

McGregor Museum Department of Archaeology



PROPOSED KATHU-SISHEN SOLAR ENERGY FACILITIES

**SPECIALIST INPUT FOR THE ENVIRONMENTAL
IMPACT ASSESSMENT PHASE AND
ENVIRONMENTAL MANAGEMENT PLAN FOR
THE PROPOSED KATHU-SISHEN SOLAR
ENERGY FACILITIES, NORTHERN CAPE**

ARCHAEOLOGY

David Morris
November 2010

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1. Introduction

This report gives input to the Environmental Impact Assessment Phase and Environmental Management Plan for the proposed Kathu-Sishen Solar Energy Facilities, near Dibeng in the Northern Cape. A scoping phase evaluation of the full site was aimed at providing high-level identification of potential areas of sensitivity together with a recommended methodology for the EIA process.

The site of proposed development is on the Farm Wincanton near to Dibeng, north west of Kathu, Northern Cape. It is understood that the proposed activities would include the construction and operation of a Solar Thermal Plant (for power generation purposes), and associated infrastructure including a steam turbine and generator, a generator transformer and substation, overhead power lines, water supply lines to the facility, a water treatment plant, a blow down pond, workshops, storage areas and access roads.

1.1 Focus and Content of Specialist Report: Archaeology

The archaeology specialist study (commissioned by Savannah Environmental (Pty) Ltd), P.O. Box 148, Sunninghill 2151, Gauteng, email info@savannahsa.com, tel 011-2346621 fax 086 6840547) is focused on the development footprint of the proposed Solar Thermal Facilities and ancillary infrastructure.

This specialist study is a stand-alone report (as per the EIA Regulations) and incorporates the following information:

- » Introduction to the Specialist in terms of qualifications, accreditation and experience to undertake the study (1.2, below)
- » Description of the affected environment (2)
- » Description of heritage features of the region (2.1)
- » Description of issues identified during the Scoping process (2.2)
- » Methodology of determining the significance of the impacts and assumptions as well as scoping phase predictions (3)
- » Observations and Assessment of impacts, including a summary in tabular format (4)
- » Comparative assessment of alternatives (4.3.2)
- » Recommended measures for draft Environmental Management Plan and site-specific mitigation (5)
- » Conclusions (6)

1.2 Archaeology Specialist

The author of this report is an archaeologist accredited as a Principal Investigator by the Association of Southern African Professional Archaeologists, having previously carried out surveys and fieldwork on sites in the Kathu area (Beaumont & Morris 1990; Morris & Beaumont 2004).

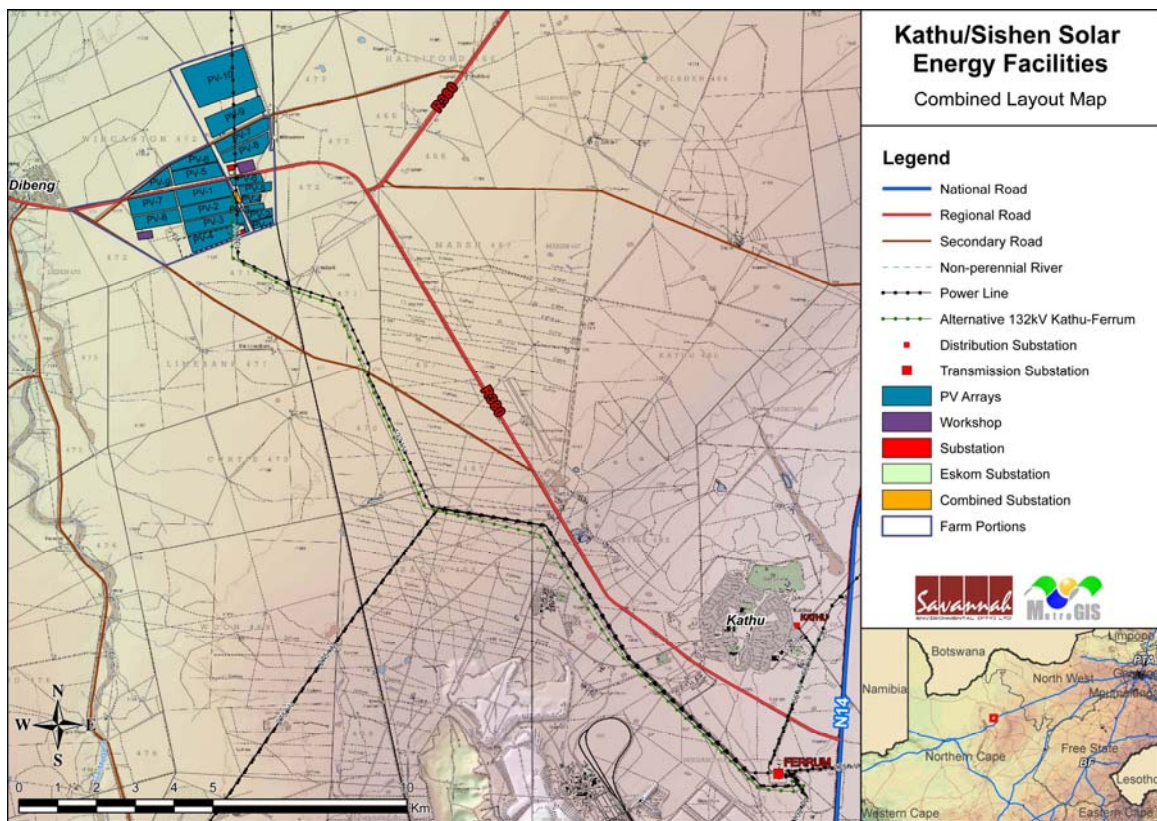
The author works independently of the organization commissioning this specialist input, and I provide these impact assessment observations within the framework of the National Heritage Resources Act (No 25 of 1999).

