

**HERITAGE IMPACT ASSESSMENT FOR THE KORANA SOLAR ENERGY FACILITY ON  
FARM NAMIES SOUTH 212/PORCION 2; KHAI-MA MUNICIPALITY  
NORTHERN CAPE**

(Assessment conducted under Section 38 (8) of the  
National Heritage Resources Act (No. 25 of 1999) as part of an EIA)

Prepared for

**Savannah Environmental (Pty) Ltd**

PO Box 148  
Sunninghill, 2157  
Phone (011) 2346621  
Fax (086) 684 0547

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**ACO Associates cc**  
Archaeology and Heritage Specialists

Prepared by

Tim Hart  
Lita Webley  
David Halkett  
Natalie Kendrick

**ACO Associates**  
8 Jacobs Ladder  
St James  
Cape Town  
7945

Phone (021) 706 4104  
Fax (086) 603 7195  
Email: [Tim.Hart@aco-associates.com](mailto:Tim.Hart@aco-associates.com)

## **EXECUTIVE SUMMARY**

ACO Associates was appointed by Savannah Environmental (Pty) Ltd to assess the potential impacts to heritage resources that might arise through construction of the proposed Korana Solar Energy Facility.

The site is situated in Bushmanland. It lies south of a range of low hills known as Die Poort se Berge and is composed of wide open, flat land covered with grass and small bushes. Small occasional pans and dry stream beds are present. Besides a few very low rock outcrops and occasional beds of quartz pebbles and shallow pans, the landscape is stark and bare,

A field assessment was undertaken from 11-13 November 2014.

The following heritage indicators were identified in the study area:

- The survey revealed that there is a thin background scatter of Stone Age artefacts over the area which is of very low significance; there are few concentrations or definable archaeological sites. The material is entirely attributable to the Middle Stone Age.
- The Namies village ruins lie on either side of the current access route from the N14. Widening this road as it is now will result in impacts to archaeology as there are graves and ruins very close to the road. Diverting the road south (as proposed) or using one of the two proposed access roads would mitigate this.
- Scenic impacts will be high due to the remoteness and wilderness qualities of the area, however there are very few visual receptors or tourism in this landscape apart from the homes of the landowners, neither of which have a heritage grading.

## **Mitigation**

PV, substations and connections: No mitigation is suggested

Access roads (alternative and second alternative). No mitigation is suggested

N14 Access Road – widening of road through archaeological footprint of Namies village will result in impacts to graves and historic ruins. Use of one of the alternatives or routing the road south of Namies (as proposed) would serve as mitigation.

## **Conclusion**

The proposed activity is considered acceptable.

## **GLOSSARY**

**Archaeology:** *Remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.*

**Calcrete:** *A soft sandy calcium carbonate rock related to limestone which often forms in arid areas.*

**Cultural landscape:** *The combined works of people and natural processes as manifested in the form of a landscape*

**Early Stone Age:** *The archaeology of the Stone Age between 700 000 and 2500 000 years ago.*

**Fossil:** *Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.*

**Heritage:** *That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999.*

**Holocene:** *The most recent geological time period which commenced 10 000 years ago.*

**Late Stone Age:** *The archaeology of the last 20 000 years associated with fully modern people.*

**Middle Stone Age:** *The archaeology of the Stone Age between 20-300 000 years ago associated with early modern humans.*

**Midden:** *A pile of debris, normally shellfish and bone that have accumulated as a result of human activity.*

**National Estate:** *The collective heritage assets of the Nation*

**Palaeontology:** *Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.*

**Pan:** *A shallow depression in the landscape that accumulates water from time to time.*

**Palaeosole:** *An ancient land surface.*

**Pleistocene:** *A geological time period (of 3 million – 20 000 years ago).*

**Pliocene:** *A geological time period (of 5 million – 3 million years ago).*

**Miocene:** *A geological time period (of 23 million - 5 million years ago).*

**SAHRA:** *South African Heritage Resources Agency – the compliance authority which protects national heritage.*

**Structure (historic:)** *Any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith. Protected structures are those which are over 60 years old.*

## **Acronyms**

DEAT	Department of Environmental Affairs and Tourism
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
HWC	Heritage Western Cape
LSA	Late Stone Age
MSA	Middle Stone Age
NHRA	National Heritage Resources Act
SAHRA	South African Heritage Resources Agency
WEF	Wind Energy Facility
PV	Photo-voltaic (solar) array

