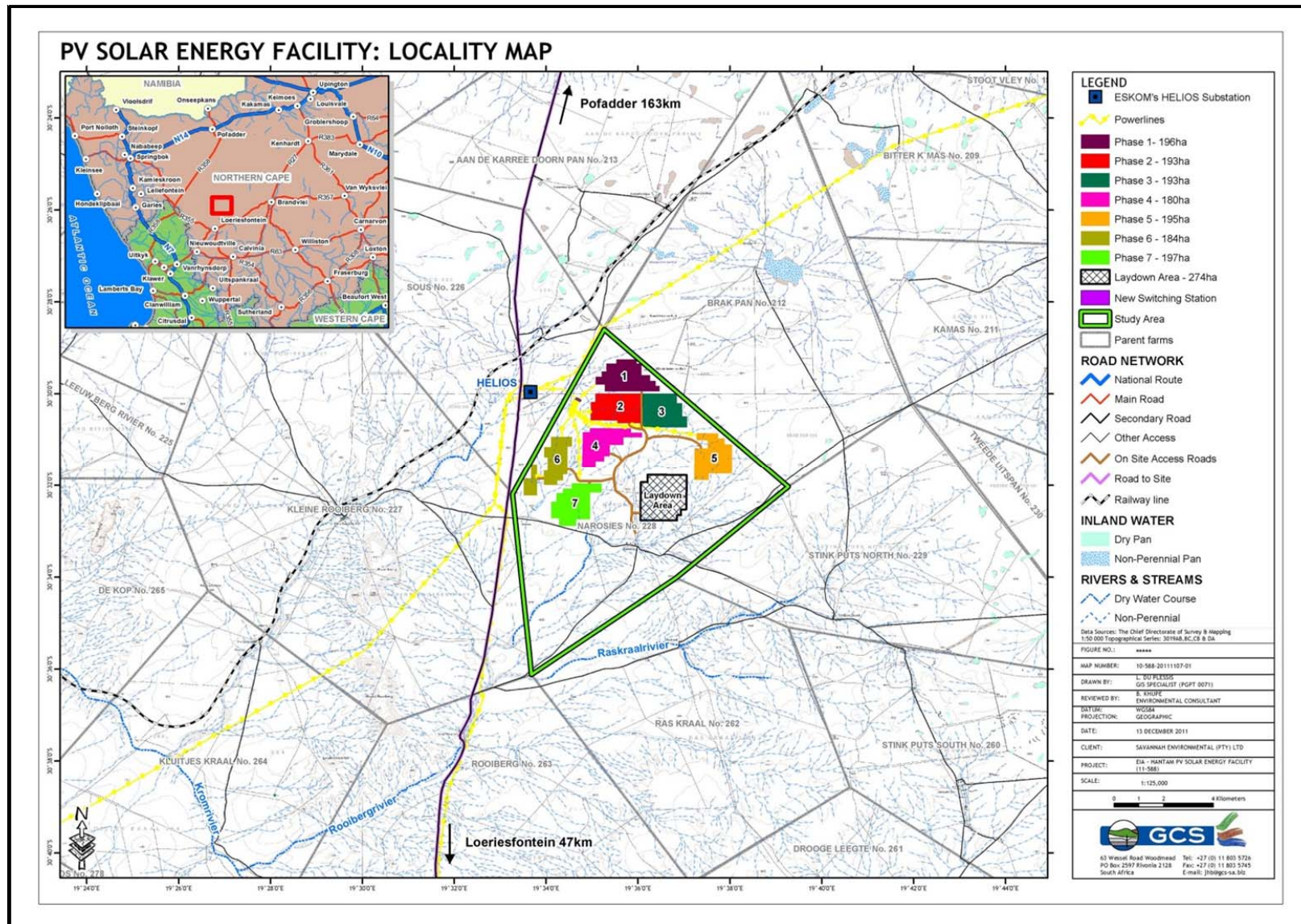


Figure 1: Location map provided by Savannah.