The National Heritage Resources Act no. 25 of 1999 (NHRA) protects heritage resources which include archaeological and palaeontological objects/sites older than 100 years, graves older than 60 years, structures older than 60 years, as well as intangible values attached to places. The Act requires that anyone intending to disturb, destroy or damage such sites, objects and/or structures may not do so without a permit from the relevant heritage resources authority. This means that a Heritage Impact Assessment should be performed, resulting in a specialist report as required by the relevant heritage resources authority/ies to assess whether

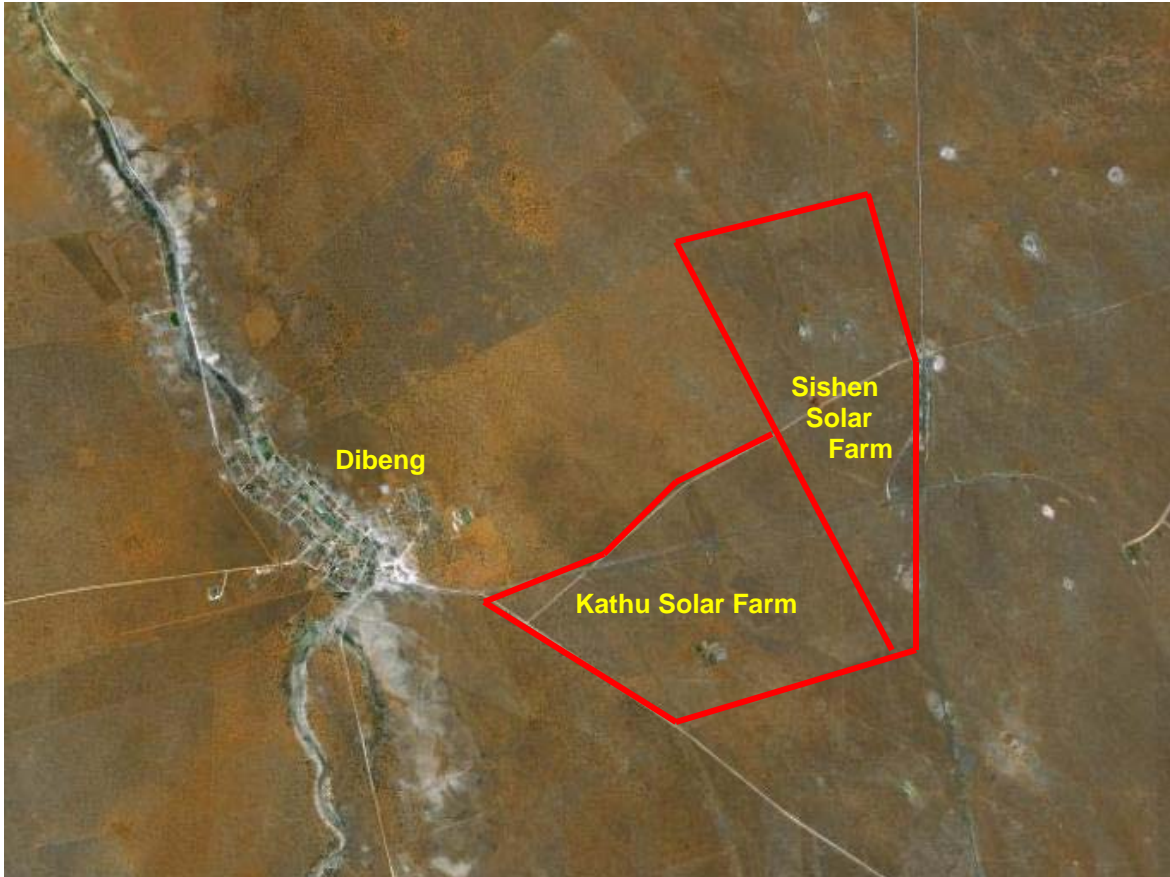
authorisation may be granted for the disturbance or alteration, or destruction of heritage resources.

2. Description of the affected environment and potential impacts

The environment in question is semi-arid, comprising relatively flat terrain east of the Gamogara River near Dibeng. The landscape is mantled by generally shallow Kalahari sands, over calcrete and outcrops of jaspilite, relatively sparsely vegetated, making any surface archaeological traces reasonably visible.



Locality map for the portions of the Wincanton property east of Dibeng.



The locations of the Kathu and Sishen Solar Farms superimposed on a google image of the area.

