

**HERITAGE IMPACT ASSESSMENT FOR THE
PROPOSED VELD PV NORTH SOLAR ENERGY FARM
ON THE REMAINDER OF NAROEP 45/REM OR
HARAMOEP 53/REM, NORTHWEST OF AGGENEYS,
NAMAKWALAND, NORTHERN CAPE**

Report for:

Aurecon South Africa (Pty) Ltd
P.O. Box 494, Cape Town, 8000
Tel: 021 526 6034
Email: Simon.Clark@aurecongroup.com

On behalf of:

Veld Solar One (Pty) Ltd



Dr Jayson Orton
ASHA Consulting (Pty) Ltd
40 Brassie Street, Lakeside, 7945
Tel: (021) 788 1025 | 083 272 3225
Email: jayson@asha-consulting.co.za

1st draft: 17 July 2019

EXECUTIVE SUMMARY

The Proponent, Veld Solar One (Pty) Ltd, proposes to develop two solar sites on two farms, Naroep (Remainder of Farm no. 45) and Haramoep (Remainder of Farm no.53), approximately 20 km north-west of Aggeneys in the Northern Cape. Two photovoltaic (PV) energy facilities and associated infrastructure are planned; they would have a maximum generation capacity of up to 75 MW each. The two facilities would utilise shared infrastructure where possible to minimise their overall footprint and associated impacts. The Veld PV North project is the subject of this report.

ASHA Consulting (Pty) Ltd was appointed by Aurecon South Africa (Pty) Ltd to conduct a heritage impact assessment (HIA) of the potential impacts to heritage resources that might occur through the proposed construction of a 75 MW photovoltaic (PV) solar energy facility on one of two sites to the north-west of Aggeneys, Northern Cape. Originally a single site was assessed but, due to various constraints arising from the specialist studies, a new alternative had to be brought into play and is now regarded as the preferred alternative. The development would fall within the Springbok Renewable Energy Development Zone (REDZ). The two sites are located as follows:

- The remainder of Naroep 45 (original site). A centre point for the site is S29° 00' 25" E 18° 34' 25" (Figure 1); and
- The remainder of Haramoep 53 (preferred site). A centre point for the site is S29° 08' 10" E 18° 37' 02" (Figure 1).

The project would entail the construction of numerous arrays of solar panels with internal roads, an on-site substation and an operations and maintenance building. Internal cabling would be laid underground. For either site alternative a new power line would link the project to the Aggeneys Substation to the southeast.

The Naroep Site (original north site)

The Naroep site is gently sloping and bisected in the east by a stream bed. Vegetation cover is sparse, although the bushes that are present are often fairly large. The surface is sandy in the east, but becomes progressively more gravelly towards the west.

Heritage resources are very rare on the development site but immediately to its east and north-east, a highly significant archaeological site was found. This site appears to be a 19th century Khoekhoe camp. It has both Stone Age and historical materials and includes fragments of five millstones. It warrants at least a Grade of IIIA (high local significance) and quite possibly Grade II (high provincial significance). It is noted that the developer has proactively altered the development footprint because part of this site originally fell within the footprint. Within the present development footprint, only occasional low density scatters of quartz artefacts were seen, although a very small chance exists that artefacts associated with the Khoekhoe camp might still occur within the far eastern part of the site. Palaeontology is not an issue for this site, with the local geological deposits being of either low or zero palaeontological sensitivity. The landscape, which is far more natural than cultural, is also considered a heritage resource, and impacts to it will be of moderate significance.

As long as the Khoekhoe camp remains undisturbed, no significant impacts to heritage resources are expected on the Naroep site and the development should be allowed to proceed. The possibility of impacts to the Khoekhoe camp must, however, be highlighted.

The Haramoep Site (preferred north site)

This site is very flat with a sandy substrate and only very light vegetation cover. It is bordered to the west by a rocky ridge, while a short longitudinal sand dune bisects the eastern boundary. Two further longitudinal dunes end at the southern boundary of the site. There are no other landscape features on the site.

The ground survey did not cover this site completely but, from the area examined, it can be stated that heritage resources are very rare within the study area. The only record made was of a very ephemeral scatter of ostrich eggshell and a single burnt bone fragment atop the dune at the east edge of the site. The scatter lies outside of the PV site.

Because there are as yet no known significant heritage resources within the Haramoep site, the development should be allowed proceed.

Based on the assessment of the two sites, a preference for the Haramoep site emerges. This is because of the proximity of the Naroep site to the Khoekhoe camp and also because it is generally more prominent in the landscape alongside a public gravel road.

It is recommended that, from a heritage point of view, the proposed Veld PV North can be authorised but subject to the following conditions:

- If the original site is used then the amount of encroachment on the Khoekhoen camp site should be minimised;
- The final layout of the PV facility, access road and grid connection should be considered by an archaeologist and any potentially sensitive areas should be surveyed; and
- If any archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

Glossary

Background scatter: Artefacts whose spatial position is conditioned more by natural forces than by human agency

Early Stone Age: Period of the Stone Age extending approximately between 2 million and 200 000 years ago.

Hand-axe: A bifacially flaked, pointed stone tool type typical of the Early Stone Age.

Hominid: a group consisting of all modern and extinct great apes (i.e. gorillas, chimpanzees, orangutans and humans) and their ancestors.

Later Stone Age: Period of the Stone Age extending over the last approximately 20 000 years.

Matjieshuis: Reed mat house constructed by creating a framework of poles and fastening the reed mats to the outside.

Middle Stone Age: Period of the Stone Age extending approximately between 200 000 and 20 000 years ago.

Abbreviations

APHP: Association of Professional Heritage Practitioners

ASAPA: Association of Southern African Professional Archaeologists

BA: Basic Assessment

CCS: Crypto-crystalline silica

CRM: Cultural Resources Management

DEA: National Department of Environmental Affairs

EIA: Environmental Impact Assessment

ESA: Early Stone Age

GPS: global positioning system

HIA: Heritage impact assessment

LSA: Later Stone Age

MSA: Middle Stone Age

n.d.: not dated

NEMA: National Environmental Management Act (No. 107 of 1998)

NHRA: National Heritage Resources Act (No. 25) of 1999

PV: Photovoltaic

SAHRA: South African Heritage Resources Agency

SAHRIS: South African Heritage Resources Information System

Contents

1. INTRODUCTION	1
1.1. Project description	1
1.1.1. Alternatives	2
1.1.2. Aspects of the project relevant to the heritage study	3
1.2. Terms of reference	4
1.3. Scope and purpose of the report	4
1.4. The author	4
1.5. Declaration of independence	5
2. HERITAGE LEGISLATION	5
3. METHODS	6
3.1. Literature survey and information sources	6
3.2. Field survey	6
3.3. Specialist studies	6
3.4. Impact assessment	6
3.5. Grading	6
3.6. Assumptions and limitations	7
4. PHYSICAL ENVIRONMENTAL CONTEXT	7
4.1. Site context	7
4.1.1. Original north site (Naroep)	7
4.1.2. New north site (Haramoep)	8
4.2. Site description	8
4.2.1. Original north site (Naroep)	8
4.2.2. New north site (Haramoep)	8
5. HERITAGE CONTEXT	9
5.1. Archaeological aspects	9
5.2. Historical aspects	10
5.3. Built environment	10
6. FINDINGS OF THE HERITAGE STUDY	11
6.1. Archaeology	14
6.1.1. Original north site (Naroep)	14
6.1.2. New north site (Haramoep)	18
6.2. Palaeontology	18
6.2.1. Both sites	18
6.3. Built environment	20
6.3.1. Both sites	20
6.4. Graves	20
6.4.1. Original north site (Naroep)	20
6.4.2. New north site (Haramoep)	20
6.4.3. General comment	20
6.5. Cultural landscape	20
6.5.1. Original north site (Naroep)	20
6.5.2. New north site (Haramoep)	21

6.6. Summary of heritage indicators	22
6.7. Statement of significance and provisional grading	22
7. ASSESSMENT OF IMPACTS	23
7.1. PV North (Original)	23
7.1.1. Archaeology and Graves	23
7.1.2. Palaeontology.....	24
7.1.3. Natural and Cultural landscape.....	25
7.2. PV North (Preferred).....	26
7.2.1. Archaeology and graves	26
7.2.2. Palaeontology.....	27
7.2.3. Natural and Cultural landscape.....	28
8. EVALUATION OF IMPACTS RELATIVE TO SUSTAINABLE SOCIAL AND ECONOMIC BENEFITS.....	29
9. CONCLUSION.....	29
9.1. Reasoned opinion of the specialist.....	29
10. RECOMMENDATIONS	30
11. REFERENCES	30
APPENDIX 1 – Curriculum Vitae	33
APPENDIX 2 – Palaeontological specialist comment	36

1. INTRODUCTION

The Proponent, Veld Solar One (Pty) Ltd, proposes to develop two solar sites on two farms, Naroep (Remainder of Farm no. 45) and Haramoep (Remainder of Farm no.53), approximately 20 km north-west of Aggeneys in the Northern Cape. Two photovoltaic (PV) energy facilities and associated infrastructure are planned; they would have a maximum generation capacity of up to 75 MW each. The two facilities would utilise shared infrastructure where possible to minimise their overall footprint and associated impacts. The Veld PV North project is the subject of this report.

ASHA Consulting (Pty) Ltd was appointed by Aurecon South Africa (Pty) Ltd to conduct a heritage impact assessment (HIA) of the potential impacts to heritage resources that might occur through the proposed construction of a 75 MW photovoltaic (PV) solar energy facility on one of two sites to the north-west of Aggeneys, Northern Cape. Originally a single site was assessed but, due to various constraints arising from the specialist studies, a new alternative had to be brought into play and is now regarded as the preferred alternative. The development would fall within the Springbok Renewable Energy Development Zone (REDZ). The two sites are located as follows:

- The remainder of Naroep 45 (original site). A centre point for the site is S29° 00' 25" E 18° 34' 25" (Figure 1); and
- The remainder of Haramoep 53 (preferred site). A centre point for the site is S29° 08' 10" E 18° 37' 02" (Figure 1).