### 1.3.3. Google Maps

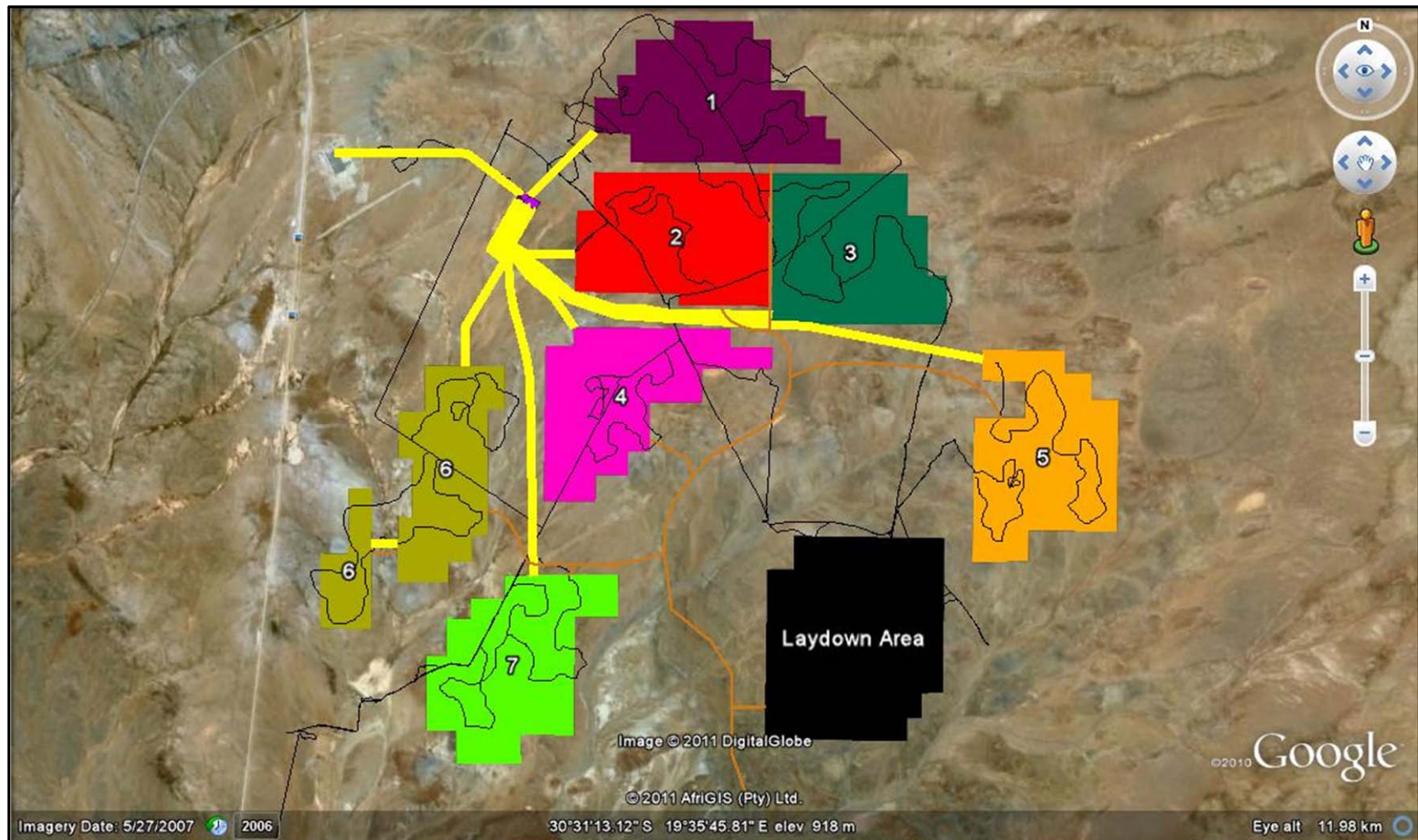


Figure 2: Google Image showing the various phases of the project and track log of the areas that was covered during the survey.

## **2. APPROACH AND METHODOLOGY**

The aim of the study is to cover archaeological databases and historical sources to compile a background history of 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 desktop study, gathering data to compile a background history of the area in question. It included scanning existing records for archaeological sites, historical sites, graves, architecture, oral history and ethnographical information on the inhabitants of the area. This phase comprised a heritage scoping report done by Heritage Contracts and Archaeological Consulting CC (van der Walt 2011).

#### ***2.1.1 Literature Search***

See Appendix A for the full Heritage Scoping Report. In addition to the information from the scoping study (App. A) the actions indicated below were also taken.

#### ***2.1.2 Information Collection***

The SAHRA report mapping project (Version 1.0) 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***

Heritage Contracts and Archaeological Consulting CC conducted brief consultations with Mr J. Nel, a CRM practitioner who conducted work in the area, as well as a neighbouring farmer Mr Adri Husselman and a local resident of Loeriesfontein Mr Abel Grobelaar, who are well acquainted with the area.

#### ***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**

Due to the nature of cultural remains, the majority of which occurs below surface, a field survey of the study area of 1600 ha was conducted; focussing on drainage lines, hills and outcrops, high lying areas and disturbances in the topography. The study area was surveyed by means of vehicle and extensive surveys on foot by professional archaeologists during the week of the 12<sup>th</sup> December 2011.

All sites discovered inside the proposed development area was plotted on 1:50 000 maps and their GPS co-ordinates noted. Digital photographs were taken at all the sites.

### **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 the possible occurrence of unmarked graves and other cultural material cannot be excluded. Only the surface infrastructure footprint areas were surveyed as indicated in the location map, and not the entire farm. This study did not assess the impact on the palaeontological component of the project. Although Heritage Contracts and Archaeological Consulting CC 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**

The proposed photovoltaic plant will have a maximum generating capacity of 525 MW to be developed in 7 phases of 75 MW on the farm Narosies 228.