2.1 Description of heritage features of the region

As noted in the Scoping Report, no archaeological survey work had been carried out in the immediate vicinity of the proposed solar thermal facility. Much of the surrounding region had yet to be examined from an archaeological viewpoint. However certain areas in the region have been investigated in great detail, particularly in the last quarter century and in current projects. This is especially true of the farms immediately surrounding Kathu (Beaumont & Morris 1990; Beaumont 2004; Morris & Beaumont 2004; Porat *et al.* 2010), to the north of Bruce, where renewed research by an international team in partnership with the McGregor Museum was commenced in August 2004. This existing work suggests that sites of great significance may yet be brought to light in the region. Broadly speaking, the archaeological record of this region reflects the long span of human history from

Earlier Stone Age times (more than one and a half million to about 270 000 years ago), through the Middle Stone Age (about 270 000 – 40 000 years ago), to the Later Stone Age (up to the protocolonial era). The last 2000 years was a period of increasing social complexity with the appearance of farming (herding and agriculture) alongside foraging, and of ceramic and metallurgical (Iron Age) technologies alongside an older trajectory of stone tool making. Of interest in this area is evidence of early mining of specularite, a sparkling mineral that was used in cosmetic and ritual contexts in from early times (Beaumont 1973). Rock art is known in the form of rock engravings (Fock & Fock 1984; Morris 1992; Beaumont 1998).

At a regional level the sites of Wonderwerk Cave (east side of the Kuruman Hills) and the Kathu complex of sites (Porat *et al.* 2010) provide important sequences against which to assess the age and significance of finds that may be made on the Kathu and Sishen Solar Farms.

There appeared at the time of the scoping phase to be at least one farm homestead, on the Kathu Solar Farm area, where there may be noteworthy heritage features including possible colonial/recent farm graves

2.2 Description and evaluation of environmental issues and potential impacts identified in the scoping phase

Heritage resources including archaeological sites are in each instance unique and non-renewable resources. Area and linear developments such as those envisaged can have a permanent destructive impact on these resources. The objective of an EIA would be to assess the sensitivity of such resources where present, to evaluate the significance of potential impacts on these resources and, if and where appropriate, to recommend no-go areas and measures to mitigate or manage said impacts.

Area impacts are possible in the case of the Kathu-Sishen Upington Solar Energy Facility itself with its various components; while the proposed power lines and access roads would represent linear impacts.

2.2.1 Direct, indirect and cumulative impacts (in terms of nature, magnitude and extent)

The destructive impacts that are possible in terms of heritage resources would tend to be direct, once-off events occurring during the initial construction period. In the long term, the proximity of operations in a given area could result in secondary indirect impacts resulting from the movement of people or vehicles in the immediate or surrounding vicinity. The Environmental Management Plan should seek to minimize the latter impacts as far as possible.

With respect to the magnitude and extent of potential impacts, it has been noted that the erection of power lines would have a relatively small impact on Stone Age sites, in light of Sampson's (1985) observations during surveys beneath power lines in the Karoo (actual modification of the landscape tends to be limited to the footprint of each pylon), whereas a road or a water supply pipeline would tend to be far more destructive (modification of the landscape surface would be within a continuous strip), albeit relatively limited in spatial extent, i.e. width (Sampson compares such destruction to the pulling out of a thread from an ancient tapestry). A water pipeline, if sourcing water at the river, could traverse more sensitive terrain, i.e. impacting a potentially greater density of archaeological sites.

3. METHODOLOGY

A site visit was necessary to inspect various parts of the terrain on foot, focusing on areas of expected impact (construction of plant, sub-station, and secondary infrastructure such as roads, pipelines and power lines). Heritage traces would be evaluated in terms of their archaeological significance (see tables below). A set of Scoping phase predictions were made which the study would test with observations made in the field.

3.1 Assumptions and limitations

It was assumed that, by and large in this landscape, with its sparse vegetation and shallow soil profiles, some sense of the archaeological traces to be found in the area would be readily apparent from surface observations (including assessment of places of erosion or past excavations that expose erstwhile below-surface features). It was not considered necessary to conduct excavations as part of the EIA to establish the potential of sub-surface archaeology.

A proviso is routinely given, that should sites or features of significance be encountered during construction (this could include an unmarked burial, an ostrich eggshell water flask cache, or a high density of stone tools, for instance), specified steps are necessary (cease work, report to heritage authority).

With regard to fossils, a preliminary assessment of the likelihood of their occurring here should be obtained from a palaeontologist.

3.2 Scoping phase predictions

During the Scoping phase it was predicted that:

- » As no archaeological survey work had been carried out in the immediate vicinity of the proposed solar thermal facility and it was uncertain what kinds of sites could be anticipated. It was noted that significant sites are known in the area, particularly the sink-hole sites at nearby Kathu – with the implication being that similar occurrences could be found in similar nearby landscapes. Experience in the terrain around Kathu had shown that significant archaeological sites were spatially concentrated and that areas away from these comprised generally low density scatters lacking archaeological integrity and hence of generally low significance. It was possible that sites of differing age could be found including rock engravings.