1.1. Project description

Veld PV North (Pty) Ltd proposes developing a 75 MW Photovoltaic (PV) solar energy facility on Naroep (Remainder of 45) or Haramoep (Remainder of Farm 53) in the Namakwa District Municipality and located respectively about 37 km and 24 km north-west of Aggeneys in Northern Cape. The development has been designed with the intention that the Veld PV North solar facility would form part of a consolidated solar development which will consist of the proposed Veld PV North (75 MW) and the proposed Veld PV South (75 MW) PV facilities. These proposed facilities would utilise shared infrastructure where possible to minimise their overall footprint. To evacuate the power generated by the proposed Veld PV North (and South), a grid connection is required between the solar farm project area and the Aggenys substation. This application pertains specifically to Veld PV North and the grid connection proposed by the proponent Veld PV North (Pty) Ltd.

The site was selected as it falls within an area considered to have some of the highest solar resource in South Africa.

The proposed grid connection will consist of a 132 kilovolt (kV) overhead powerline, approximately 25 km in length that would feed into the national electricity grid at the Aggenys substation. A 35m wide servitude will be required for the construction of the powerline and it will run adjacent to the existing 220 kV powerline that runs past the site, comprising single circuit steel monopoles with bird perches.

The following components would be required for the solar farm and to evacuate the power generated by the proposed Veld PV North:

- **A photovoltaic component**, comprising of numerous arrays of PV solar panels mounted on steel tracking mounts and footings with associated support infrastructure to generate up to 75 MW of renewable energy
- **On-site substations**, including amongst others:
 - **Inverters**, to convert the direct current (DC) generated by the PV modules into alternating current (AC)
 - **Transformers**, to step up the 33-kV power generated by the inverters to 132 kV to connect to the new 132 kV overhead transmission line
- **Internal cabling** laid underground when feasible to connect the PV modules to the on-site substation and inverters
- **Internal access roads** for servicing and maintenance of the site
- **Stormwater infrastructure**
- **Temporary construction areas** for use during construction
- **Buildings**, including an operations and maintenance building, a connection building, control building, guard cabin
- **Weather stations** within and along the fenced perimeter of the site; and
- **Perimeter fencing.**

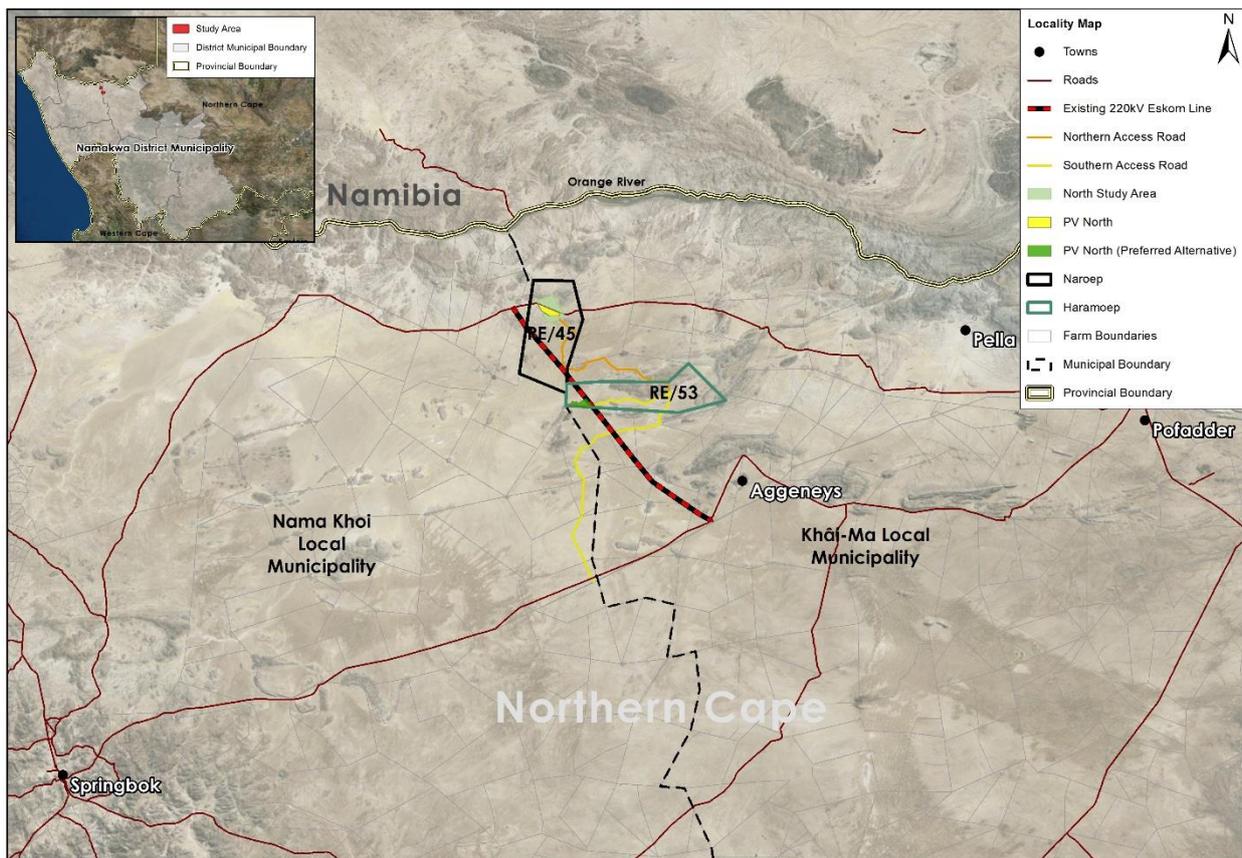


Figure 1: Map showing the location of the sites under consideration for the originally proposed Veld PV North alternative on Naroep 45/rem and the new and preferred PV North on Haramoep 53/rem. The town of Aggeneys lies south-east of the proposed sites.

1.1.1. Alternatives

- Two alternatives for the solar panels are being considered:

- 'fixed axis PV' (Alternative A1); or
- 'single axis tracking PV' (Alternative A2); and
- Two site alternatives exist:
 - The remainder of Naroep 45 (original north site); and
 - The remainder of Haramoep 53 (new north site).
- Two alternatives exist for access to the original Veld PV North site.
 - Along the Goodhouse-Pella Road from the west via Concordia (Alternative 1); and
 - Along the Goodhouse-Pella Road from the east passing south of Pella (Alternative 2).
- Two alternatives exist for access to the to the preferred Veld PV North site.
 - One would utilise the existing farm access roads leading northwards from the N14 (Alternative 1)
 - The second would be utilise the existing farm access roads between the proposed project and the Pella-Goodhouse Road (Alternative 2).

Figures 3 and 4 show preliminary layout plans for the two site alternatives.

1.1.2. Aspects of the project relevant to the heritage study

All aspects of the proposed development are relevant, since excavations for foundations and/or services may impact on archaeological and/or palaeontological remains, while all above-ground aspects create potential visual (contextual) impacts to the cultural landscape and any significant heritage sites that might be visually sensitive.

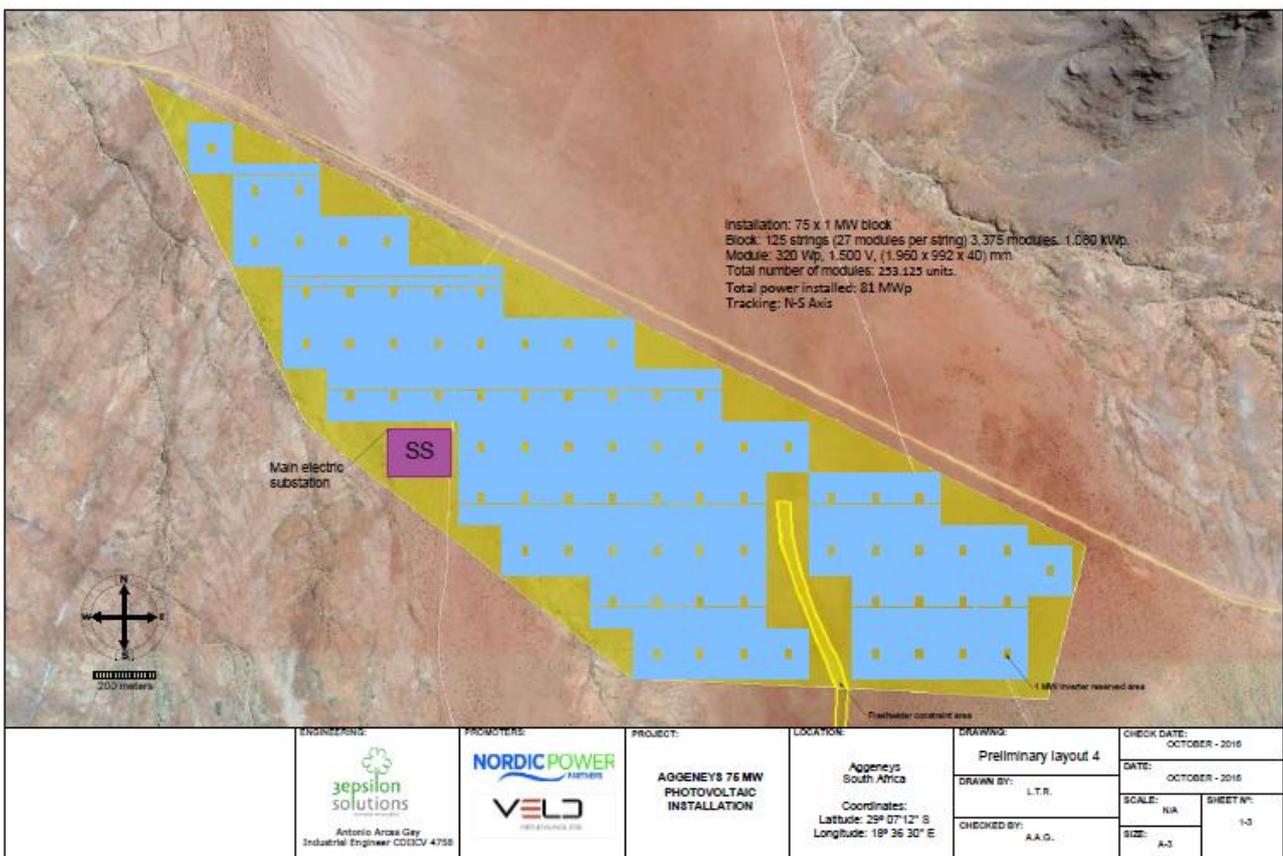


Figure 3: Preliminary layout plan of the proposed facility on the Naroep (original north) site.