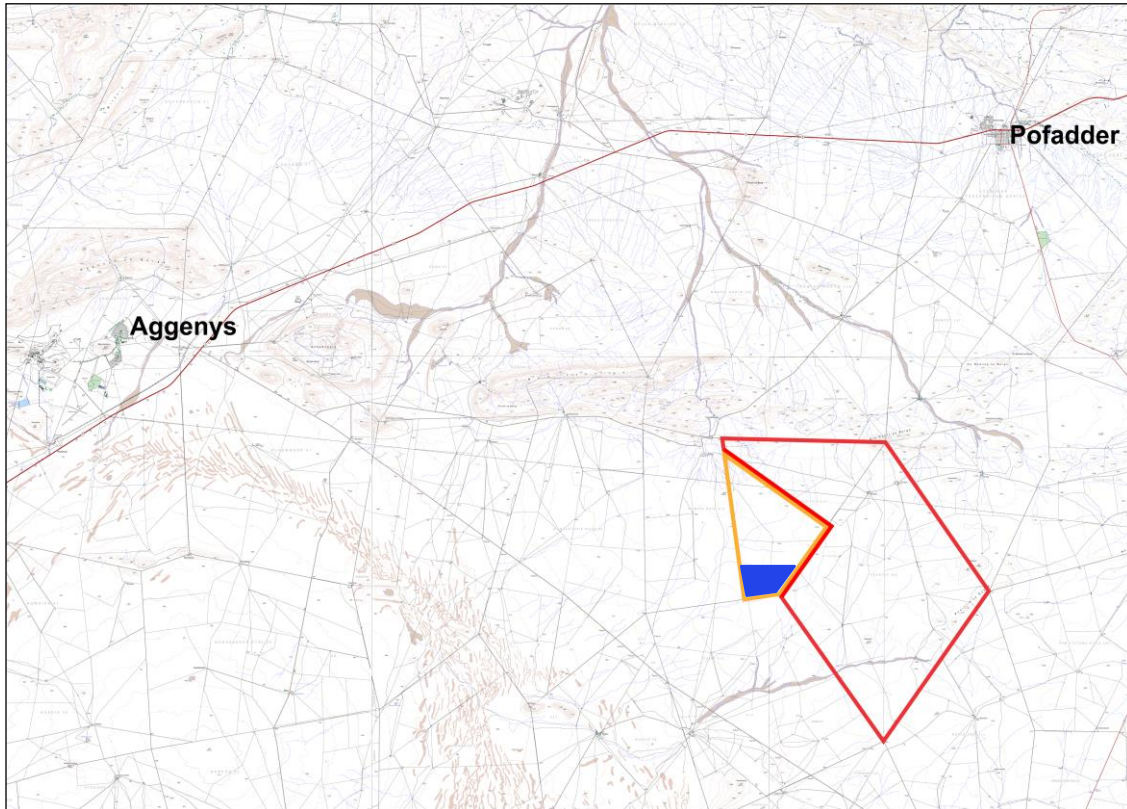
## CONTENTS

<b>1</b>	<b>INTRODUCTION.....</b>	<b>7</b>
1.1	Proposed Activity .....	7
<b>2</b>	<b>HERITAGE LEGISLATION .....</b>	<b>9</b>
2.1	Cultural Landscapes (places of cultural significance) .....	9
2.2	Scenic Routes .....	10
2.3	Heritage Grading .....	10
2.4	Heritage authorities.....	10
<b>3</b>	<b>METHODS .....</b>	<b>11</b>
3.1	Literature survey .....	11
3.2	Field survey.....	11
3.3	Impact assessment.....	11
3.4	Limitations.....	11
<b>4</b>	<b>DESCRIPTION OF THE AFFECTED ENVIRONMENT .....</b>	<b>11</b>
<b>5</b>	<b>HERITAGE CONTEXT .....</b>	<b>12</b>
5.1	Archaeology .....	12
5.2	History.....	13
5.3	Cultural Landscape.....	14
<b>6</b>	<b>FINDINGS .....</b>	<b>14</b>
6.1	Stone Age archaeology .....	14
6.2	Built environment .....	15
6.3	Cultural landscape, sense of place, visual impacts .....	15
<b>7</b>	<b>Potential Impacts associated with solar energy facilities .....</b>	<b>16</b>
7.1	Impacts expected during the construction phase of the solar facility .....	16
7.2	Operation of the solar energy facility .....	17
<b>8</b>	<b>Assessment of Impacts .....</b>	<b>17</b>
8.1.1	Archaeological material.....	17
8.1.2	Nature of impacts.....	17
8.1.3	Extent of impacts .....	17
8.1.4	Significance of impacts .....	18
8.1.5	Status of impacts .....	18
8.2	Colonial period heritage.....	18
8.2.1	Nature of impacts.....	18
8.2.2	Extent of Impacts.....	18
8.2.3	Significance of impacts .....	18
8.2.4	Status of impacts .....	19
8.3	Cultural landscape and sense of place.....	19
8.3.1	Nature of impacts.....	19
8.3.2	Extent of impacts .....	19
8.3.3	Significance of impacts .....	19
8.3.4	Status of impacts .....	19
8.4	Transmission lines .....	20
8.5	Access routes .....	20
8.6	Comparison of alternatives .....	21
8.6.1	The PV sites.....	21
8.6.2	Access Roads.....	21
8.6.3	Substations .....	21
8.7	The no-go alternative .....	22
<b>9</b>	<b>CUMULATIVE IMPACTS. ....</b>	<b>22</b>
<b>10</b>	<b>Mitigation and conservation .....</b>	<b>23</b>
10.1	Archaeological and palaeontological heritage .....	23
10.2	Built environment and colonial period sites .....	23

10.3	Cultural landscape .....	23
10.4	Human remains .....	23
10.5	Mitigation and Management .....	24
<b>11</b>	<b>CONCLUSIONS.....</b>	<b>24</b>
<b>12</b>	<b>MANAGEMENT .....</b>	<b>24</b>
<b>13</b>	<b>REFERENCES.....</b>	<b>26</b>
	<b>Appendix A: Archaeological occurrences found on the Korana PV.....</b>	<b>28</b>

# 1 INTRODUCTION

ACO Associates was appointed by Savannah Environmental (Pty) Ltd to assess the potential impacts to heritage resources that might arise through construction of the Korana Solar Energy Facility in close proximity to three wind energy facilities (WEF) on four farm portions south of Pofadder in the Northern Cape Province (Figure 1). Pofadder lies approximately 21 km north-north-east of the study area while Aggeneys is 38 km to the west. The affected farm portion is Namies South 212/portion 2. The proponent is Mainstream Renewable Energy South Africa. The study is being undertaken as a specialist contribution to an Environmental Impact Report.

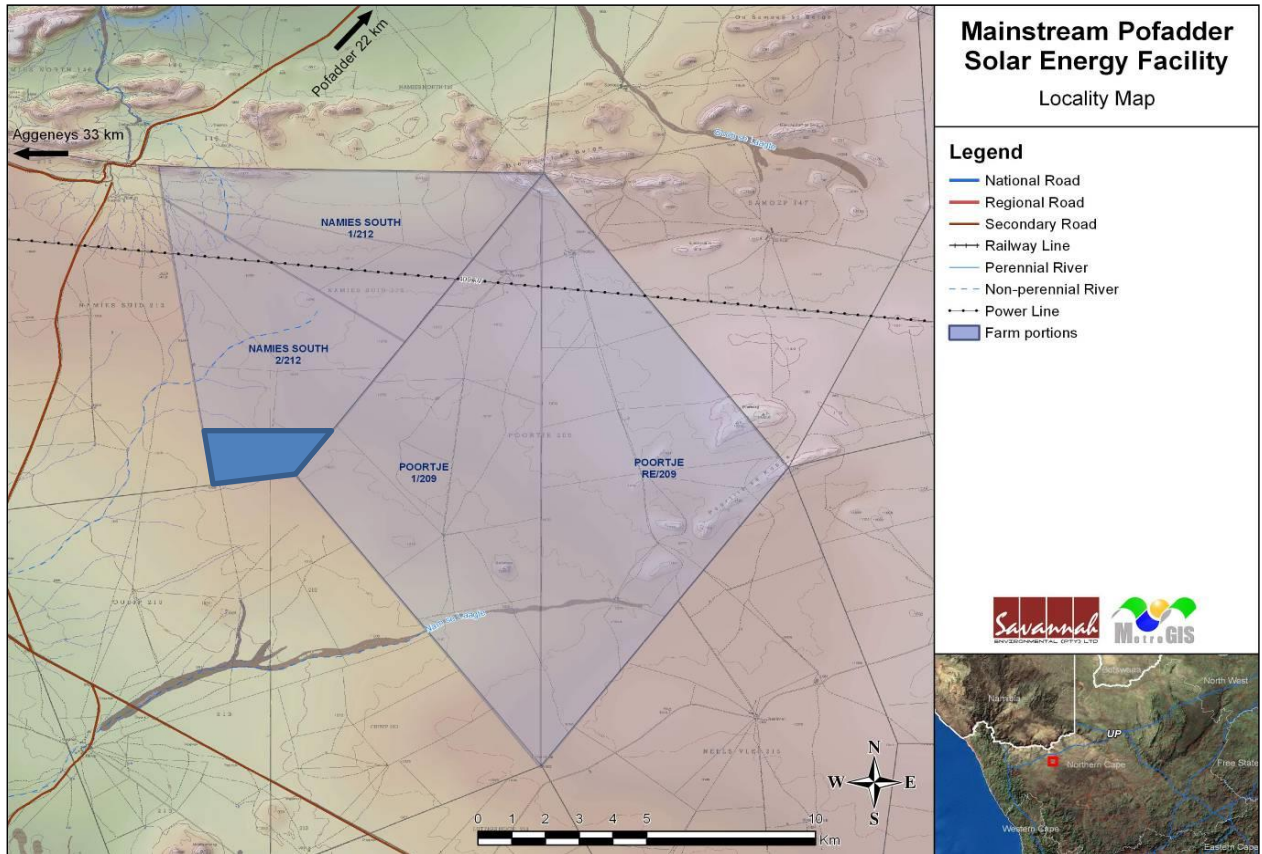


**Figure 1:** Map of the general vicinity of the study area showing the relationship between it and the two nearest towns. The N14 National road runs east to west through Pofadder and Aggeneys and the R358 runs south through Pofadder. The proposed solar facility is indicated by a blue polygon.