The Scoping Phase report suggested, in summary, that “based on previous experience in the area ... the terrain on which the Kathu and Sishen Solar Farms are to be located may contain important archaeological traces, such as at ‘Kathu Pan’ and ‘Kathu Townlands’ (Beaumont & Morris 1990), or may in fact have minor, highly dispersed surface scatters of limited significance.”

It further suggested that “there appear to be none of the features such as hills or rocky features which in other parts of this landscape provide shelters with traces of precolonial Stone Age occupation/activity. Iron Age traces including pottery are known from comparable settings immediately north east of Kathu.”

- » In the vicinity of farm homesteads there could be noteworthy heritage features including possible colonial/recent farm graves.

3.3 Potentially significant impacts to be assessed in the EIA process

Any area or linear, primary and secondary, disturbance of surfaces in the development locales could have a destructive impact on heritage resources, where present. In the event that such resources are found, they are likely to be of a nature that potential impacts could be mitigated by documentation and/or salvage following approval and permitting by the South African Heritage Resources Agency and, in the

case of any built environment features, by Ngwao Bošwa ya Kapa Bokone (the Northern Cape Heritage Authority). Although unlikely, there may be some that could require preservation *in situ* and hence modification of intended placement of development features.

Disturbance of surfaces includes any construction: of a road, a pipeline, erection of a pylon, or preparation of a site for a sub-station, or plant, or building, or any other *clearance of*, or *excavation* into, a land surface. In the event of archaeological materials being present such activity would alter or destroy their context (even if the artefacts themselves are not destroyed, which is also obviously possible). Without context, archaeological traces are of much reduced significance. It is the contexts as much as the individual items that are protected by the heritage legislation.

Some of the activities indicated here have a generally lower impact than others. For example, Sampson (1985) has shown that powerlines tend to be less destructive on Stone Age sites than roads since access along the route of the line during construction and maintenance tends to be by way of a 'twee-spoor' temporary roadway (not scraped, the surface not significantly modified). Individual tower positions might be of high archaeological significance (e.g. a grave, or an engraving). The impact of a 'twee-spoor' could be far greater on Iron Age sites in other parts of South Africa, where stone walling might need to be breached.

3.4 Determining archaeological significance

In addition to guidelines provided by the National Heritage Resources Act (Act No. 25 of 1999), a set of criteria based on Deacon (nd) and Whitelaw (1997) for assessing archaeological significance has been developed for Northern Cape settings (Morris 2000a). These criteria include estimation of landform potential (in terms of its capacity to contain archaeological traces) and assessing the value to any archaeological traces (in terms of their attributes or their capacity to be construed as evidence, given that evidence is not given but constructed by the investigator).

Estimating site potential

Table 1 (below) is a classification of landforms and visible archaeological traces used for estimating the potential of archaeological sites (after J. Deacon nd, National Monuments Council). Type 3 sites tend to be those with higher archaeological potential, but there are notable exceptions to this rule, for example the renowned rock engravings site Driekopseiland near Kimberley which is on landform L1 Type 1 – normally a setting of lowest expected potential. It should also be noted that, generally, the older a site the poorer the preservation, so that sometimes *any* trace,

even of only Type 1 quality, can be of exceptional significance. In light of this, estimation of potential will always be a matter for archaeological observation and interpretation.

Assessing site value by attribute

Table 2 is adapted from Whitelaw (1997), who developed an approach for selecting sites meriting heritage recognition status in KwaZulu-Natal. It is a means of judging a site's archaeological value by ranking the relative strengths of a range of attributes (given in the second column of the table). While aspects of this matrix remain qualitative, attribute assessment is a good indicator of the general archaeological significance of a site, with Type 3 attributes being those of highest significance.

Table 1. Classification of landforms and visible archaeological traces for estimating the potential for archaeological sites (after J. Deacon, National Monuments Council).

| Class | Landform | Type 1 | Type 2 | Type 3 |
|-------|---|---|--|---|
| L1 | Rocky surface | Bedrock exposed | Some soil patches | Sandy/grassy patches |
| L2 | Ploughed land | Far from water | In floodplain | On old river terrace |
| L3 | Sandy ground, inland | Far from water | In floodplain or near feature such as hill | On old river terrace |
| L4 | Sandy ground, Coastal | >1 km from sea | Inland of dune cordon | Near rocky shore |
| L5 | Water-logged deposit | Heavily vegetated | Running water | Sedimentary basin |
| L6 | Developed urban | Heavily built-up with no known record of early settlement | Known early settlement, but buildings have basements | Buildings without extensive basements over known historical sites |
| L7 | Lime/dolomite | >5 myrs | <5000 yrs | Between 5000 yrs and 5 myrs |
| L8 | Rock shelter | Rocky floor | Sloping floor or small area | Flat floor, high ceiling |
| Class | Archaeological traces | Type 1 | Type 2 | Type 3 |
| A1 | Area previously excavated | Little deposit remaining | More than half deposit remaining | High profile site |
| A2 | Shell or bones visible | Dispersed scatter | Deposit <0.5 m thick | Deposit >0.5 m thick; shell and bone dense |
| A3 | Stone artefacts or stone walling or other feature visible | Dispersed scatter | Deposit <0.5 m thick | Deposit >0.5 m thick |