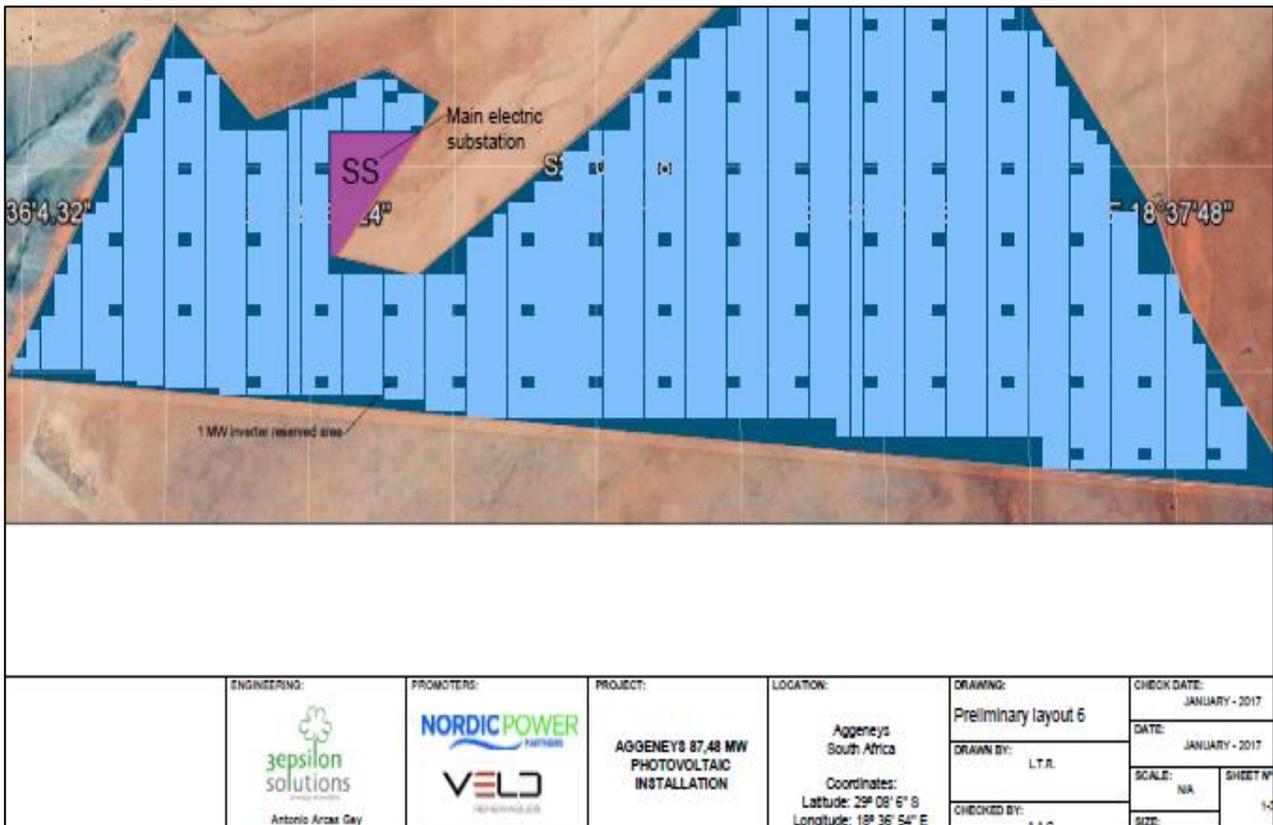


Figure 4: Preliminary layout plan of the proposed facility on the Haramoep (new north) site.

1.2. Terms of reference

ASHA Consulting was asked to provide a heritage impact assessment for the proposed development. The assessment was to be based on both desktop and field research and was to cover all relevant aspects of heritage as appropriate to the sites.

1.3. Scope and purpose of the report

An HIA is a means of identifying any significant heritage resources before development begins so that these can be managed in such a way as to allow the development to proceed (if appropriate) without undue impacts to the fragile heritage of South Africa. This HIA report aims to fulfil the requirements of the heritage authorities such that a comment can be issued by them for consideration by the National Department of Environmental Affairs (DEA) who will review the Basic Assessment (BA) and grant or refuse authorisation. The HIA report will outline any management and/or mitigation requirements that will need to be complied with from a heritage point of view and that should be included in the conditions of authorisation should this be granted.

1.4. The author

Dr Jayson Orton has an MA (UCT, 2004) and a D.Phil (Oxford, UK, 2013), both in archaeology, and has been conducting Heritage Impact Assessments and archaeological specialist studies in the Western Cape and Northern Cape provinces of South Africa since 2004 (see curriculum vitae included as Appendix 1). He has also conducted research on aspects of the Later Stone Age in these provinces and published widely on the topic. He is an accredited heritage practitioner with the

Association of Professional Heritage Practitioners (APHP) and also holds archaeological accreditation with the Association of Southern African Professional Archaeologists (ASAPA) CRM section (Member #233) as follows:

- Principal Investigator: Stone Age, Shell Middens & Grave Relocation; and
- Field Director: Colonial Period & Rock Art.

1.5. Declaration of independence

ASHA Consulting (Pty) Ltd and its consultants have no financial or other interest in the proposed development and will derive no benefits other than fair remuneration for consulting services provided.

2. HERITAGE LEGISLATION

The National Heritage Resources Act (NHRA) No. 25 of 1999 protects a variety of heritage resources as follows:

- Section 34: structures older than 60 years;
- Section 35: palaeontological, prehistoric and historical material (including ruins) more than 100 years old;
- Section 36: graves and human remains older than 60 years and located outside of a formal cemetery administered by a local authority; and
- Section 37: public monuments and memorials.

Following Section 2, the definitions applicable to the above protections are as follows:

- Structures: “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”;
- Palaeontological material: “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”;
- Archaeological material: a) “material 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”; b) “rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation”; c) “wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the Republic, as defined respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation”; and d) “features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found”;
- Grave: “means a place of interment and includes the contents, headstone or other marker of such a place and any other structure on or associated with such place”; and

- Public monuments and memorials: “all monuments and memorials a) “erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organisation funded by or established in terms of the legislation of such a branch of government”; or b) “which were paid for by public subscription, government funds, or a public-spirited or military organisation, and are on land belonging to any private individual.”

While landscapes with cultural significance do not have a dedicated Section in the NHRA, they are protected under the definition of the National Estate (Section 3). Section 3(2)(c) and (d) list “historical settlements and townscapes” and “landscapes and natural features of cultural significance” as part of the National Estate. Furthermore, Section 3(3) describes the reasons a place or object may have cultural heritage value; some of these speak directly to cultural landscapes.

3. METHODS

3.1. Literature survey and information sources

A survey of available literature was carried out to assess the general heritage context into which the development would be set. This literature included published material, unpublished commercial reports and online material, including reports sourced from the South African Heritage Resources Information System (SAHRIS). The 1:50 000 map was sourced from the Chief Directorate: National Geo-Spatial Information.

3.2. Field survey

The original north site was subjected to a detailed foot survey by two archaeologists (Dr Jayson Orton and Chester Kaplan) on the 8th and 9th of October 2016, while a large part of the new north site was searched on 6th October 2016. This was in late Spring but, because of the generally dry climate, the season makes little difference to vegetation cover and hence little difference to the visibility of archaeological resources. During the survey, the positions of finds were recorded on a hand-held GPS receiver set to the WGS84 datum. Photographs were taken at times in order to capture representative samples of both the affected heritage, and the landscape setting, of the proposed development.

3.3. Specialist studies

Despite the very low sensitivity of palaeontological heritage in this case, a desktop study has been produced by Dr John Almond of Natura Viva cc and submitted alongside the present report.

3.4. Impact assessment

For consistency, the impact assessment was conducted through application of a scale supplied by Aurecon.

3.5. Grading

S.7(1) of the NHRA provides for the grading of heritage resources into those of National (Grade I), Provincial (Grade II) and Local (Grade III) significance. Grading is intended to allow for the

identification of the appropriate level of management for any given heritage resource. Grade I and II resources are intended to be managed by the national and provincial heritage resources authorities respectively, while Grade III resources would be managed by the relevant local planning authority. These bodies are responsible for grading, but anyone may make recommendations for grading.

It is intended under S.7(2) that the various provincial authorities formulate a system for the further detailed grading of heritage resources¹ of local significance, but this is generally yet to happen. SAHRA (2007) has formulated its own system for use in provinces where it has commenting authority. In this system sites of high local significance are given Grade IIIA (with the implication that the site should be preserved in its entirety) and Grade IIIB (with the implication that part of the site could be mitigated and part preserved as appropriate) while sites of lesser significance are referred to as having 'General Protection' and rated with an A (high/medium significance, requires mitigation), B (medium significance, requires recording) or C (low significance, requires no further action).

3.6. Assumptions and limitations

Although a number of applications in the general area have been lodged on SAHRIS, many of these do not have heritage reports associated with them which means that relatively little background information was available for the desktop study from the immediate surrounds of the study area. However, far more was available from the area around Aggeneys, well to the south.

The field study was carried out at the surface only and hence any completely buried archaeological and/or palaeontological sites would not be readily located. Similarly, it is not always possible to determine the depth of archaeological material visible at the surface. It should be noted that the westernmost quarter of the new PV North site was not surveyed.