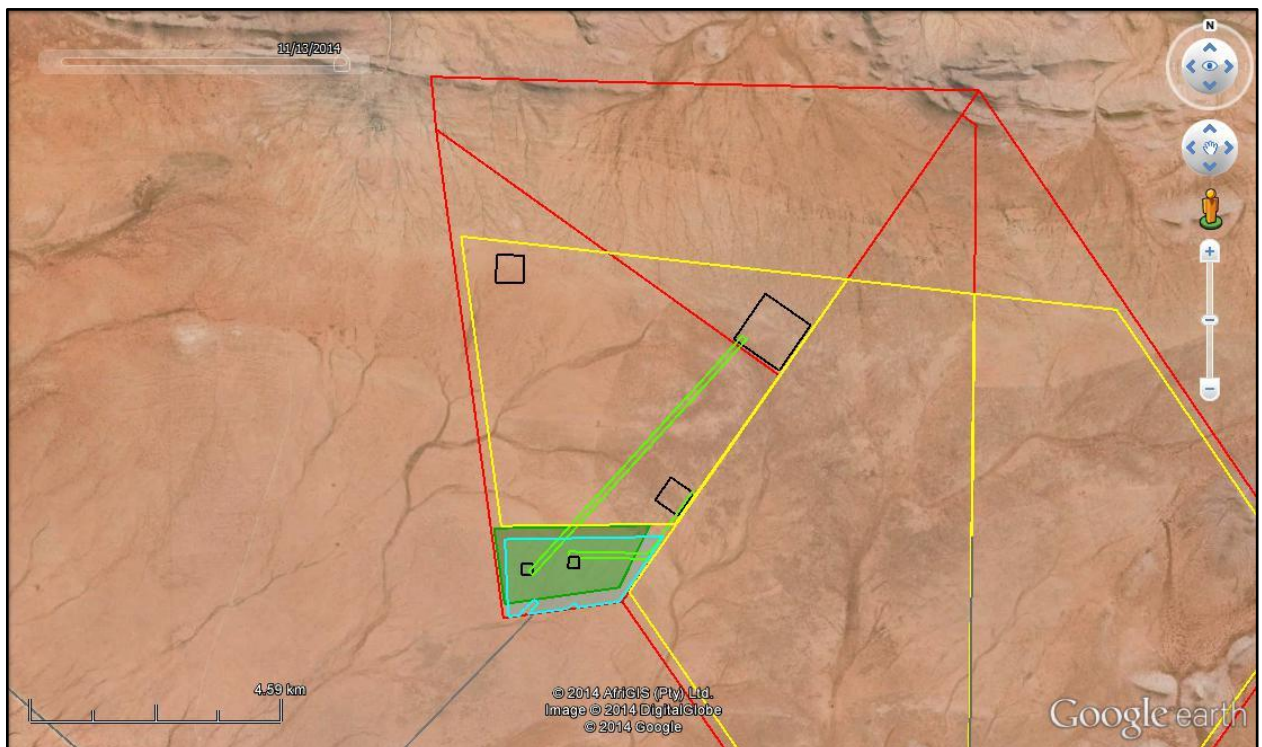
## 1.1 Proposed Activity

The proposed activities will involve construction of a 75 MW Korana solar energy facility. Two alternative sites have been proposed, both of which are in close proximity to each other on the same farm portion.

- A solar energy facility with either photovoltaic or concentrator panels with a capacity of up to 75 MW;
- Cabling between the project components, to be lain underground where practical;
- A 400 kV substation and satellite 132 kV substations to facilitate grid connection via a loop-in loop-out connection to the existing Eskom Aggeneys Aries 400kV power line which traverses the site;
- Internal access roads; and
- Workshop area for maintenance and storage.



**Figure 2:** Map showing the affected farm portion.



**Figure 3:** The location of the proposed solar facility, both alternative sites. PV Alternative 1 is in cyan and PV Alternative 2 is in dark green. Power lines are in green, substations are black. The red and yellow lines indicate farm portions.



## 2 HERITAGE LEGISLATION

The basis for all HIA is the NHRA, which in turn prescribes the manner in which heritage is assessed and managed. The NHRA has defined certain kinds of heritage as being worthy of protection, by either specific or general protection mechanisms. In South Africa the law is directed towards the protection of human made heritage, although places and objects of scientific importance are covered. The National Heritage Resources Act also protects intangible heritage such as traditional activities, oral histories and places where significant events happened. Generally protected heritage, which must be considered in any heritage assessment, includes:

- Any place of cultural significance (described below)
- Buildings and structures (greater than 60 years of age)
- Archaeological sites (greater than 100 years of age)
- Palaeontological sites and specimens
- Shipwrecks and aircraft wrecks
- Graves and grave yards.

Section 38 of the NHRA stipulates that HIAs are required for certain kinds of development such as rezoning of land greater than 10 000 m<sup>2</sup> in extent or exceeding 3 or more sub-divisions, linear developments in excess of 300 m or for any activity that will alter the character or landscape of a site greater than 5000 m<sup>2</sup>. Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as—

- a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
- b) the construction of a bridge or similar structure exceeding 50 m in length;
- c) any development or other activity which will change the character of a site--
  - i) exceeding 5 000 m<sup>2</sup> in extent; or
  - ii) involving three or more existing erven or subdivisions thereof; or
  - iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or
  - iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
- d) the re-zoning of a site exceeding 10 000 m<sup>2</sup> in extent; or
- e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

### 2.1 Cultural Landscapes (places of cultural significance)

*Section 3(3) of the NHRA, No 25 of 1999 defines the cultural significance of a place or objects with regard to the following criteria:*

- (a) its importance in the community or pattern of South Africa's history;
- (b) its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- (c) its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- (d) its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
- (e) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
- (f) its importance in demonstrating a high degree of creative or technical achievement at a particular period;

- (g) its strong or special association with a particular community or cultural group for social cultural or spiritual reasons;
- (h) 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
- (i) sites of significance relating to the history of slavery in South Africa.

## 2.2 Scenic Routes

While not specifically mentioned in the NHRA, No 25 of 1999, Scenic Routes are recognised as a category of heritage resources. Baumann & Winter (2005) recommend that the visual intrusion of development on a scenic route should be considered a heritage issue.

## 2.3 Heritage Grading

A key tool in the assessment of heritage resources is the heritage grading system which uses standard criteria. In the context of an EIA process, heritage resources are graded following the system established by Winter & Baumann (2005) in the guidelines for involving heritage practitioners in EIA's (Table 1). The system is also used internally within Heritage Authorities around the country for making decisions about the future of heritage places, buildings and artefacts.<sup>1</sup> Presently Heritage Western Cape has a good guide to grading which is nationally applicable on their website (<http://www.westerncape.gov.za/public-entity/heritage-western-cape>).

**Table 1:** Grading of heritage resources (Source: Winter & Baumann 2005).

Grade	Level of significance	Description
1	National	Of high intrinsic, associational and contextual heritage value within a national context, i.e. formally declared or potential Grade 1 heritage resources.
2	Provincial	Of high intrinsic, associational and contextual heritage value within a provincial context, i.e. formally declared or potential Grade 2 heritage resources.
3A	Local	Of high intrinsic, associational and contextual heritage value within a local context, i.e. formally declared or potential Grade 3A heritage resources.
3B	Local	Of moderate to high intrinsic, associational and contextual value within a local context, i.e. potential Grade 3B heritage resources.
3C	Local	Of medium to low intrinsic, associational or contextual heritage value within a national, provincial and local context, i.e. potential Grade 3C heritage resources.

Heritage specialists use the grading system to express the relative significance of a heritage resource. This is known as a field grading or a recommended grading. Official grading is done by a special committee of the relevant heritage authority, however heritage authorities rely extensively on field gradings by consultants in terms of decision making.

## 2.4 Heritage authorities

Since the study area will take place in the Northern Cape a provincial heritage authority will be involved – namely Ngwao-Boswa Jwa Kapa Bokone (Northern Cape Heritage Authority). Ngwao-Boswa Jwa Kapa is assisted by SAHRA on an agency basis as it is a small organisation with limited capacity. Heritage resources are graded following the system established by Winter & Baumann (2005) in the guidelines for involving heritage practitioners in EIA's (Table 1).

<sup>1</sup> [http://www.westerncape.gov.za/other/2012/9/grading\\_guide\\_&\\_policy\\_version\\_5\\_app\\_30\\_may\\_2012.pdf](http://www.westerncape.gov.za/other/2012/9/grading_guide_&_policy_version_5_app_30_may_2012.pdf)

### 3 METHODS

#### 3.1 Literature survey

A survey of available literature was carried out to assess the general heritage context into which each development was to be set. This literature included published material and unpublished commercial reports. The information gained was used to inform the field survey.

#### 3.2 Field survey

The WEF site was examined through a combination of driving and walking between 11 and 13 November 2014. During the surveys the positions of finds were recorded on hand-held GPS receivers set to the WGS84 datum.

The survey was done by driving around the site and walking certain areas, as appropriate, to record heritage resources, or conduct sample transects of the landscape. Due to the very large size of the study area binoculars were used to try to identify landscape features that might have attracted prehistoric settlement.

#### 3.3 Impact assessment

Impact assessment ratings were done using a template provided by Savannah Environmental (Pty) Ltd.

#### 3.4 Limitations

In general the landscape was such that we could easily identify areas requiring detailed foot survey so the fact that we did not walk the entire layout is not considered to be a significant limitation. Visibility was excellent throughout the study area and archaeological resources are unlikely to have been missed.