Table 2. Site attributes and value assessment (adapted from Whitelaw 1997)

| Class | Attribute | Type 1 | Type 2 | Type 3 |
|-------|----------------------------|--|------------------|-------------------------------------|
| 1 | Length of sequence/context | No sequence Poor context Dispersed | Limited sequence | Long sequence Favourable context |

| | | | | |
|---|---|--------------|---------|-------------------------------|
| | | distribution | | High density of arte/ecofacts |
| 2 | Presence of exceptional items (incl regional rarity) | Absent | Present | Major element |
| 3 | Organic preservation | Absent | Present | Major element |
| 4 | Potential for future archaeological investigation | Low | Medium | High |
| 5 | Potential for public display | Low | Medium | High |
| 6 | Aesthetic appeal | Low | Medium | High |
| 7 | Potential for implementation of a long-term management plan | Low | Medium | High |

4. OBSERVATIONS AND ASSESSMENT OF IMPACTS

The manner in which archaeological and other heritage traces or values might be affected by the proposed development may be summed up in the following terms: it would be any act or activity that would result immediately or in the future in the destruction, damage, excavation, alteration, removal or collection from its original position, any archaeological material or object (as indicated in the National Heritage Resources Act (No 25 of 1999)). The most obvious impact in this case would be land surface disturbance associated with infrastructure construction.

4.1 Fieldwork observations

The proposed development footprint area and ancillary infrastructure locales were visited on 2 December 2010. In summary the findings can be reported in relation to predictions made in the scoping report (see 3.2 above):

4.1.1 Presence of significant sites:

That based on previous experience in the area ... the terrain ... may contain important archaeological traces, such as at 'Kathu Pan' and 'Kathu Townlands' (Beaumont & Morris 1990), or may in fact have minor, highly dispersed surface scatters of limited significance."

And further that "there appear to be none of the features such as hills or rocky features which in other parts of this landscape provide shelters with traces of precolonial Stone Age occupation/activity. Iron Age traces including

pottery are known from comparable settings immediately north east of Kathu."

By and large generally low density and poor integrity heritage traces were found in the development footprint areas, comprising usually jaspilite flakes and cores as surface occurrences in densities less, and often significantly less, than 1/m². The higher density end of the spectrum occurs in areas where banded ironstone rubble is exposed at the surface.