In one area between the two alternative sites we specifically walked to some longitudinal dunes that had pans between them as this was expected to be a sensitive area. The lack of material there is assumed to indicate that archaeological resources, especially recent sites, are rare in the dune field and surroundings in general.

4. PHYSICAL ENVIRONMENTAL CONTEXT

4.1. Site context

The sites are located in a very remote area between Aggeneys and the Orange River.

4.1.1. Original north site (Naroep)

The original north site on Naroep 45/rem lies along the southern edge of the gravel road that runs between Pella and Goodhouse. It is 14 km south of the Orange River and about 37 km northwest of Aggeneys. There is no other infrastructure nearby, although a borrow pit has been excavated at the eastern end of this study area. A 220 kV power line runs past the site a few kilometres to the west.

¹ The system is intended only for use with archaeological and palaeontological resources.

4.1.2. New north site (Haramoep)

The new north site on Haramoep 53/rem lies 24 km northwest of Aggeneys and 29 km south of the Orange River. It is in a broad valley that is traversed by a 220 kV power line (which runs past the site immediately to its east) but lacks any other development aside from farm fences.

4.2. Site description

4.2.1. Original north site (Naroep)

This site is a large plain that slopes very gently downhill towards the north-west and is bisected by a few stream beds (Figure 5). It is mostly sandy (Figure 6) but in the west, bedrock has been exposed by erosion and patches of gravel are relatively common (Figure 7). The vegetation is sparse, although what there is tends to be larger bushes of the species *Euphorbia gregaria* (D. McDonald, pers. comm. 2016).

4.2.2. New north site (Haramoep)

This site is very flat with a sandy substrate and only very light vegetation cover. It is bordered to the west by a rocky ridge, while a short longitudinal sand dune bisects the eastern boundary. Two further longitudinal dunes end at the southern boundary of the site. There are no other landscape features on the site.



Figure 5: View towards the west across the original north site which lies to the south (near side) of the gravel road (indicated by dashed line).



Figure 6: View of the surface in the eastern part of the original north site.



Figure 7: View of the surface in the western part of the original north site.



Figure 8: View towards the south-west across the eastern part of the new north site.

5. HERITAGE CONTEXT

This section of the report contains the desktop study and establishes what is already known about heritage resources in the vicinity of the study area. What was found during the field survey may then be compared with what is already known in order to gain an improved understanding of the significance of the newly reported resources.

5.1. Archaeological aspects

Because of the very dry nature of the landscape, archaeological sites tend to be sparsely distributed and are usually very closely associated with water sources. A prime example of this is the many small sites found scattered around a large pan 42 km south of the present PV study area (Orton 2016a). Morris (2013) found a similar occurrence close to Aggeneys. The general lack of archaeological sites in other areas (e.g. Morris 2011a, 2011b; Smith 2012) does not suggest a lack of occupation, but more likely suggests that people were moving through these areas more quickly and simply did not leave many traces of their passing. It is well-known that the Orange River region was fairly densely occupied by the Bushman and Khoekhoe during historical times (Penn 2005) and, in some areas, many archaeological sites reflecting this occupation have been found (Beaumont *et al.* 1995).

A small survey by Paleo Field Services (n.d.) in the mountains to the north of Aggeneys failed to yield any heritage resources, but a rock art site is known to occur on a free-standing boulder to the south (Morris 2011a). The painting is a finger painting, likely associated with the Khoekhoen. Similar art is found on granite outcrops throughout Namaqualand and elsewhere in Bushmanland, but in very low densities (Orton 2013). Morris (2014) examined land to the south of the study area and reported scatters of quartz flakes associated with quartz outcrops, a small Later Stone Age (LSA) scatter of stone artefacts and ostrich eggshell on the summit of a hill, as well as a very ephemeral background scatter over some areas.

Some of the place names in the region reflect the living heritage of the Khoekhoen. Ghaamsberg (also Gamsberg), for example, derives from the Khoekhoen word meaning 'grassy spring' (Raper n.d.). This mountain lies some 46 km south-east of the present PV study area and also houses one of the very few rock shelter deposits known from the region (Orton 2014). There are unconfirmed historical reports that a massacre of Bushmen may have occurred in a kloof of the Ghaamsberg (Robinson 1978), but surveys have failed to yield any evidence.

5.2. Historical aspects

Colonial occupation of the area commenced fairly late and, as a result, historical traces tend to be few and far between. Throughout much of the 19th century the region was a colonial frontier with Caucasian, small stock farmers moving through the region, but generally not living a settled lifestyle. The earliest settlements were mission stations that were located at springs. The nearest to the study area was at Pella, some 55 km to the east, which was founded as early as 1814 (anonymous n.d.). Conflict was frequent as competition for grazing land and access to water sources grew stronger, although this may have been more the case further south where better quality grazing occurs (Penn 2005). It is notable, however, that Robert Moffat (Schaeffer 2008:58) found Wortel (a farm a short distance east of the present study areas) to be "one of the finest grazing places in Namaqualand". Survey diagrams of the area indicate that Naroep 45 and Haramoep 53 were both first surveyed in 1894.

That the majority of activity in the region occurred in proximity to the Orange River is demonstrated by a mid-19th century map on which we see many place names and landscape features close to the river, but a large empty space to the south (Figure 9).

5.3. Built environment

Because most farms were settled quite late, the majority of structures in the region date to the 20th century. At Pella, however, there were buildings by 1882, for we know from the writings of Bishop John Marie Simon (1959) that at that time the residents of Pella were, under his direction, making lime plaster from local rocks with which to plaster buildings. They also built a 'cathedral' in the early 1890s (Anonymous n.d.). Orton (2016a) found all structures in his survey area to the south to be 20th century.

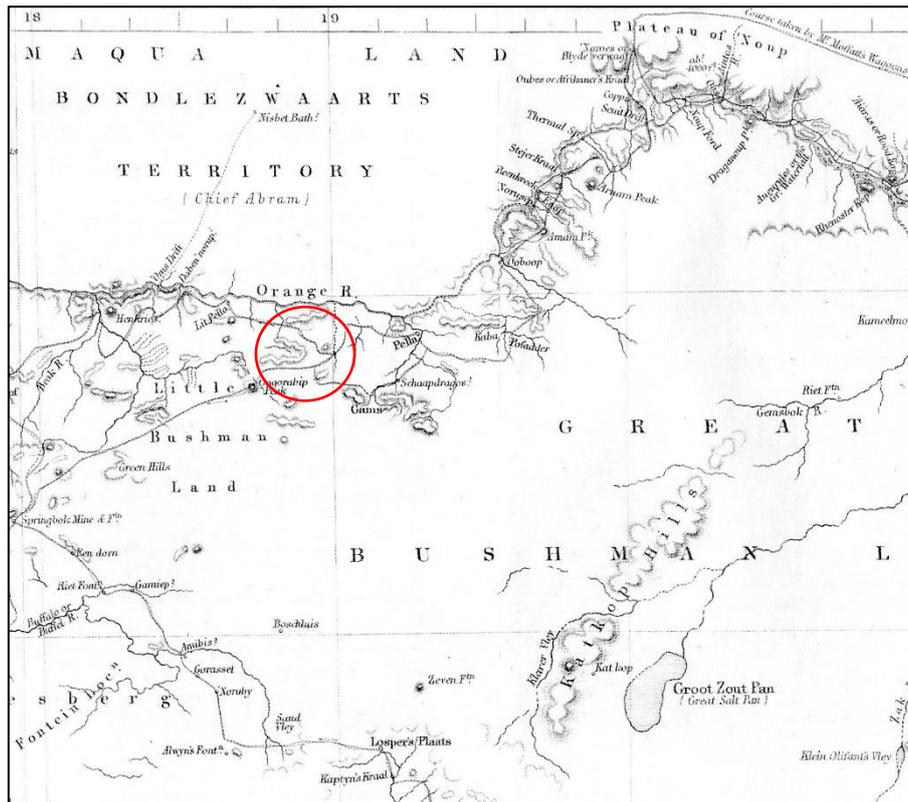


Figure 9: Extract from an 1858 map by Robert Moffat. Source: Schaeffer (2008: opp. p. 38). The present study areas fall within the red circle.

6. FINDINGS OF THE HERITAGE STUDY

This section describes the heritage resources recorded in the study area during the course of the project. They are listed in Table 1 and mapped in Figures 10 and 11.

Table 1: List of heritage resources recorded during the survey.

Waypoint	Location	Description	Heritage significance	Suggested grade
PV site				
KK Camp	S28 59 47.0 E18 34 35.0 (northwest)	A large area of some 2.6 km long and varying in width between less than 100 m in the north-west, to about 500 m in the south-east. It has abundant traces of a relatively recent encampment, presumably of the Khoekhoen. These traces include a widespread, low-density stone artefact scatter (mostly of quartz but including occasional crypto-crystalline silica and quartzite) with occasional patches of higher-density scatter, grindstones (often broken), four and a half	High AVOID	IIIA (possible Grade II)
	S29 00 15.0 E18 35 12.0 (mid-point)			
	S29 00 47.0 E18 35 31 (southeast)			