### 4 DESCRIPTION OF THE AFFECTED ENVIRONMENT

The site lies on a wide plain to the south of a range of low rocky hills known as Die Poort se Berge. A very light covering of vegetation with small bushes and grass tufts exists over most of the area but bare patches are present (Figure 4). A number of bare areas are covered with calcrete nodules and fragments of vein quartz. The site is mostly very flat, arid and treeless, however occasional shallow pans and drainage lines occur in places. There is no built environment in the study area apart from fenced farm camps, gravels roads and a few wind pumps.



**Figure 4:** View across the study area showing typical environment. A wide open flat landscape unpunctuated by features or foci.

## 5 HERITAGE CONTEXT

### 5.1 Archaeology

Although little archaeological research has been conducted in the general area around Pofadder, several impact assessment studies have been conducted in recent years. These form the basis of the present background review. The most useful assessment is that of Orton & Webley (2013) who assessed the adjoining property for the proposed Namies Wind Energy facility.

Early (ESA) and Middle Stone Age (MSA) material, including manufacturing sites, have been found on the northern slopes of the Gamsberg, probably positioned so as to gain easy access to a source of stone material on the mountain. Suitable flaking rock is apparently not easily available on the plains (Morris 2010). Pelser (2011) reported MSA and Later Stone Age (LSA) material in an area around the Paulputs substation near Pofadder, although his illustrations appear to be of LSA artefacts made of quartz. He also mentions the presence of ostrich eggshell. East of Aggeneys, Webley and Halkett (2012) found a background scatter of predominantly quartz, and some quartzite artefacts. The material is particularly prevalent in those areas where the soil surface is covered in quartz pebbles and cobbles. The size of the artefacts suggests that they pertain to the Middle Stone Age but diagnostic MSA features were absent. In general, the scatter of stone tools is very widely distributed and does not appear to be concentrated in any specific location.

Orton & Webley (2013) note that the pre-colonial archaeology on the adjoining Namies Wind Energy Facility is sparse and, in common with other surveys in the region, strongly linked to landscape features. Although background scatter artefacts were noted, these were very rare, even more so than expected. This may be due to the lack of suitable flaking rock in the landscape. However, within the proposed development area very diffuse stone artefact scatters were located in association with surface manifestation of vein quartz. These scatters all date to the Middle Stone Age, and comprise of extensive thin scatters of flaked quartz, as well as rare quartzite and ccs (crypto-crystalline silica) artefacts.

According to Morris (2011a) LSA sites are the predominant archaeological trace noted in surveys in the Aggeneys-Pofadder region, although his survey of the northern slopes of the Gamsberg identified very few isolated LSA flakes (Morris 2010). However, on the plains below the mountain he did find three LSA settlements. To the northwest of the Gamsberg, he located two stone cairns which could represent graves, as well as a ceramic LSA site. These sites probably represent transient settlement by transhumant hunter-gatherers or herders that moved through the area. Beaumont *et al.* (1995:263) noted that most LSA sites then known in Bushmanland appeared to be ephemeral occupations by small groups of people in the hinterland both north and south of the Orange River. This was in sharp contrast to the substantial herder encampments along the Orange River floodplain itself. Away from the river, LSA material, mainly quartz flakes, appears to often be focused around the base of granite hills (Morris 2011a, b & c; Pelser 2011; Webley & Halkett 2011). (Beaumont *et al.* 1995) agree and add that red dunes and the margins of seasonal pans also served as foci for LSA occupation.

Orton & Webley (2013) note the presence of bedrock exposures with grinding grooves in several locations throughout the adjoining Namies Wind Energy Facility. Some of these bedrock grooves are found in proximity to water holes in the bedrock (waterbakke).

Rock art is known in the region. Rudner and Rudner (1968) note the scarcity of suitable rock canvases and that art is sparsely distributed through the region. Engravings occur along the Orange River (Morris 1998) where suitable rock exists, while in the rocky areas away from the river there are rare rock paintings. Rudner and Rudner (1968:80-81) described the paintings on the farm Kangnas 60 km to the southwest of Aggeneys but their descriptions were somewhat inaccurate. The sites were re-recorded by Orton and Webley (2012a; Orton 2013). The art is geometric tradition art, a style thought to have been painted by herders. Three sites contain rock art, two in a small ravine and one alongside a large pan. A number of rock engravings, comprised of ground cupules, were recorded by Orton & Webley (2012) at Kangnas and a similar engraving at Namies suggesting a common tradition in this part of the Northern Cape.

Historical accounts of travels through southern Africa frequently provide clues to the pre-colonial occupation of the land. In this case, two travellers, John Barrow and George Thompson, passed through this area leaving observations on the local population.

Barrow (1801:387) wrote of the plains between the Kamiesberg Mountains and the Orange River that:

*"These plains are now desolate and uninhabited. All those numerous tribes of Namaquas, possessed of vast herds of cattle, are, in the course of less than half a century, dwindled away to four hordes, which are not very numerous, and in a great measure subservient to the Dutch peasantry, who dwell among them."*

Thompson (1824:288) noted the following:

*"The extensive plains, lying between the Gariiep and the Kamiesberg, are represented, by old writers, as occupied by a numerous race of people, possessed of large flocks and herds, and living in ease and abundance. Of these, the tribe now resident at Pella and its vicinity, is the only one remaining."*

Both texts show that the area was well inhabited in the past but that colonial expansion was taking its toll on the indigenous inhabitants. Legend has it that the last groups of bushmen were massacred after being trapped at the Gamsberg by Komandos.

## **5.2 History**

Two towns and a village lie in an arc to the north of the site. They are Aggeneys, Pofadder and Pella.

The first reference to a farm at Aggeneys/Aggeneis dates to 1872. It became important with the arrival of the Trekboers as the first watering point reached after leaving Springbok. The farm was acquired in 1905 by a former British soldier and the ruins of the original farmhouse are still visible. There was some Boer War action around Aggeneys and the old fortifications can still be seen on the valley sides. The first known investigation of the mineral potential of the area dates to 1928 but the first mining at Swartberg (Black Mountain) dates to the 1970s.

Pofadder was founded as a mission station in 1875 by Reverend Christian Schröder. It was named after a Korana chief, Klaas Pofadder, who was shot by farmers. Colonists began settling around the perennial spring from 1889 but the first residential plots were only surveyed in 1917 (Eksteen 2012).

Pella, to the north and closer to the Orange River, is also a mission station but it was founded much earlier by the London Missionary Society in 1814 as a sanctuary for the indigenous people who were driven from Namibia. The mission was abandoned in 1872 because of drought but reopened by the Roman Catholic Church in 1878 (Simon 1959).

The most important historical archaeological resource in the immediate vicinity of the proposed solar facility is the ruined village of Namies and its associated features. The ruined village is located at the foothills of Die Poort se Berg which lies just north of the Poortjie and Namies Wind Farms. The most detailed source of information comes from Mr Barry Eksteen, a local resident and son of a former dominee in the area (Eksteen 2012).

Namies was important as a water supply point for people trekking across Bushmanland, as it was the last water before Gamoep, 100 km to the southwest across the open plains. After good rains Trekboers used to camp at Namies (Eksteen 2012). There are at least three fountains on the property. When Namies became established is unknown but early maps suggest that it was still relatively unknown in 1858.

During the late 19<sup>th</sup> century, the minister from Garies travelled through Bushmanland each autumn to lead 'Nagmaal' (communion) at Namies (Eksteen 2012). Scully noted that after good

rains Trekboers from across northern Bushmanland would congregate at Namies and the minister at times preached to several hundred people (Eksteen 2012). At this stage sermons were held in a large tent.

The farms here, including Namies South 212, on which the village was located, were first surveyed in 1895. In 1897 A.J. Dippenaar, who was living at Namies in a tented waggon, wrote to the civil commissioner requesting that land be donated by the government for a church and school. Soon afterwards there was much correspondence regarding the establishment of a town at Pofadder. The need for a church and school was great and a school inspector was dispatched to the region – and his 1905 report was favourable. In July 1906 the surveyor-general sent a surveyor to Namies South to select approximately 500 morgen of land for the church and school. Because the land around the fountain was rocky and bad for grazing, a minimum of 200 morgen was required (Eksteen 2012). The resulting “school erf” was indicated on a 1908 survey diagram. Although work had not yet started on the school, a teacher was sent to start at Namies in 1910.