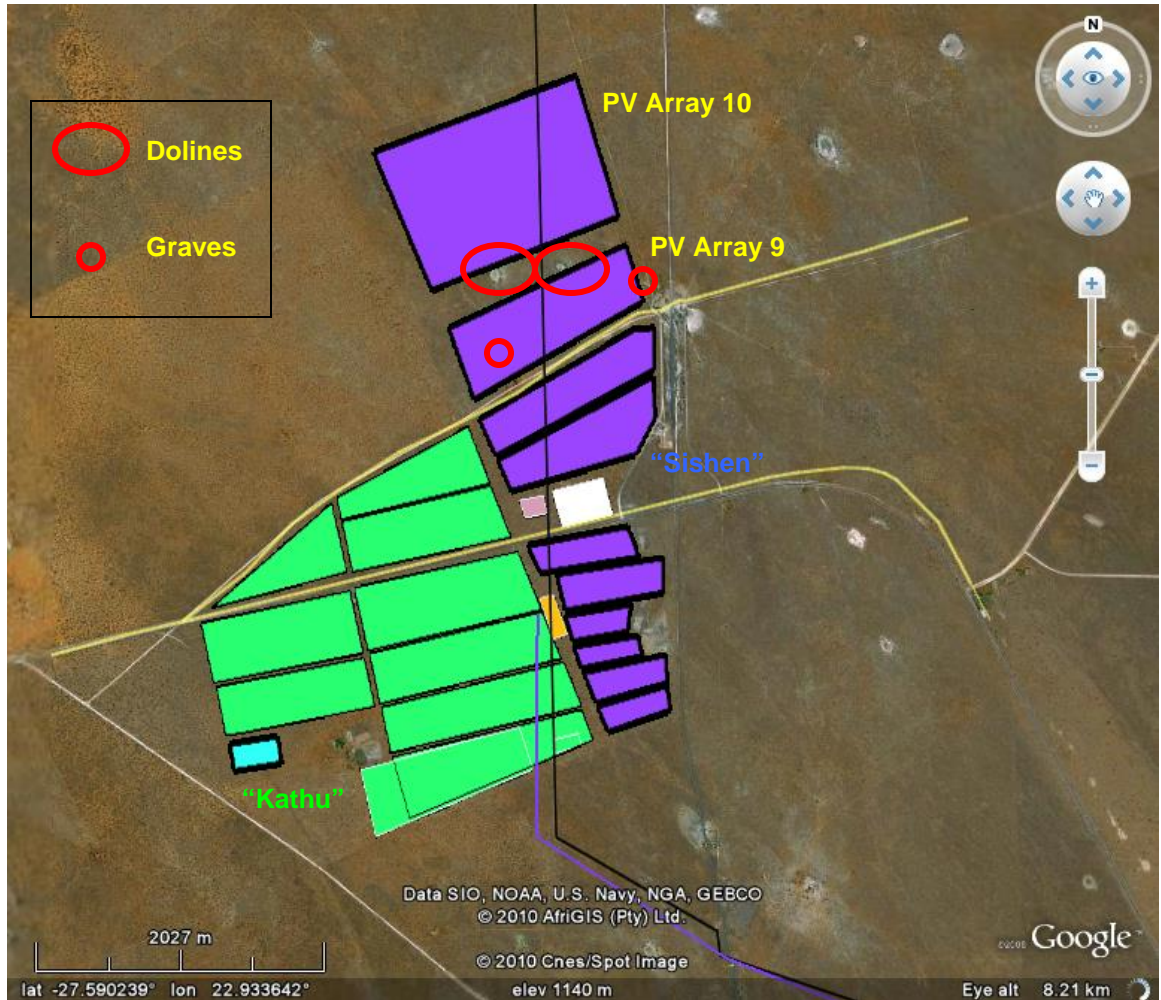


Flaked material, generally of low to very low density over large areas.

Potentially of far greater significance are three relatively small 'pans' which appear in fact to be dolines or 'plugged' sink holes which occur within the distribution of the development although in each case outside of any proposed project component.

They occur in the vicinity of GPS positions: at 27.57599° S 22.92752° E, 27.57506° S 22.93190° E, situated between PV Array 9 and 10 (Sishen) and (the south-eastern one which is in an area of quarrying relating to the railway and roadworks) at 27.59886° S 22.93925° E.

These may represent features similar to the Kathu Pan archaeological sites mentioned above. It is possible that they contain archaeological material – a variety of stone tools was noted in different raw materials including chert, but not in high densities. It is recommended that Phase 2 mitigation take place if these are likely to be impacted by the proposed project and this mitigation be aimed at establishing whether any sequence/stratigraphic development similar to that observed at the Kathu Pan sites exists here.



View of doline – potentially contains archaeological sequence.



Middle Stone Age artefacts found in the doline
at 27.57599° S 22.92752° E

No pottery was found, nor were there any rock exposures likely to support rock engravings.

4.1.2 Colonial era features such as graves:

That in the vicinity of farm homesteads there could be noteworthy heritage features including possible colonial/recent farm graves.

The present Beth-El homestead is not old (<60 years) and no features in its neighbourhood were seen that would be of heritage significance as defined by the Act.

Two older farm sites were noted: one within the project area, a farm shed and other infrastructure, and another just outside the project area's eastern edge. The latter is the old Wincanton homestead.

The first appears to be no more than a cattle post with farm shed but, significantly, is the place where farm workers currently have a dwelling. Workers have lived there from at least the mid-twentieth century (pers. comm. Richard Motlhaodi).

About 150 m north west of the place lie three graves, fenced in, which are unmarked. The 59-year old Mr Motlhaodi however identified the graves as being of his grandfather 'Ou Piet' Tselakgothu and Ou Piet's wife (Motlhaodi's

grandmother) and Phukotso Tselakgothu, Motlhaodi's uncle. They died when he was about 9 or 10, i.e. circa 1960.

These graves are situated at 27.57986° S 22.92779° E.



Three unmarked graves of Tselakgothu family members, circa 1960.

The Wincanton homestead is outside the project area but possibly just within the area of impact is a second set of graves, of Petrus Johannes Jansen van Vuuren, b 1842, and of Helena Maria Elisabeth Jansen van Vuuren nee Oberholster b 1851.



Wincanton homestead.

The headstones are very finely crafted. Curiously they feature no death dates – but it is possible that part of the head stone in both cases lies under the sand surface. The graves were fenced but cattle have trampled the fencing.

These graves are situated at 27.57653° S 22.93706° E.





Jansen van Vuuren graves, surrounded by fence (but trampled by cattle).

Nearby there is an earlier-mid twentieth century ash-heap associated with the farm at 27.57803° S 22.93753° E.

4.2 Characterising the archaeological significance (Refer to 3.4 above)

In terms of the significance matrices in Tables 1 and 2 under 3.4 above, most of the archaeological observations fall under Landforms L1 and L3 Type 1 with some L1 Type 2 settings. In terms of archaeological traces they all fall under Class A3 Type 1. All of these ascriptions (Table 1) reflect poor contexts and likely low significance for these criteria.

For site attribute and value assessment (Table 2), most of the observations noted fall under Type 1 for Classes 1-7, again reflecting low significance, low potential and absence of contextual and key types of evidence. Where the dolines/depressions are concerned they potentially fit Class 2 Type 2 or 3 and Class 4 Type 2 or 3 and further assessment by way of a set of test excavations would be needed to assess whether these have significant sequences such as at the Kathu Pan sites.

The two sets of graves are of high sensitivity.