		millstones (one was complete), abundant ostrich eggshell fragments, occasional ostrich eggshell beads, pottery, 19 th century colonial ceramics, tins and wire, fragments of a cast iron cooking pot, seven graves oriented east-west (some with small headstones), and a variety of other rocks (generally in clusters) that are assumed to relate to weights for <i>matjieshuise</i> (reed mat huts). Note that 112 waypoints were taken during the recording of this site and that three locations are given here as representative of the whole. Note also that subsequent to the survey described here, further work has been undertaken at this site as part of a student research project and revealed many more finds (K. Johnson in preparation).		
275	S29 00 36.9 E18 34 24.7	Quartz artefact scatter around a quartz outcrop.	Very low	GP C
276	S29 00 32.4 E18 34 07.7	Quartz artefact scatter around a quartz outcrop.	Very low	GP C
277	S29 00 28.4 E18 34 25.8	Quartz artefact scatter around a quartz outcrop.	Very low	GP C
325	S29 00 45.1 E18 35 42.6	Hand-axe.	Very low	---
327	S29 00 49.4 E18 35 35.9	A boulder with quartz artefacts scattered around it.	Low	GP C
328	S29 00 54.4 E18 35 33.6	A honey ladder made of iron fence poles with wooden steps wired onto it. No sign of the beehive anymore (or the place where it was attached) but a small fragment of honeycomb was found under one of the rocks on the ledge. Just to the right was a wire 3-pronged hook lying in a crevice, either stashed there for later use on the beehive, or else for hooking something out of the crevice. Possibly related to the Khoekhoe encampment.	Low	GP C
329	S29 00 57.5 E18 35 28.0	A large boulder with a good artefact scatter surrounding it. Mostly quartz but hornfels, quartzite and crypto-crystalline silica (CCS) also present.	Low	GP A
330	S29 00 59.3 E18 35 29.0	Porcupine lair with many animal bones inside it. It is no longer in use. It is located in a deep cavity in the side of the granite mountain. It is unknown how old the lair is	Low	GP B

		and whether domesticates or purely wild animals are present. Potential archive of wild species for the region.		
331	S29 01 01.2 E18 35 27.0	Ephemeral remains of a stock post. Some poles and wire and a single rusty tin.	Very low	GP C
Stockpost	S28 59 50 5 E18 32 49.0	A stock post exists on the south side of a small, rocky hill. The site was identified only from aerial photography and was not visited. Its age is unknown but it is likely older than 60 years.	Very low	GP C
337	S29 01 35.8 E18 32 16.9	East-facing rock wall with quite a number of artefacts on the talus slope.	Low	GP C
305	S29 08 11.0 E18 37 49.4	Light scatter of ostrich eggshell and a single burnt bone fragment.	Very low	GP C

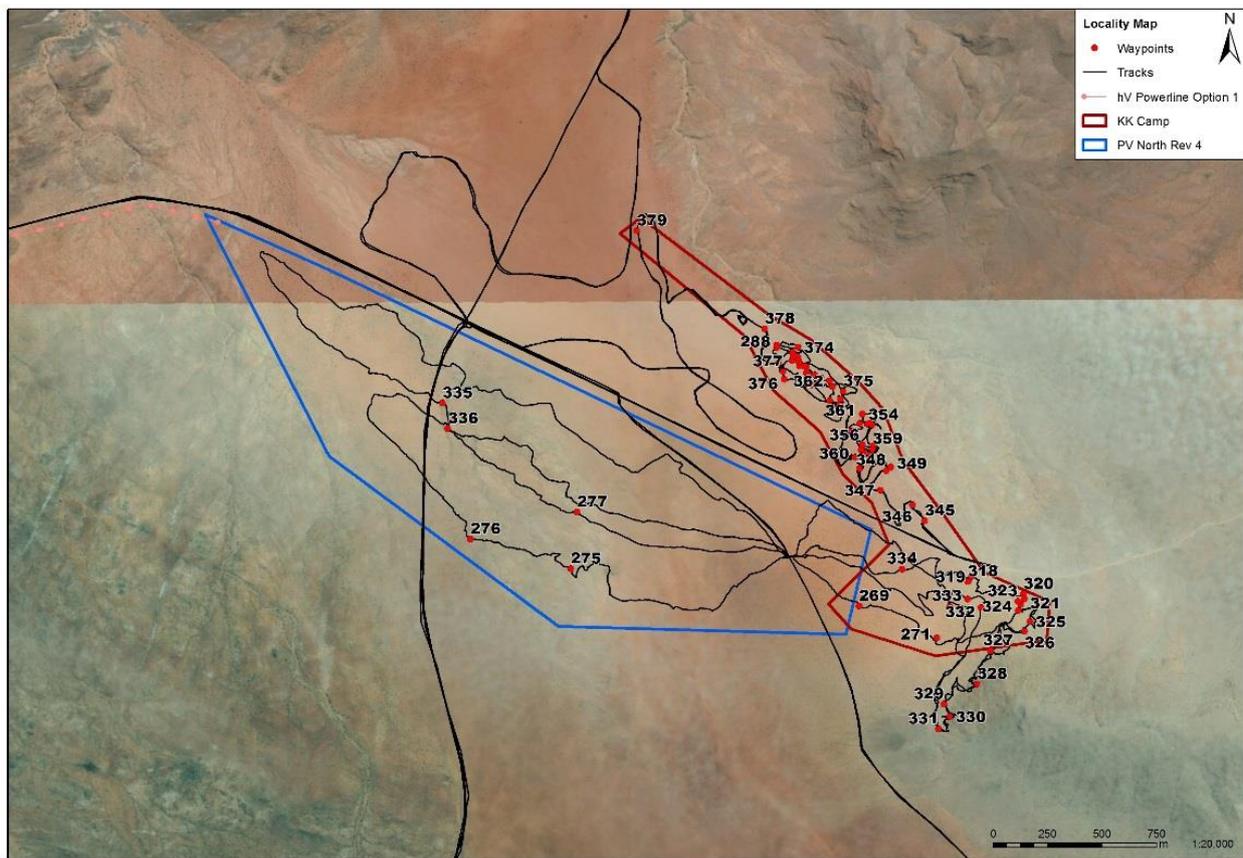


Figure 10: Map of the original north site development footprint on Naroep 45/rem (PV facility = blue polygon; red dashed line = transmission line) showing the walk- and drive-paths created during the survey (black lines) and the positions of all finds (numbered red symbols). The important Khoekhoe site as documented in 2016 is enclosed by the red polygon which, for precautionary reasons, allows a large buffer around the known materials.

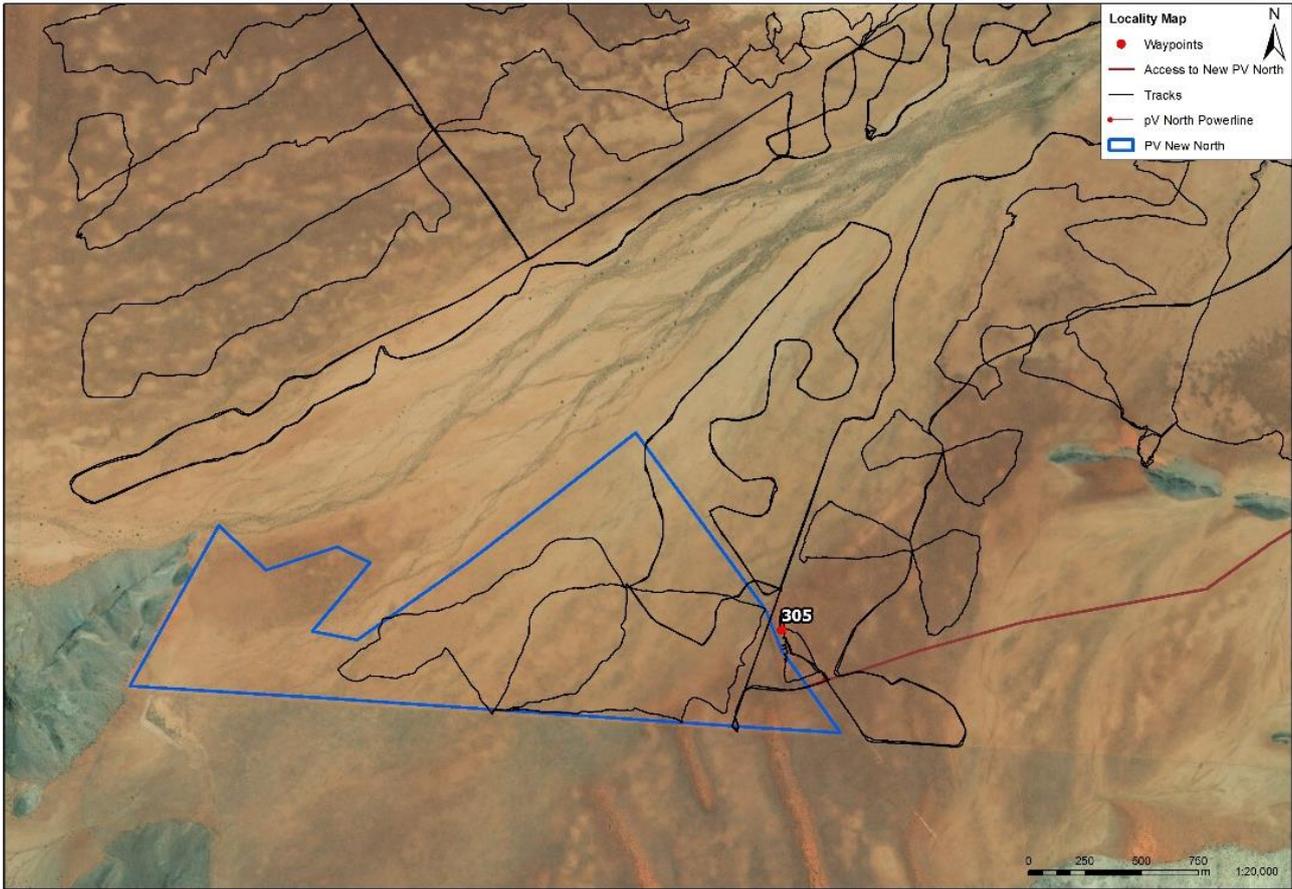


Figure 11: Map of the new north site development footprint on Haramoep 53/rem (PV facility = blue polygon; red line = access road) showing the walk- and drive-paths created during the survey (green lines) and the positions of all finds (numbered red symbols).

6.1. Archaeology

6.1.1. Original north site (Naroep)

A few LSA (Later Stone Age) archaeological sites were located at the foot of the mountain, to the east of and outside the study area. Two of these were artefact scatters spread around large boulders (Figures 11 & 12), while the third was a massive scatter extending in a north-westerly direction from the mountain, along the western margin of a water course. This last was by far the most important site and will be discussed in more detail below. The study area for the proposed PV site was altered during the scoping phase of this project in order to specifically avoid this site. Within the study area a number of ephemeral scatters of quartz artefacts of unknown age were noted. These are more likely part of the background scatter and there could well be further artefacts scattered amongst the quartz gravel. They are insignificant. There were generally very few background scatter artefacts present and the only one about which anything could be said was an Early Stone Age (ESA) hand-axe found just to the east of the study area (Figure 13).