Around the same time, permission was also granted for a school to be built at Pofadder (Eksteen 2012). The congregation then moved to Pofadder where a new church was built and consecrated around 1922/1923, interestingly, the congregation retained the name of Namies until 1927 when the name Pofadder was adopted. A church booklet provides a photograph of the Namies Church which we must then assume to have been in existence before the decision was taken to move the congregation to Pofadder.

It is apparent from the above history that the village of Namies, although being relatively short-lived, played a key role in the development of the region. It was for many years a central gathering point for Trekboers from Namaqualand and Bushmanland and eventually the first Dutch Reformed Church congregation for the local region was established here. Only in the mid-20<sup>th</sup> century did the area fall from favour with the still relatively new town of Pofadder taking over the primary role. The ruins of the church and at least 20 mud brick structures and stone kraals remain of the old settlement (Orton & Webley 2013). The boarding school is still in relatively good condition and is used for storage. There are at least two graveyards associated with the settlement; the fenced graveyard contains 14 burials while the unfenced graveyard (which is situated next to the gravel road) contains at least 24 graves.

### 5.3 Cultural Landscape

The potential importance of the Gamsberg as a likely massacre site of Bushmen groups during the 19<sup>th</sup> century is discussed by Morris (2010 & 2013). This has resulted in discussions around including the Gamsberg in a potential /Xam and Khomani Heartland World Heritage Site.

## 6 FINDINGS

Appendix A contains an inventory of finds. Figure 7 shows find locations and the search path tracks.

### 6.1 Stone Age archaeology

No clear archaeological sites were recorded. Even the few foci that there were on the landscape failed to attract any form of stable pre-colonial occupation. The typical archaeology of the site is limited to a diffuse litter of stone artefacts, most of which were informal. The only formal artefact found was a single small biface made from quartzite. Natural occurrences of quartz and crystal quartz showed limited flaking or harvesting for raw materials.



**Figure 5:** Quartz flake, typically MSA.

## 6.2 Built environment

There are no structures on the proposed PV site, grid connections or proposed access roads. The 20<sup>th</sup> century heritage consists of stock camp fences, steel gates, watering troughs, wind pumps and wind pump dams.

## 6.3 Cultural landscape, sense of place, visual impacts

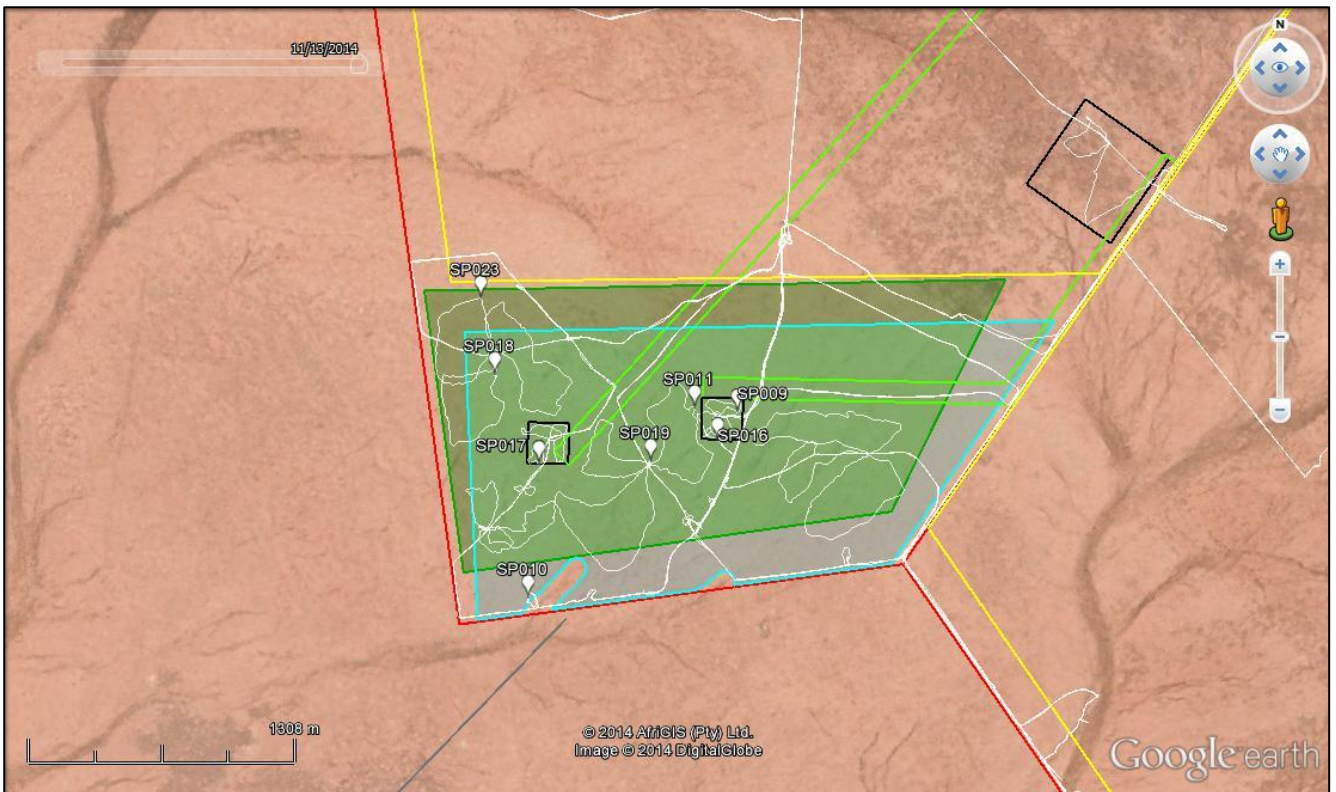
Given that the farm was only granted in the early 20<sup>th</sup> century and that all the structures date to this time and later, there are few if any, cultural landscape elements of concern. The site is very remote has a distinct sense of place. This pertains to the vast open spaces of Bushmanland which stretch as far as one can see without man-made interruptions. Visual impacts will be high due to the remoteness and unspoiled wilderness qualities of the area, however there are very few visual receptors on site apart from the landowners themselves.

The N14 lies some 37 km to the west of the POV site and is the only route that can be regarded as a significant scenic route through the area. To the north the site is completely screened from the N14 by the intervening low mountains and from the west it is too distant from the N14 to result in an impact.

The R358 is has scenic qualities but, being a gravel road, carries far less traffic. It lies some 13 km to the east.



**Figure 6:** Natalie Kendrick and David Halkett check an exposure of quartz pebbles for artefacts.



**Figure 7:** Detail of the Korana solar area showing the PV alternatives (cyan and dark green), and search track logs (white). Areas where the generalised archaeological scatter appeared to be slightly more concentrated are indicated by numbered white dots. The power lines are in green and substations black.

## 7 Potential Impacts associated with solar energy facilities

Solar energy facilities are big developments that can produce a wide range of impacts that will affect the heritage qualities of an area. The arrays will occupy a number of hectares of land which will need to be flattened. The panels may be fixed or constructed on tracking towers approximately 12 m high depending on the kind of technology that is favoured. These may be constructed on small concrete foundations or piles. The arrays are connected via underground cables to a sub-station(s) (positions to be determined), where the generated current will be fed to the national grid via transmission lines. Normally the facility will be fenced, secured and lit for security reasons. During construction there will need to be a laydown area and some form of construction camp.

### 7.1 Impacts expected during the construction phase of the solar facility

During the construction phase the following physical impacts to the landscape and any heritage that lies on it can be expected:

- Bulldozing of roads to the site with a possibility of cut and fill operations in places;
- Upgrading of existing farm tracks;
- Creation of working and lay-down areas;
- Flattening and clearing of land for the solar facility;
- Excavations of small foundations or piling;
- Excavation of linear trenches for cables;
- Erection of power lines (pole design or route not finalised);
- Construction of electrical infra-structure in the form of sub-stations.