4.3 Characterising the significance of impacts

The following criteria are used in this Environmental Impact Assessment to characterise the significance of direct, indirect and cumulative impacts (Jodas 2010):

- » 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:
 - * local extending only as far as the development site area – assigned a score of 1;
 - * limited to the site and its immediate surroundings (up to 10 km) – assigned a score of 2;
 - * will have an impact on the region – assigned a score of 3;
 - * will have an impact on a national scale – assigned a score of 4; or
 - * will have an impact across international borders – assigned a score of 5.
- » 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 a score is assigned:
 - * 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, and a score assigned:
 - * Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
 - * Assigned a score of 2 is improbable (some possibility, but low likelihood);
 - * Assigned a score of 3 is probable (distinct possibility);
 - * Assigned a score of 4 is highly probable (most likely); and

- * Assigned a score of 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 (refer formula below) and can be assessed as low, medium or high.
- » 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 determined by combining the criteria in the following formula:

S = (E+D+M) P; where

- 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).

4.3.1 Impact tables summarising the significance of impacts (with and without mitigation)

Two sets of significance tables are given: one for the areas of PV Array 9 & 10 (Sishen), which have sensitive features; and one for the remainder of the area of the proposed Kathu-Sishen development.

4.3.1.1 For PV Array 9 & 10 (Sishen)

| | | |
|--|---------------------------|------------------------|
| Nature: Acts or activities resulting in disturbance of surfaces and/or sub-surfaces containing artefacts (causes) resulting in the destruction, damage, excavation, alteration, removal or collection from its original position (consequences), of any archaeological material or object (what affected). | | |
| | Without mitigation | With mitigation |
| Extent | 1 | 1 |
| Duration | 5 | 1 |
| Magnitude | 8 | 4 |
| Probability | 4 | 1 |

| | | |
|--|---|---|
| Significance | 56 | 6 |
| Status (positive or negative) | | |
| Reversibility | No | No |
| Irreplaceable loss of resources? | Yes, where present - two sets of farm graves occur within the development area for PV Array 9. - two doline-like depressions occur between the suggested PV Array areas 9 and 10 which may contain significant archaeology. | Graves: It would be preferable if the development could be located such that graves need not be moved. If this is not possible the graves would need to be relocated following due procedures as laid out in the Act and SAHRA guidelines. Descendants of the farm-workers in question are known, i.e. Richard Motlhaodi and family. Dolines: it is recommended that test excavations take place to assess whether these occurrences have archaeological or palaeoenvironmental significance. |
| Can impacts be mitigated? | Yes | See recommendations above. |
| <p>Mitigation: Mitigation Measures: Artefact densities are generally low over the development footprint. Unlike biological processes, heritage destruction generally has a once-off permanent impact and in view of this the figures given in the “Without mitigation” column err on the side of caution. Even so, the criteria for significance indicated in this matrix would give a Low significance weighting (<30 points) for most of the areas under consideration. Mitigation measures are not considered necessary for the greater part of the areas in question.</p> <p>However, significant heritage traces in the form of two sets of graves (three of Tswana farm-workers, circa 1960, and two of white people, evidently a couple, probably associated with the Wincanton farm homestead, early twentieth century) occur in PV Array 9 (Sishen); and two dolines with potential archaeological significance lie in a strip of land separating the proposed PV Array 9 & 10 (Sishen) development footprints.</p> | | |
| <p>Cumulative impacts: Cumulative Impacts: where any archaeological contexts occur the impacts, unless mitigated, are once-off permanent destructive events.</p> | | |
| <p>Residual Impacts: -</p> | | |

At the main development footprint of the proposed Solar Thermal Facility with ancillary infrastructure – OTHER THAN FOR PV ARRAY 9 AND 10 (SISHEN)

| | | |
|--|---------------------------|------------------------|
| Nature: | | |
| Acts or activities resulting in disturbance of surfaces and/or sub-surfaces containing artefacts (causes) resulting in the destruction, damage, excavation, alteration, removal or collection from its original position (consequences), of any archaeological material or object (what affected). | | |
| | Without mitigation | With mitigation |
| Extent | 1 | 1 |

| | | |
|---|---|---------------------------|
| Duration | 5 | 1 |
| Magnitude | 8 | 4 |
| Probability | 2 | 1 |
| Significance | 28 | 6 |
| Status (positive or negative) | | |
| Reversibility | No | No |
| Irreplaceable loss of resources? | Yes, where present – but occurrence is low density and of low significance. | Not regarded as necessary |
| Can impacts be mitigated? | Yes – but not considered necessary. | Not regarded as necessary |
| Mitigation: Mitigation Measures: Artefact densities are generally low over the development footprint. Unlike biological processes, heritage destruction generally has a once-off permanent impact and in view of this the figures given in the “Without mitigation” column err on the side of caution. Even so, the criteria for significance indicated in this matrix give a Low significance weighting (<30 points). Mitigation measures are not considered necessary. | | |
| Cumulative impacts: Cumulative Impacts: where any archaeological contexts occur the impacts are once-off permanent destructive events. | | |
| Residual Impacts: - | | |

MEASURES FOR INCLUSION IN THE DRAFT ENVIRONMENTAL MANAGEMENT PLAN

OBJECTIVE: Archaeological or other heritage materials occurring in the path of any surface or sub-surface disturbances associated with any aspect of the development are highly likely to be subject to destruction, damage, excavation, alteration, or removal. The objective should be to limit such impacts to the primary activities associated with the development and hence to limit secondary impacts during the medium and longer term working life of the facility.