Figure 11: A large boulder around which the artefact scatter at waypoint 329 was found.



Figure 12: Stone artefacts from waypoint 329. The scale is in cm.



Figure 13: The single hand-axe noted during the study. The scale is in cm.

The very large scatter measured approximately 100 m by 800 m and was spread along the western margin of a water course. The site is extremely unusual in that it appears to be a very recent contact period site. It is assumed to be the camp of one of the Khoekhoe groups who lived along the Orange River and, judging by the ceramics present, probably dates to the 19th century. Other historical materials on the site included several fragments of iron cooking pots, some wire, some tins, a shot gun cartridge case and several small millstones. Strangely, no glass was noted. The LSA remains include ostrich eggshell fragments and beads, many grindstones (especially lower grindstones, some of which had deep grooves), large numbers of stone artefacts spread unevenly over the entire area, and some pottery. Importantly, there were also seven graves. These graves were presumably of people that had close contact with Christian society because they were aligned east-west, packed with stones, and some had small headstones present. The graves tended to be along the eastern edge of the site, overlooking the watercourse. Also found were a number of loose scatters of rocks that may well have served as anchors for *matjieshuise* (reed mat huts). A Shepherd's Bush tree (*Boscia albitrunca*; D, McDonald, pers. comm. 2016) occurs in the south-eastern part of the site and has had a large rock placed between its main branches. These trees are extremely long-lived and the stone was likely placed there by the occupants of the site. Figure 14 shows examples of the kinds of artefacts present on the site, while Figures 15 to 18 show some of the graves and some views over the site.



Figure 14: A selection of Stone Age and Historical period artefacts from the Khoekhoe encampment. Not to scale.



Figures 15 & 16: A pair of graves. In each case the other can be seen in the background.



Figure 17: View downslope towards the north-west along the length of the site.



Figure 18: View upslope towards the south-east along the length of the site.

Another find that may well be connected to this Khoekhoe camp is a honey ladder located a short way up the mountain, to the south of the camp (waypoint 328). It was made of iron fence poles with wooden steps wired onto it (Figure 19). There was no visible sign of the beehive, but a small fragment of old honeycomb was found under one of the rocks on the ledge. Just to the right was a wire 3-pronged hook lying in a crevice, either stashed there for later use on the beehive, or else for hooking something out of the crevice (Figure 20).



Figure 16: The honey ladder (waypoint 328).



Figure 17: The wire hook (waypoint 328).

6.1.2. New north site (Haramoep)

No heritage resources were found within the area searched. One very ephemeral scatter of ostrich eggshell fragments and a single burnt bone fragment (indicating a human origin for the materials) was found on top of the sand dune along the eastern margin of the site.



Figure 18: The dune-top location of the ephemeral scatter at waypoint 305.



Figure 19: Ostrich eggshell fragments and a burnt bone fragment from waypoint 305. Scale in cm.

6.2. Palaeontology

6.2.1. Both sites

The entire study area and surrounds are underlain by geological deposits of low or zero palaeontological sensitivity (Figures 20 & 21). According to the SAHRIS Palaeosensitivity Map key, no palaeontological specialist studies should be required in such areas. Nevertheless, brief comment was sought from Dr John Almond and is included in Appendix 2. Of the local geology and palaeontology, Almond (2019) notes the following:

The entire study area for the proposed Veld PV North and Veld PV South solar facilities near Aggenys, Northern Cape, as well as for the associated 132 kV grid connection to Aggenys Substation, is underlain by unfossiliferous Precambrian basement rocks. The bedrocks are largely covered by Late Cenozoic superficial sediments – alluvial sands and gravels, aeolian sands and calcretes – of low palaeontological sensitivity. Fossiliferous older alluvial deposits of the ancient (Miocene) Koa River Palaeo-valley that once flowed through this region of Bushmanland are unlikely to be impacted by the proposed development since they are probably deeply buried beneath younger sediments.

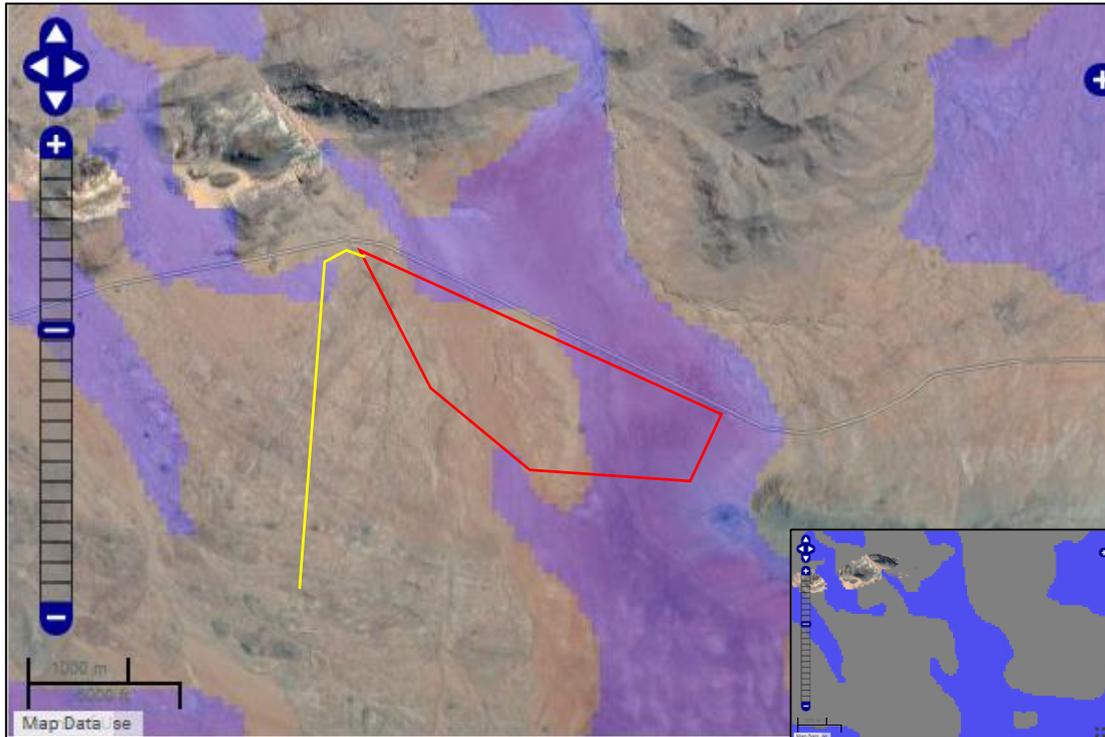


Figure 20: Extract from the SAHRIS Palaeosensitivity map showing the Naroep (original site) study area to be largely underlain by sediments of zero palaeontological sensitivity (grey shading). Some parts of the site are of low sensitivity (blue shading).



Figure 21: Extract from the SAHRIS Palaeosensitivity map showing the Haramoep (new site) study area to be largely underlain by sediments of low palaeontological sensitivity (blue shading). The easternmost part of the site is of zero sensitivity (grey shading).

It is clear that palaeontological resources at both sites are likely to be extremely rare and/or insignificant in the area and that palaeontology is not an issue for this project. Almond (2019) has suggested that no further work is required in terms of palaeontology but that, for the sake of caution, a chance finds procedure should be included in the EMP for the project.

6.3. Built environment

6.3.1. Both sites

There are no buildings of any sort on either of the two sites. Rare farm houses do occur in the vicinity, but the only one of heritage value that was seen lies 19.5 km to the south-east of the original site, and 11 km east of the new site, and will not be affected in any way by development of either of the proposed locations.

6.4. Graves

6.4.1. Original north site (Naroep)

A total of seven graves was seen within the bounds of the Khoekhoe camp described above. They were packed with stones and generally fairly easily identified. Examples are illustrated in Figures 11 and 12. These are off the proposed development site, with all being at least 300 m from its boundary.

6.4.2. New north site (Haramoep)

No graves were seen on this site, although a portion (~40 ha) of it was not surveyed. The chances of finding graves in this environment are generally very low. They seem to generally be associated with landscape features and/or occupation sites and, given the very flat, open nature of the study area it is unlikely that graves would be present in the unsurveyed portion of the study area.

6.4.3. General comment

Another stone-packed grave was seen elsewhere during the course of the fieldwork, showing that graves do occur more widely in the landscape. Although fairly unlikely, there is always a small chance that unmarked precolonial graves could be uncovered during development. The locations of such graves cannot be predicted and they would have to be dealt with on a case-by-case basis when discovered.

6.5. Cultural landscape

6.5.1. Original north site (Naroep)

There is virtually no cultural landscape in the Naroep area because the landscape is very largely natural with very few anthropogenic interventions. The latter are limited to occasional farm roads and fences. A small stock post occurs on the south side of a small hill in the bend of the transmission line. There is no cultivation in the area, with small stock farming dominating.

The Khoekhoe camp, however, could be thought of as a precolonial cultural landscape. Orton (2016b) has explored the notion of precolonial cultural landscapes and this site would fit into his Type 5 landscape: "single archaeological entities covering very large areas". The site is some 60 ha in extent (Figure 22). This precolonial cultural landscape is highly significant because of the lack of known similar examples. It is possible that this landscape could be connected to intangible heritage

if there are people alive who are able to relate stories about the place that have been passed down the generations.