In terms of impacts to heritage archaeological sites, which are highly context sensitive, are most vulnerable to the alteration of the land surface. The best way to manage impacts to



archaeological material is to avoid impacting them. This can mean micro-adjustment of the layouts. However if avoidance of the heritage resource is not possible, then some degree of mitigation can be achieved by systematically removing the archaeological material from the landscape. This is generally considered a second best approach as the process that has to be used is exacting and time-consuming, and therefore expensive. Furthermore the NHRA requires that archaeological material is stored indefinitely, which has cost implications and places an undue burden on the limited museum storage space available in the province.

The study area is not archaeologically sensitive therefore rescue excavations of archaeological material will not be necessary for any development of the site, power line routes or substation sites.

## **7.2 Operation of the solar energy facility**

During the operational life of the solar facility, it is expected that physical impacts to heritage will diminish or cease. Impacts to intangible heritage are expected to occur. Such impacts relate to changes to the feel, atmosphere and identity of a place or landscape. Such changes are evoked by visual intrusion, changes in land use and population density. In the case of this project, impacts to remote and rural landscape and wilderness qualities are possibly of greatest concern. Combined with the proposed nearby wind energy facilities, the landscape will become more industrialised and lose its remote and natural qualities.

- Since solar facilities impact smaller areas and are lower in stature than wind energy facilities, the impacts can be less.
- Solar facilities are visible from the air and from elevated positions.
- Perimeter fencing and lighting will contribute to impacts to landscape quality.
- Residual impacts can occur after the cessation of operations – landscape remodeling, structure footings may remain.

Not implementing the proposal will result in no impacts to heritage, apart from those impacts caused by natural forces such as erosion, weathering and natural decay.

## **8 Assessment of Impacts**

### **8.1.1 Archaeological material**

The study area is not archaeologically sensitive therefore rescue excavations or sampling of archaeological material will not be necessary for any development of the site, power line routes or substation sites. Generally the impact of the proposed activity on archaeological material is very low.

### **8.1.2 Nature of impacts**

The main cause of impacts to archaeological and palaeontological sites is physical disturbance of the material itself and its context. The heritage and scientific potential of an archaeological site is highly dependent on its geological and spatial context. This means that even though, for example a deep excavation may expose archaeological artefacts, the artefacts are relatively meaningless once removed from the area in which they were found. In the case of the proposed activity the main source of impact is likely to be the construction of access roads, lay-down areas and excavation of the footings for PV arrays.

### **8.1.3 Extent of impacts**

In the case of the proposed POV facility, it is expected that impacts will be limited (local). There is a chance that the deep excavations for bases could potentially impact buried archaeological material, similarly excavation of cable trenches and clearing of access roads could impact material that lies buried in the surface sand. Potential impacts caused by power line and proposed access roads are similarly likely to be limited and local. The physical survey of the study area has shown

that archaeological material is insignificant and dispersed, which means that the extent of impacts is likely to be highly localised (if at all), with no regional implications for heritage of this kind.

#### 8.1.4 Significance of impacts

In terms of the information that has been collected, indications are that impacts to pre-colonial archaeological material will be limited. In terms of palaeontological material, one can never be sure of what lies below the ground surface, however indications are that this is extremely sparse and that impacts caused by the construction of footings and other ground disturbance is likely to be negligible.

#### 8.1.5 Status of impacts

The destruction of archaeological material is usually considered to be negative; however opportunities for the advancement of science and knowledge about a place can be a result, provided that professional assessments and mitigation is carried out in the event of an unexpected find.

<b>Table 2: Summary of Impacts for Archaeology</b>		
	<b>Without Mitigation</b>	<b>With Mitigation</b>
<b>Extent</b>	Local (1)	Local (1)
<b>Duration</b>	Permanent (5)	Permanent (5)
<b>Magnitude</b>	Low (1)	Low (1)
<b>Probability</b>	Possible (2)	Possible (2)
<b>Significance</b>	Low (14)	Low (14)
<b>Status</b>	Neutral	Neutral
<b>Reversibility</b>	Low reversibility	Low reversibility
<b>Irreplaceable loss of resources?</b>	No	No
<b>Mitigation:</b> No mitigation required prior to construction.		
<b>Cumulative impacts:</b> n/a.		
<b>Residual Impact:</b> n/a		

## 8.2 Colonial period heritage

Colonial period heritage – that is buildings and historical sites of significance have not been identified within the boundaries of the study area.

### 8.2.1 Nature of impacts

Historic structures are sensitive to physical damage such as demolition as well as neglect. They are also context sensitive, in that changes to the surrounding landscape will affect their significance.

### 8.2.2 Extent of Impacts

Direct or indirect impacts are not expected.

### 8.2.3 Significance of impacts

Given that there are no structures or historical sites within the study area, the significance of any impacts is very low.

### 8.2.4 Status of impacts

Within the boundaries of the proposed wind energy facility, impacts are considered improbable. The overall status is considered to be neutral

<b>Table 3: Summary of impacts on colonial period heritage .</b>		
	<b>Without Mitigation</b>	<b>With Mitigation</b>
<b>Extent</b>	Local (1)	Local (1)
<b>Duration</b>	Temporary (1)	Temporary (1)
<b>Magnitude</b>	Low (1)	Low (1)
<b>Probability</b>	improbable (1)	Improbable (1)
<b>Significance</b>	Very low (3)	Very low (3)
<b>Status</b>	Neutral	Neutral
<b>Reversibility</b>	n/a	n/a
<b>Irreplaceable loss of resources?</b>	No	No
<b>Mitigation:</b>	n/a	
<b>Cumulative impacts:</b>	No cumulative impacts	
<b>Residual Impact:</b>	n/a	

### 8.3 Cultural landscape and sense of place

No impacts are expected.

#### 8.3.1 Nature of impacts

Cultural landscapes are highly sensitive to accumulative impacts and large scale development activities that change the character and public memory of a place. In terms of the National Heritage Resources Act, a cultural landscape may also include a natural landscape of high rarity value and scientific significance. The construction of a large facility can result in profound changes to the overall sense of place of a locality, if not a region. In this case the addition of three turbines to the existing turbine rich environment will have no impact at all.

#### 8.3.2 Extent of impacts

PV arrays are without doubt conspicuous structures which will affect the atmosphere of the "place". While this impact may be considered local in terms of physical extent, there may be wider implications in terms of the change in "identity" of the area and the accumulative effect this could have on future tourism potential (not necessarily negative). The impact of the proposed activity will be highly localised.

#### 8.3.3 Significance of impacts

The impact of the proposed activity is low.

#### 8.3.4 Status of impacts

The status of the impact is neutral (without mitigation).

<b>Table 4: Summary of Impacts on Cultural Landscape</b>		
	<b>Without Mitigation</b>	<b>With Mitigation</b>
<b>Extent</b>	Local (1)	Local (1)
<b>Duration</b>	Long term (4)	Long term (4)
<b>Magnitude</b>	Low (1)	Low (1)

<b>Probability</b>	Possible(2)	Possible (2)
<b>Significance</b>	Low (12)_	Low (12)
<b>Status</b>	Neutral	Neutral
<b>Reversibility</b>	Reversible after closure of facility	Reversible after closure of Facility.
<b>Irreplaceable loss of resources?</b>	No	No
<b>Mitigation:</b> A no-development buffer zone of a radius of 500 m must be implemented around Boorwater Farm		
<b>Cumulative impacts:</b> This development together with the proposed 3 wind energy facility will create a local industrial enclave which will be further reinforced by the nearby proposed Namies Wind Farm. The aesthetic qualities of the study area will irrevocably change. This has the possibility of changing the regional identity of the Province at large due to the high frequency of similar proposals in the area. The sense of isolation and wilderness will be effected which could sterilise future tourism growth potential.		
<b>Residual Impact:</b> n/a		

#### 8.4 Transmission lines

Neither the proposed internal power line routes or the proposed 400 kV line to the Aggenys substation are likely to cause negative impacts to cultural heritage. The study area is extremely sparse in terms of both archaeological and historical material/sites.