The following associated infrastructure is part of the project proposal:

- » An on-site substation and a new overhead power line to connect directly into Eskom's Helios Substation;
- » Foundations to support the PV Panels;
- » Cabling between the project components, to be laid underground where practical;
- » Internal access roads;
- » Storage area and a workshop.

## **4. HISTORICAL AND ARCHAEOLOGICAL BACKGROUND OF THE STUDY AREA**

### **4.1 Databases Consulted**

#### ***Wits and McGregor Museum Archaeological Data Bases***

No previously recorded sites are on record for the study area.

#### ***SAHRA Report Mapping Project***

The SAHRA Report Mapping project (version 1) does not have any surveys on record close to the study area. However, some recent CRM projects on the area are available that is not yet included in the report mapping project (e.g., Fourie 2011, van Schalkwyk 2011). Both studies found no sites of heritage significance in the respective study areas.

#### ***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.

### **Public Consultation**

No consultation was done with people residing on the farm as currently no one resides there. However locals were consulted including a nearby farm owner, Mr Adri Husselman of the farm Kaalspruit, who indicated that he is not aware of any sites with heritage significance, apart from San and historical rock engravings located well outside of the study area. Mr Abel Grobbelaar, a resident at Loeriesfontein, was also consulted and indicated that he is aware of fossil remains in the wider area to the south and east of Loeriesfontein.

### **4.2 Archaeological and Historical Information Available on the Study Area**

This scoping study revealed that a range of heritage sites occur in the larger region and similar sites can be expected within the study area. Every site is relevant to the heritage landscape, but it is anticipated that few, if any, sites in the area have conservation value. The scoping study revealed that the Cape Military Police Station seems to have been located on Narosies until 1905, when it was abolished (Cape Town Archives Repository 1905). From an archaeological point of view, an extensive range of Stone Age manifestations is known to occur widely across the Northern Cape. However, studies by Morris (2007) have indicated minimal finds of archaeological sites in the vicinity of the upgrade of Loop 7A of the Sishen-Saldanha ore line to the north of the study area. Morris (2010) further notes that previous studies have indicated that substantial MSA scatters is fairly uncommon in the Bushmanland/Namaqualand areas while herder sites are more limited to sheltered and dune areas close to water sources such as pans and rivers. A recent study by Fourie (2011) just south of Narosies, on the farm Kaalspruit, also recorded no sites of heritage significance.

Kensley (1975) makes reference to paleontological finds of *Pygocephalomorphic Crustacea* in the Loeriesfontein area. Further investigation indicated that these sites are located well to the north-west of the study area. The study area is mostly underlain by Palaeozoic mudrocks of the Ecca Group. Of the two Ecca Group rocks present in the general vicinity of the study area the Whitehill formation around Loeriesfontein is well known for its rich record of fossil fish, crustaceans and marine reptiles. Mr J Nel conducted a field visit to the east of the study area on the farm Kleine Rooiberg 227 in 2011 and recorded a fossil fish that is opened by erosion (Nel pers. comm. 2011).

## 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 Hantam PV Solar 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;
- » 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;
- » 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 approved 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 9 of this report.

<b><i>FIELD RATING</i></b>	<b><i>GRADE</i></b>	<b><i>SIGNIFICANCE</i></b>	<b><i>RECOMMENDED MITIGATION</i></b>
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 a site. as provided by the client:

- » 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 was not surveyed but only the footprint of the proposed phases for the PV layout area and power line for connection to the grid as indicated in Figure 1.



Figure 3. Eastern view of the Helios substation that the photovoltaic plant will feed into

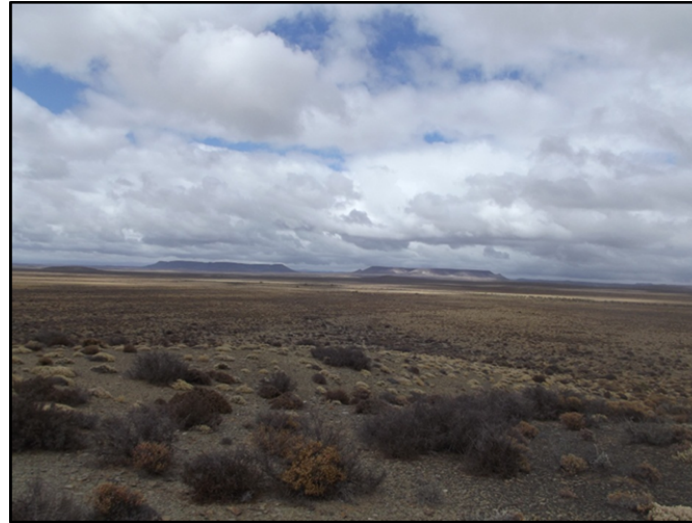


Figure 4. General Site conditions of Area 4, viewed from the North.