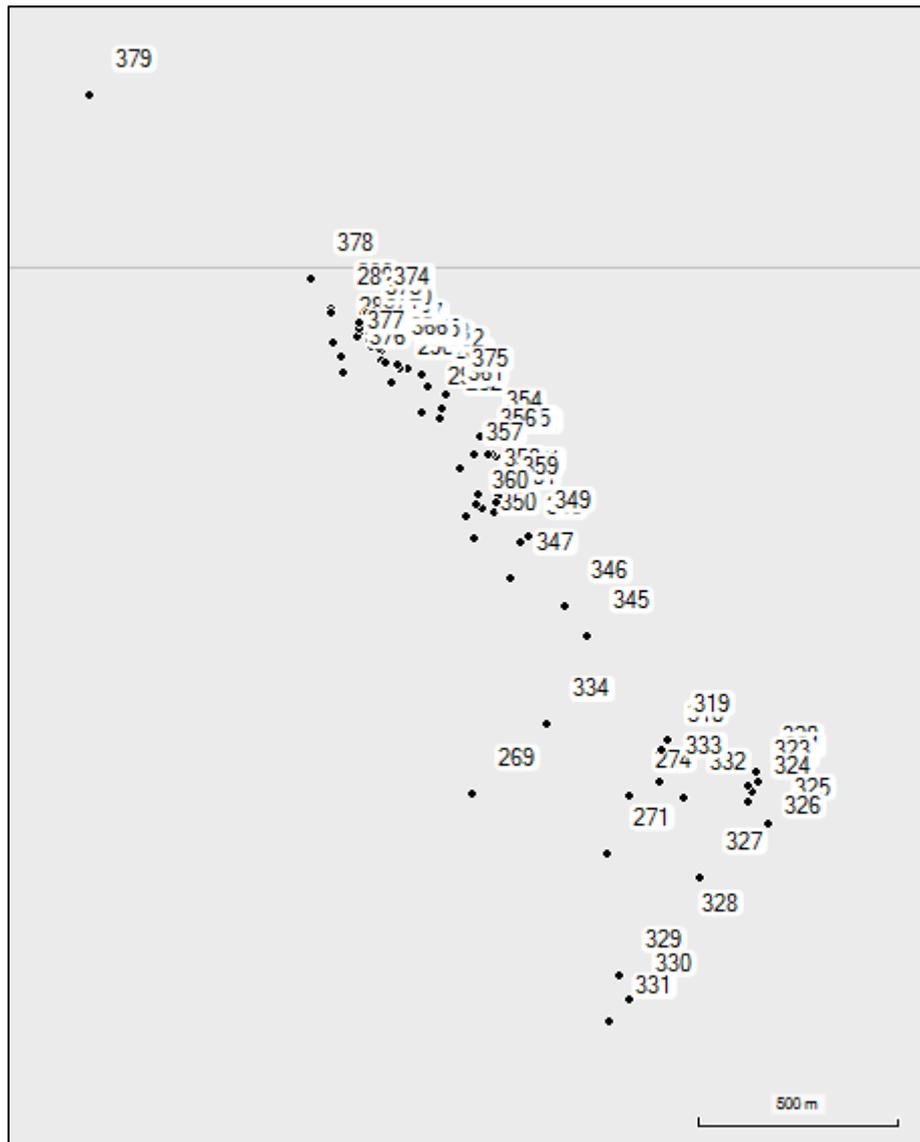


Figure 22: Map of all the waypoints recorded as being part of the Khoekhoe camp.

6.5.2. New north site (Haramoep)

The site is very remote and not at all visible from any public roads in the wider area. The cultural landscape on Haramoep is equally poorly developed with the same features – occasional farm roads and fences – present on the plains between rocky hills. There is no cultivation and the landscape is largely natural. An intriguing industrial heritage feature that forms part of the cultural landscape is an old diesel-driven pump located on the southern boundary of the site. Its borehole has been plugged but the machinery is still present (Figure 23). It was made in England and imported by Hubert Davies and Company Ltd (Figure 24). This company was founded in 1891 in Johannesburg (Hudaco Industries Limited, n.d.) but the cement mounting of the equipment suggests a mid-twentieth century age.



Figure 23: The pumping mechanism with the plugged borehole at lower left.



Figure 24: The diesel motor located behind the pump.

6.6. Summary of heritage indicators

There are no significant heritage indicators occurring within the bounds of either alternative site. With one exception just outside of the Original PV North site, the heritage material that was seen consists of a very low density background scatter Stone Age artefacts of indeterminate age. The exception is the Khoekhoe camp (including its associated graves) which is a very important and, thus far, unique type of archaeological site. Given its size, which may be a result of the area being used repeatedly over many years, it is perhaps better considered a cultural landscape. The only other heritage aspect of relevance is the landscape itself, which is largely natural. Because of its general expansiveness, the remote location of the proposed development, the lack of proximate scenic routes and the presence of many hills in the vicinity, contextual/visual impacts to the landscape are not of great concern. Overall, and despite the very similar nature of the receiving environment at both sites, the New PV North site is preferred over the Original PV North site simply because of the latter's proximity to the Khoekhoen encampment and the little-used Pella-Goodhouse gravel road.

6.7. Statement of significance and provisional grading

Section 38(3)(b) of the NHRA requires an assessment of the significance of all heritage resources. In terms of Section 2(vi), "cultural significance" means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

The archaeological resources within both alternative development footprints are deemed to have low cultural significance for their scientific value. These artefacts are provisionally assigned a grading of 'Generally Protected C'. However, the very large Khoekhoe camp to the north-east of the Naroep original north site is considered to have very high significance for its scientific and historical value. It is likely to be worthy of at least Grade IIIA (i.e. high local significance), and possibly even Grade II (i.e. high provincial significance). In the latter instance, SAHRA should consider formal protection of the site as a Provincial Heritage Site.

Although palaeontological resources are unlikely to occur, any that may be present are likely to have very low cultural significance for their scientific value. An appropriate grade would be 'General Protection C'.

Graves are deemed to have high cultural significance for their social value. There are no known graves on either site but graves do occur in the wider vicinity, especially on the Khoekhoen camp site to the west of the Naroep original north site. Graves should always be assumed to be of high local significance and accorded Grade IIIA.

The broader cultural landscape has low-medium cultural significance for its aesthetic value, although the precolonial cultural landscape of the Khoekhoe camp is considered to be of high cultural significance for its social, historical and scientific values. The SAHRA grading system does not cover landscapes but, because of the archaeological nature of the Khoekhoe camp, that aspect can be graded as mentioned above.

7. ASSESSMENT OF IMPACTS

It should be noted that for both the original and preferred sites there are no differences between the technology and access options and the entire project using any options is thus considered in the assessments that follow.

7.1. PV North (Original)

7.1.1. Archaeology and Graves

Table 2 provides an assessment of the impacts to archaeological heritage resources and graves. Although very few artefacts were seen in the PV footprint, the area of concern lies in the far east of the site where it overlaps slightly with the edge of the very large Khoekhoen camp. Because of the size and significance of this site the potential impact is considered to be local in extent and medium in magnitude. In combination with the permanent duration of impacts to archaeological materials and the very likely chance of impacts happening, the overall significance before mitigation is considered to be **medium negative**. The chances of finding graves are very small and have no bearing on the above ratings.

The key mitigation measure if this was to be used would be to conduct a very detailed survey focusing on the area closest to the Khoekhoe camp in order to determine how far that site extends into the PV area. The grid connection must also be surveyed. Recommendations for mitigation may be forthcoming from this survey. With mitigation the impact significance would be reduced to **very low negative**.

Table 2: Assessment of impacts to archaeology and graves (original site).

IMPACT DESCRIPTION: Destruction or damage to archaeological materials and unmarked graves				
Predicted for project phase:	Pre-construction	Construction	Operation	No-Go
Dimension	Rating	Motivation		
PRE-MITIGATION				

Duration	Permanent	More than 10 years (after construction)	Consequence: Highly detrimental	Significance: Moderate - negative
Extent	Local	Within a 2 km radius of the centre of the site		
Magnitude	Medium - negative	Natural and/ or social functions and/ or processes are notably altered		
Probability	Very likely	Estimated 50 to 95% chance of the impact occurring		
MITIGATION:				
The final layout must be examined by an archaeologist and any potentially sensitive areas must be checked on site prior to construction (applies mainly to the grid connection and the east end of the PV site which is known to be sensitive)				
POST-MITIGATION				
Duration	Permanent	More than 10 years (after construction)	Consequence: Slightly detrimental	Significance: Very low - negative
Extent	Site-specific	On site or within the boundaries of the property		
Magnitude	Very Low - negative	Natural and/ or social functions and/ or processes are negligibly altered		
Probability	Unlikely	Estimated less than 5 % chance of the impact occurring.		
BROADER CONSIDERATIONS				
Confidence	Certain	Wealth of information on and sound understanding of the environmental factors potentially influencing the impact.		
Reversibility	Irreversible	The activity will lead to an impact that is permanent.		
Irreplaceability	High	The resource is irreparably damaged and is not represented elsewhere		

7.1.2. Palaeontology

Table 3 provides an assessment of the impacts to palaeontological heritage resources. The specialist palaeontological assessment has suggested that the chances of finding significant fossils are very low. However, given the rarity of important fossils in the region, an impact could be seen as being of medium magnitude. Because impacts are unlikely to occur, the significance is rated as **very low negative**.

Mitigation involves keeping a watch for fossils during bulk earthworks and ensuring that any that are found get protected, recorded and reported. A chance finds procedure has been provided by the palaeontologist for use in such instances. Because of the rarity of fossils in the area, a find could result in a positive impacts because new information that would not otherwise have been available to science can be gained. The significance after mitigation is this deemed to be **very low positive**.

Table 3: Assessment of impacts to fossils (original site).