| | |
|-------------------------------------|--|
| Project component/s | Any road construction over and above what is necessary and any extension of other components addressed in this EIA. |
| Potential Impact | The potential impact if this objective is not met is that wider areas or extended linear developments may result in further destruction, damage, excavation, alteration, removal or collection of heritage objects from their current context on the site. |
| Activity/risk source | Activities which could impact on achieving this objective include deviation from the planned lay-out of road/s and infrastructure without taking heritage impacts into consideration. |
| Mitigation: Target/Objective | <p>A facility environmental management plan that takes cognizance of heritage resources in the event of any future extensions of roads or other infrastructure.</p> <p>It is not regarded as necessary that any mitigation should take place for <i>most</i> of the areas identified for development.</p> <p>However, mitigation steps are recommended for heritage resources encountered in PV Array 9 (Sishen) and between PV Array 9 and PV Array</p> |

10 (Sishen).

| Mitigation: Action/control | Responsibility | Timeframe |
|--|---|--|
| <p>Provision for on-going heritage monitoring in a facility environmental management plan which also provides guidelines on what to do in the event of any major heritage feature being encountered during any phase of development or operation.</p> <p>Phase 2 Mitigation is recommended for resources in PV Array area 9 (Sishen) and in the strip of terrain between PV Array 9 and 10 (Sishen). Mitigation measures are regarded as not necessary in terms of the development layout for the remainder of the area under consideration.</p> | <p>Environmental management provider with on-going monitoring role set up by the developer.</p> <p>The Developer through the environmental management provider. Procedures for Phase 2 as required by SAHRA or other relevant heritage authorities, e.g. Burial Grounds and Graves Unit of SAHRA.</p> | <p>Environmental management plan to be in place before commencement of development.</p> <p>Mitigation must have been completed and assessed by SAHRA prior to development taking place in PV Array areas 9 and 10 (Sishen)</p> |

| | |
|------------------------------|---|
| Performance Indicator | <p>Inclusion of further heritage impact consideration in any future extension of infrastructural elements.</p> <p>Immediate reporting to relevant heritage authorities of any heritage feature discovered during any phase of development or operation of the facility.</p> |
| Monitoring | <p>Officials from relevant heritage authorities (National and Provincial) to be permitted to inspect the operation at any time in relation to the heritage component of the management plan.</p> |

CONCLUSIONS

Generally low density heritage traces were found in most of the development footprint areas, but high significance graves and environmental settings of high potential (dolines) were found in PV Array 9 (Sishen) and between PV Array 9 and 10 (Sishen). *Mitigation measures are recommended for these particular areas.*

From an archaeological perspective the observed heritage resources either fall well outside of the proposed development footprint or are of low significance. Criteria used here for impact significance assessment rate the impacts for the remainder of the proposed development as Low – where, for the areas in question, no mitigation measures are considered necessary.

No particular preference emerges in terms of heritage impacts for the alternative sites for substations and for transmission lines.

References

- Beaumont, P.B. 1973. The ancient pigment mines of Southern Africa. *South African Journal of Science* 69: 140-146.
- Beaumont, P.B. 1998. Report on preliminary fieldwork on the farm Beeshoek 448, Postmasburg District, Northern Cape. Unpublished report, McGregor Museum.
- Beaumont, P.B. 2004. Archaeological sites in the Gamagara Municipal Area. Ms.
- Beaumont, P.B. & Boshier, A.K. 1974. Report on test excavations in a prehistoric pigment mine near Postmasburg, Northern Cape. *South African Archaeological Bulletin* 29: 41-59.
- Beaumont, P. & Morris, D. 1990. *Guide to archaeological sites in the Northern Cape*. Kimberley: McGregor Museum.
- Deacon, J. nd. Archaeological Impact Assessment - specialist input to planning and design. Unpublished notes compiled for the National Monuments Council.
- Fock, G.J. & Fock, D.M.L. 1984. *Felsbilder in Südafrika: Kinderdam und Kalahari*. Köln: Böhlau Verlag.
- Morris, D. 1992. An archaeological impact assessment of a rock engraving site on the mining property at Beeshoek. Unpublished report to the National Monuments Council and Associated Manganese Mines of South Africa.
- Morris, D. 2000. Gamsberg Zinc Project environmental impact assessment specialist report: archaeology.
- Porat, N., Chazan, M., Grűn, R., Aubert, M., Eisenmann, V. & Horwitz, L.K. 2010. New radiometric ages for the Fauresmith industry from Kathu Pan, southern Africa: implications for the Earlier to Middle Stone Age transition. *Journal of Archaeological Science* 37: 269–283.

Sampson, C. G. 1974. *The Stone Age archaeology of South Africa*. New York: Academic Press.

Thackeray, A.I., Thackeray, J.F. & Beaumont, P.B. 1983. Excavations at the Blinkklipkop specularite mine near Postmasburg, Northern Cape. *South African Archaeological Bulletin* 38:17-25.

Whitelaw, G. 1997. Archaeological monuments in KwaZulu-Natal: a procedure for the identification of value. *Natal Museum Journal of Humanities*. 9: 99-109.