<b>Table 5: Summary of Impacts on Heritage</b>		
	<b>Without Mitigation</b>	<b>With Mitigation</b>
<b>Extent</b>	Local (1)	Local (1)
<b>Duration</b>	Long term (4)	Long term (4)
<b>Magnitude</b>	Low (1)	Low (1)
<b>Probability</b>	Possible(2)	Possible (2)
<b>Significance</b>	Low (12)_	Low (12)
<b>Status</b>	Neutral	Neutral
<b>Reversibility</b>	Reversible after closure of facility	Reversible after closure of facility.
<b>Irreplaceable loss of resources?</b>	No	No
<b>Mitigation:</b> A no-development buffer zone of a radius of 500m must be implemented around Boorwater Farm and the Namies School building.		
<b>Cumulative impacts:</b> This development together with the proposed 3 wind energy facility will create a local industrial enclave which will be further reinforced by the nearby proposed Namies Wind Farm. The aesthetic qualities of the study area will irrevocably change. This has the possibility of changing the regional identity of the Province at large due to the high frequency of similar proposals in the area. The sense of isolation and wilderness will be effected which could sterilise future tourism growth potential. There is already an existing Eskom 400 kV line in the study area so an additional line will contribute further to industrial clutter, especially along the N14 stretch to the Aggenys sub-station.		
<b>Residual Impact:</b> n/a		

#### 8.5 Access routes

<b>Table 6: Summary of Impacts on heritage</b>		
	<b>Without Mitigation</b>	<b>With Mitigation</b>
<b>Extent</b>	Local (1)	Local (1)
<b>Duration</b>	Long term (5)	Long term (4)
<b>Magnitude</b>	Medium (3)	Low (1)

<b>Probability</b>	Likely (4)	Possible (2)
<b>Significance</b>	High (32)	Low (12)
<b>Status</b>	Negative	Neutral
<b>Reversibility</b>	Not reversible	Not reversible
<b>Irreplaceable loss of resources?</b>	Yes	No
<b>Mitigation:</b> Avoid Namies by moving the access road to the south of the village. Use of the alternative or the second alternative access road is supported.		
<b>Cumulative impacts:</b> This development together with the proposed 3 wind energy facility will create a local industrial enclave which will be further reinforced by the nearby proposed Namies Wind Farm. The aesthetic qualities of the study area will irrevocably change. This has the possibility of changing the regional identity of the Province at large due to the high frequency of similar proposals in the area. The sense of isolation and wilderness will be effected which could sterilise future tourism growth potential. Increasing the road infrastructure will further impact the wilderness qualities of the area and impact the sense of isolation of this region. The ruins of the village of Namies is a unique archaeological site which highly sensitive to physical impacts.		
<b>Residual Impact:</b> n/a		

## 8.6 Comparison of alternatives

### 8.6.1 The PV sites

Option 1 and Option 2 PV site positions are equally suited to the proposed activity from a heritage point of view. Other environmental considerations may influence the choice of site.

### 8.6.2 Access Roads

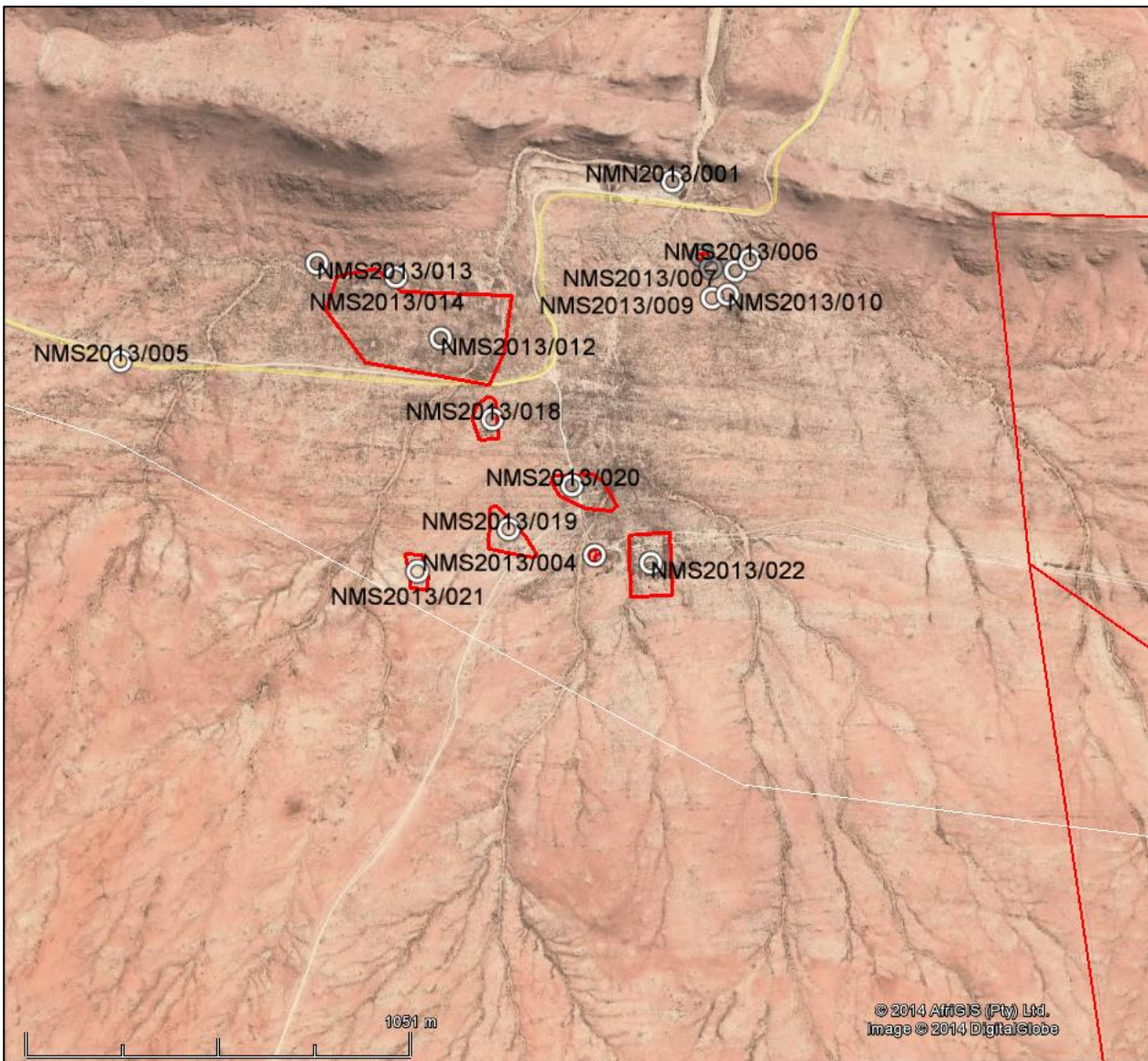
Existing road: The existing west-east access road from the N14 passes very close to the historic site of Namies. Widening or changing the alignment of this road could result in impacts to graves and ruins at the settlement. If this route is selected, extensive mitigation in terms of recording, rescue archaeology and grave relocation may be required.

#### **Alternatives:**

- The second alternative is preferred as there is an existing road in the area that could be upgraded and minimise the loss of natural landscape.
- The alternative route is an acceptable but intermediary choice.
- The existing route is least preferred due to the potential impacts that road widening and re-alignment will have on the Namies village archaeological site. However if the proposed alignment south of Namies is implemented, impacts will be avoided.

### 8.6.3 Substations

Proposed and alternative substation sites are both acceptable.



**Figure 8** Sensitive heritage areas associated with Namies village and the existing access road. The proposed route south of Namies will avoid these (after Webley and Orton 2013).

## 8.7 The no-go alternative

The no-go alternative will result in retention of the status-quo in heritage terms.