Figure 5. Area 7 viewed from the North.

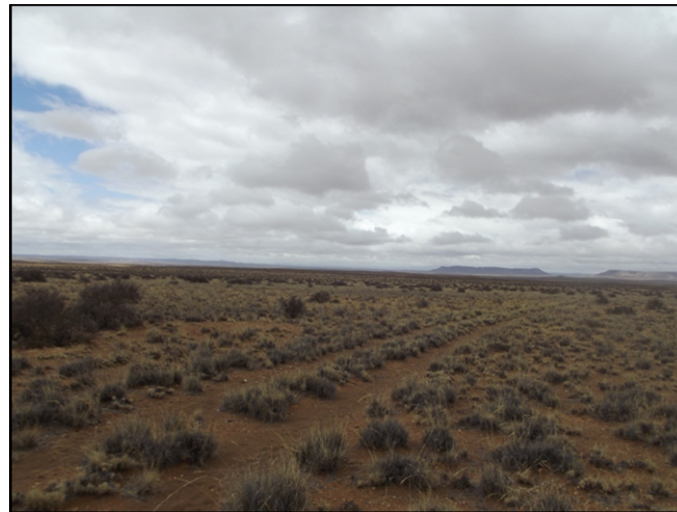


Figure 6. General site conditions in Area 5.

## Impact evaluation of the proposed project on heritage resources

<b>Nature:</b> 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.		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	Local (2)	Local (1)
<b>Duration</b>	Permanent (5)	Permanent (5)
<b>Magnitude</b>	Low (2)	Low (1)
<b>Probability</b>	Probable (1)	Probable (1)
<b>Significance</b>	<b>9 ( low)</b>	<b>8 (low)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>Reversibility</b>	Not reversible	Not reversible
<b>Irreplaceable loss of resources?</b>	Yes	Yes
<b>Can impacts be mitigated?</b>	Yes	
<b>Mitigation:</b> No sites were identified during the survey. However, if any archaeological material is uncovered during construction or operation a qualified archaeologist must be contacted to verify and record the find. Mitigation will then include documentation and sampling of the material. This will also be required if any paleontological material is uncovered.		
<b>Cumulative impacts:</b> Archaeological sites are non-renewable and impact on any archaeological context or material will be permanent and destructive.		
<b>Residual Impacts:</b> Depletion of archaeological record of the area.		

## 7. RECOMMENDATIONS

No sites of heritage significance were identified during the survey. However, from the desktop study it is clear that palaeontological sites can be expected in the area. The management actions below are, therefore, recommended to be included in the EMP for the proposed project.

- It is recommended that the construction crew is educated about the potential palaeontological and heritage resources they could encounter during the construction phase of the project. This includes basic training for construction staff on possible finds, action steps for mitigation measures, surface collections, and communication routes to follow in the case of a discovery.
- Two palaeontological studies are on record for the area (Almond, 2011a, b). Both indicated, however, that very little impact can be expected on the palaeontological resources of the area, and it is therefore recommended that a qualified palaeontologist is approached to provide a letter of exemption from a paleontological impact assessment.
- If any fossils are exposed (*e.g.* vertebrate teeth, bones, burrows, petrified wood) during construction, all operations must stop in the affected area until the finds are assessed by a palaeontologist
- If, during construction, any archaeological finds are made (*e.g.* stone tools, skeletal material), the operations must be stopped, and the archaeologist must be contacted for an assessment of the finds.

## 8. CONCLUSIONS

No sites of heritage significance were found during the survey. However, the area is known for the Whitehill formation around Loeriesfontein with a rich record of fossils including fish, crustaceans and marine reptiles. The palaeontological component of the project needs to be addressed as per the recommendations.

If the developers adhere to the recommendations made under section 7 of this report, there is, from a heritage point of view, no reason why the development cannot commence work.

## 9. PROJECT TEAM

Jaco van der Walt, Project Manager

Dr. Marlize Lombard, Principle Investigator

J.P Cilliers, Field Assistant

## 10. 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.

Currently, I serve as Council Member for the CRM Section of ASAPA, and have been involved in research and contract work in South Africa, Botswana, Zimbabwe, Mozambique and Tanzania; having conducted more than 300 AIAs since 2000.

Dr Marlize Lombard lectures in the Anthropology Department of the University of Johannesburg, where she also conducts research and publishes on the Stone Age of Southern Africa. She is an accredited Stone Age Principal Investigator with ASAPA, SAHRA and AMAFA.

J.P Cilliers is a professional archaeologist with more than 10 years of experience in CRM in South Africa. He is also an accredited CRM practitioner with ASAPA.

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