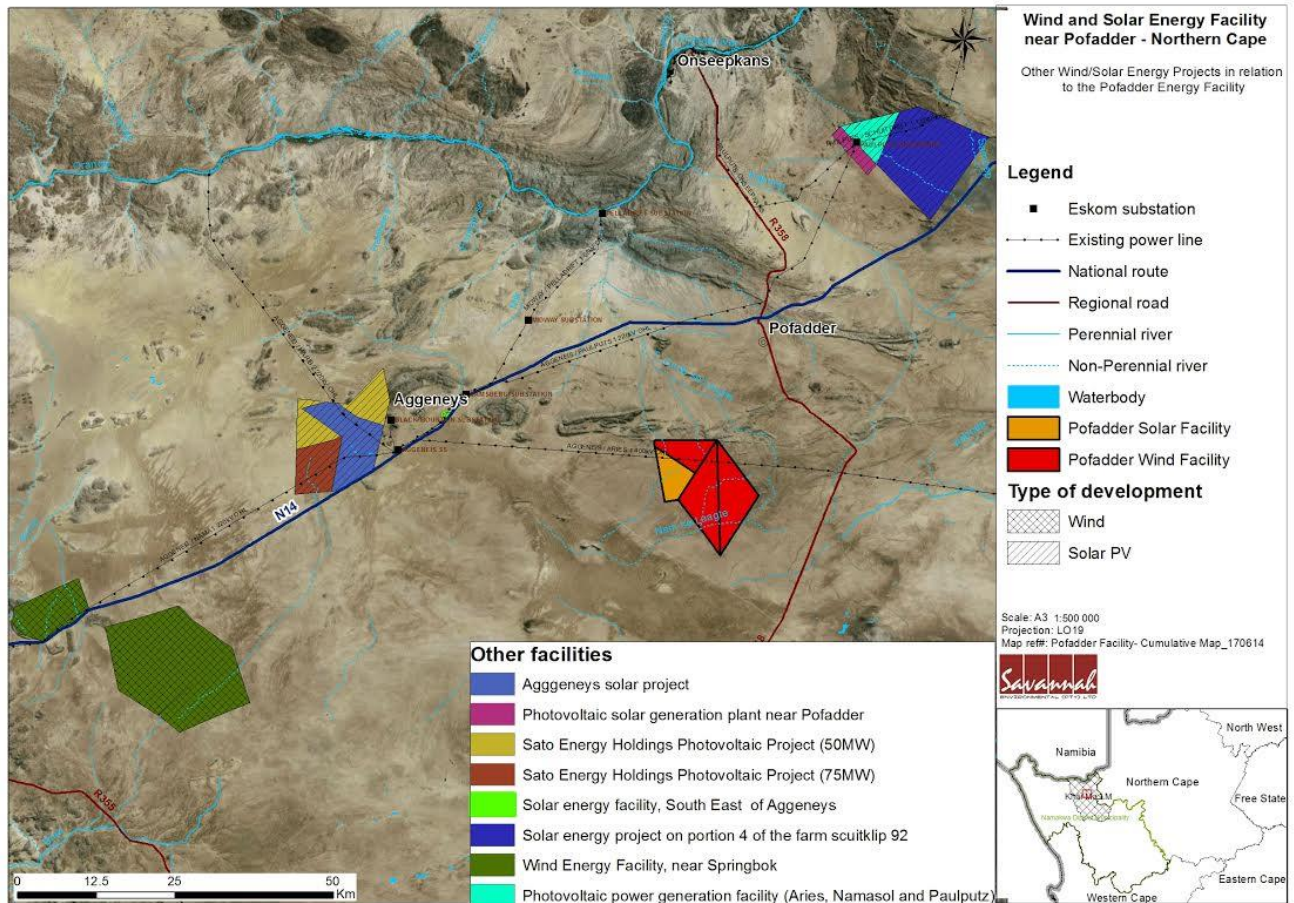
## 9 CUMULATIVE IMPACTS.

The Mainstream proposals combined will see the construction of up to 210 turbines and a photovoltaic facility, which in itself is a large concentration of industrial paraphernalia that will have a powerful effect on the sense of place. This combined with the three wind proposals, substations and transmission lines will effectively transform a natural and largely wilderness environment into an industrial enclave. The proposed Namies wind energy facility that lies a few kilometres to the west and further solar and wind facilities in the Aggeneys area create a combined chain of industrial development some 75 km in length ( if they are approved) excluding roughly an 18 km radius that will be affected by visual impacts. This is a massive development which in terms of area is the size of a large city.

The cumulative impact will negatively affect the landscape qualities of the area which are generally considered to be significantly scenic. This has the possibility of changing the regional

identity of the Province at large due to the high frequency of similar proposals in the area. The sense of isolation and wilderness will be effected which negatively affect future tourism growth potential (https://dea.maps.arcgis.com/apps/webappviewer/index.html?id=b8452ef22aeb4522953f1fb10e6dc79e).

The accumulative impact is of high significance, in terms of the impact to character and quality of the landscape. It effect will in time alter the regional identity.



**Figure 9: Proposed Wind and Solar energy facilities near Pofadder**

## 10 Mitigation and conservation

### 10.1 Archaeological and palaeontological heritage

There is no surface archaeological material that requires any form of mitigation prior to construction work.

### 10.2 Built environment and colonial period sites

There are no protected sites or structures within the study area that require mitigation.

### 10.3 Cultural landscape

No mitigation measures are suggested.

### 10.4 Human remains

Human remains can occur at any place on the landscape. They are regularly exposed during construction activities along the west and south coasts. Such remains are protected by a plethora of legislation including the Human Tissues Act (Act No 65 of 1983), the Exhumation Ordinance of 1980 and the National Heritage Resources Act (Act No 25 of 1999). In the event of human bones being found on site, SAHRA must be informed immediately and the remains removed under an emergency permit. This process will incur some expense as removal of human remains is at the cost of the developer. Time delays may result while application is made to the authorities and an archaeologist is appointed to do the work.

## 10.5 Mitigation and Management

The proposed activity is unlikely to result in significant heritage impacts. Generally no mitigation will be required for the PV sites, transmission lines and sub-stations.

If the existing east west access road from the N14 is selected as the site access route mitigation will be required that could include quite a lengthy process of archaeological recording, grave relocation and excavation.

The proposed re-aligning of the route south of the Namies village site as indicated in Figure 8 would serve to mitigate potential impacts.

## 11 CONCLUSIONS

Given the generally low sensitivity of the study area, the proposed activity is acceptable. The area of concern is the proposed access road from the N14.

The current access road passes through the middle of the ruined village of Namies. This area is of concern because there are components of the village (buildings and graves) that are located very close to the roads and could be impacted by any road widening. Here depending on how the access road is designed, mitigation may be required. Realigning this road south of Namies as proposed would be an acceptable solution.

## 12 MANAGEMENT

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>• PV array construction involves levelling of ground surface.</li> <li>• Overhead and below surface power lines.</li> <li>• Substation(s) construction</li> <li>• An overhead power line to connect the facility to the electricity grid</li> <li>• Internal access roads</li> <li>• Workshop area/office for maintenance</li> <li>• Construction of access road.</li> </ul>
<b>Potential Impact</b>	No impacts expected, avoid impacts to ruins and graves at Namies.
<b>Activity/risk source</b>	Widening of existing access road.
<b>Mitigation: Target/Objective</b>	Ensure that Namies is avoided by routing road to south of Namies village ruins. No mitigation is deemed necessary, other than to observe heritage law and report un-anticipated finds.

<b>Mitigation action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Check final selected access route with heritage consultant, mitigation if necessary.	Proponent and project archaeologist.	In planning stages before construction commences.





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**Appendix A:** Archaeological occurrences found on the Korana PV.

No	Description	East	South
SP009	MSA scatter around pan (currently with water) Mostly quartz but a few other quartzitic materials. All MSA and low density	19.3359	-29.3688
SP010	Small scatter. Large quartz core and a few flakes. MSA. Located on a flat area with no focus.	19.2484	-29.3743
SP011	Small Pan with lots of crystal quartz. Some white, some clear. This site has a fair number of flakes of crystal quartz- some small. Mostly MSA. Raw material source rather than a living site. Lots of chips chunks and flakes.	19.2379	-29.3825
SP016	Next to pan (SP009) small quartz flake scatter. One core.	19.3364	-29.3689
SP017	Small quartz flake scatter (only 3) overall area has more flakes but so low density- no definite site- maybe washed in. Lots of obvious sheet washing.	19.2474	-29.3755
SP018	Three quartz crystal blades artefacts	19.2384	-29.3766
SP019	Dense lens of OES (ostrich egg shell), a few crystal blades and flakes. Not associated with a pan.	19.2362	-29.3727
SP023	MSA scatter with a few quartz flakes that has a moderately higher density than other areas	19.2954	-29.3428