IMPACT DESCRIPTION: Destruction or damage to palaeontological materials				
Predicted for project phase:	Pre-construction	Construction	Operation	No-Go
Dimension	Rating	Motivation		
PRE-MITIGATION				
Duration	Permanent	More than 10 years (after construction)	Consequence: Highly detrimental	Significance: Very low - negative
Extent	Local	Within a 2 km radius of the centre of the site		
Magnitude	Medium - negative	Natural and/ or social functions and/ or processes are notably altered		

Probability	Unlikely	Estimated less than 5 % chance of the impact occurring.		
MITIGATION: Any fossils found during construction must be protected, recorded and reported using the fossil finds procedure.				
POST-MITIGATION				
Duration	Permanent	More than 10 years (after construction)	Consequence: Highly beneficial	Significance: Very low - positive
Extent	Local	Within a 2 km radius of the centre of the site		
Magnitude	Medium - positive	Natural and/ or social functions and/ or processes are notably altered (positively)		
Probability	Unlikely	Estimated less than 5 % chance of the impact occurring.		
BROADER CONSIDERATIONS				
Confidence	Certain	Wealth of information on and sound understanding of the environmental factors potentially influencing the impact.		
Reversibility	Irreversible	The activity will lead to an impact that is permanent.		
Irreplaceability	High	The resource is irreparably damaged and is not represented elsewhere		

7.1.3. Natural and Cultural landscape

Table 4 provides an assessment of the impacts to the natural and cultural landscape. Key aspects of the cultural landscape at the original site are its proximity to a road from which the natural landscape can be seen and appreciated (although it is only a local road) and the presence of the very large Khoekhoe camp which is perhaps better considered to be a precolonial cultural landscape. The impacts are a result of the presence of the proposed facility in the landscape. The impact would definitely occur and would last for the entire lifetime of the project. Because the site is not visible from a long distance and PV panels are generally not visible from faraway, the extent of the impacts is regarded as being local. Magnitude is rated as medium and the overall significance is **moderate negative**.

There is no feasible mitigation that can significantly reduce the impact significance, although it will be very important to minimise the amount of encroachment on the Khoekhoe camp. The usual best practice measures such as minimising ground disturbance, littering and night time lighting with have minor effects on the ratings but the significance remains **moderate negative**.

Table 4: Assessment of impacts to the natural and cultural landscape (original site).

IMPACT DESCRIPTION: Impacts to the cultural and natural landscape				
Predicted for project phase:	Pre-construction	Construction	Operation	No-Go
Dimension	Rating	Motivation		
PRE-MITIGATION				
Duration	Permanent	More than 10 years (after construction)	Consequence: Highly detrimental	Significance: Moderate - negative
Extent	Local	Within a 2 km radius of the centre of the site		
Magnitude	Medium - negative	Natural and/ or social functions and/ or processes are notably altered		
Probability	Definite	Estimated greater than 95 % chance of the impact occurring.		

MITIGATION: Minimise encroachment on the Khoekhoe camp. Minimise damage to areas not required during operation. Minimise lighting at night. Minimise litter and keep site tidy.				
POST-MITIGATION				
Duration	Permanent	More than 10 years (after construction)	Consequence: Moderately detrimental	Significance: Moderate - negative
Extent	Site-specific	On site or within the boundaries of the property		
Magnitude	Low - negative	Natural and/ or social functions and/ or processes are slightly altered (negatively)		
Probability	Definite	Estimated greater than 95 % chance of the impact occurring.		
BROADER CONSIDERATIONS				
Confidence	Sure	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact.		
Reversibility	Irreversible	The activity will lead to an impact that is permanent.		
Irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere		

7.2. PV North (Preferred)

7.2.1. Archaeology and graves

Table 5 provides an assessment of the impacts to archaeological heritage resources and graves. No significant archaeological materials were seen on the preferred site, although a small section of it was not surveyed. The chances of finding graves are extremely small. Archaeological sites are known from the wider area so there is still a small chance of impacts occurring but the magnitude is likely to be low. The low heritage significance of the types of sites typically seen means that the magnitude can be rated as low. The overall significance is considered to be **low negative**.

Mitigation would entail a consideration of the final layout, including the grid connection, and an archaeological survey of areas deemed to be potentially sensitive. Recommendations for mitigation may be forthcoming from this survey. With mitigation the impact significance would be reduced to **very low negative**.

Table 5: Assessment of impacts to archaeology and graves (preferred site).

IMPACT DESCRIPTION: Destruction or damage to archaeological materials and unmarked graves				
Predicted for project phase:	Pre-construction	Construction	Operation	No-Go
Dimension	Rating	Motivation		
PRE-MITIGATION				
Duration	Permanent	More than 10 years (after construction)	Consequence: Moderately detrimental	Significance: Low - negative
Extent	Site-specific	On site or within the boundaries of the property		
Magnitude	Low - negative	Natural and/ or social functions and/ or processes are slightly altered (negatively)		
Probability	Fairly likely	Estimated 5 to 50 % chance of the impact occurring.		
MITIGATION: The final layout must be examined by an archaeologist and any potentially sensitive areas must be checked on site prior to construction (applies mainly to the grid connection).				

POST-MITIGATION				
Duration	Permanent	More than 10 years (after construction)	Consequence: Slightly detrimental	Significance: Very low - negative
Extent	Site-specific	On site or within the boundaries of the property		
Magnitude	Very Low - negative	Natural and/ or social functions and/ or processes are negligibly altered		
Probability	Unlikely	Estimated less than 5 % chance of the impact occurring.		
BROADER CONSIDERATIONS				
Confidence	Certain	Wealth of information on and sound understanding of the environmental factors potentially influencing the impact.		
Reversibility	Irreversible	The activity will lead to an impact that is permanent.		
Irreplaceability	High	The resource is irreparably damaged and is not represented elsewhere		

7.2.2. Palaeontology

Table 6 provides an assessment of the impacts to palaeontological heritage resources. The specialist palaeontological assessment has suggested that the chances of finding significant fossils are very low. However, given the rarity of important fossils in the region, an impact could be seen as being of medium magnitude. Because impacts are unlikely to occur, the significance is rated as **very low negative**.

Mitigation involves keeping a watch for fossils during bulk earthworks and ensuring that any that are found get protected, recorded and reported. A chance finds procedure has been provided by the palaeontologist for use in such instances. Because of the rarity of fossils in the area, a find could result in a positive impacts because new information that would not otherwise have been available to science can be gained. The significance after mitigation is this deemed to be **very low positive**.

Table 6: Assessment of impacts to fossils (preferred site)

IMPACT DESCRIPTION: Destruction or damage to palaeontological materials				
Predicted for project phase:	Pre-construction	Construction	Operation	No-Go
Dimension	Rating	Motivation		
PRE-MITIGATION				
Duration	Permanent	More than 10 years (after construction)	Consequence: Highly detrimental	Significance: Very low - negative
Extent	Local	Within a 2 km radius of the centre of the site		
Magnitude	Medium - negative	Natural and/ or social functions and/ or processes are notably altered		
Probability	Unlikely	Estimated less than 5 % chance of the impact occurring.		
MITIGATION:				
Any fossils found during construction must be protected, recorded and reported using the fossil finds procedure.				
POST-MITIGATION				
Duration	Permanent	More than 10 years (after construction)	Consequence: Highly beneficial	Significance: Very low - positive
Extent	Local	Within a 2 km radius of the centre of the site		
Magnitude	Medium - positive	Natural and/ or social functions and/ or processes are notably altered (positively)		

Probability	Unlikely	Estimated less than 5 % chance of the impact occurring.	
BROADER CONSIDERATIONS			
Confidence	Certain	Wealth of information on and sound understanding of the environmental factors potentially influencing the impact.	
Reversibility	Irreversible	The activity will lead to an impact that is permanent.	
Irreplaceability	High	The resource is irreparably damaged and is not represented elsewhere	

7.2.3. Natural and Cultural landscape

Table 7 provides an assessment of the impacts to the natural and cultural landscape. Because the site is in a very remote location and is not accessible to the general public, the project will have a generally low visibility. The magnitude of impacts to the landscape will thus be very low and of local extent, although they would definitely occur. Mainly because the impacts will occur for the duration of the project and would definitely happen if the project was constructed, the significance is rated as being **moderate negative**.

There is no feasible mitigation that can significantly reduce the impact significance, but because the site is as remote as it is, the usual best practice measures such as minimising ground disturbance, littering and night time lighting with have some effect on the ratings and the significance with mitigation reduces to **low negative**.

Table 7: Assessment of impacts to the natural and cultural landscape (preferred site).

IMPACT DESCRIPTION: Impacts to the cultural and natural landscape				
Predicted for project phase:	Pre-construction	Construction	Operation	No-Go
Dimension	Rating	Motivation		
PRE-MITIGATION				
Duration	Permanent	More than 10 years (after construction)	Consequence: Moderately detrimental	Significance: Moderate - negative
Extent	Local	Within a 2 km radius of the centre of the site		
Magnitude	Very Low - negative	Natural and/ or social functions and/ or processes are negligibly altered		
Probability	Definite	Estimated greater than 95 % chance of the impact occurring.		
MITIGATION: Minimise damage to areas not required during operation. Minimise lighting at night. Minimise litter and keep site tidy.				
POST-MITIGATION				
Duration	Permanent	More than 10 years (after construction)	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Site-specific	On site or within the boundaries of the property		
Magnitude	Very Low - negative	Natural and/ or social functions and/ or processes are negligibly altered		
Probability	Definite	Estimated greater than 95 % chance of the impact occurring.		
BROADER CONSIDERATIONS				
Confidence	Sure	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact.		

Reversibility	Irreversible	The activity will lead to an impact that is permanent.
Irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere

7.3. Cumulative impacts

Due to their relative scarcity on the landscape, few impacts to heritage resources have occurred from other developments. The site is so remote that visual impacts to the cultural landscape would not overlap with those from other developments and this is not a concern. Provided the construction and operation activities of the projects remain contained within the allocated areas, the overall impact should be limited and of a Neutral significance.

7.4. No Go Alternative

The no-go alternative will result in the current status quo being maintained as far as the heritage is concerned. The no-go option would therefore eliminate any additional impact on the heritage and palaeontological aspects of the proposed development and the significance is rated as Neutral.

8. EVALUATION OF IMPACTS RELATIVE TO SUSTAINABLE SOCIAL AND ECONOMIC BENEFITS

Section 38(3)(d) requires an evaluation of the impacts on heritage resources relative to the sustainable social and economic benefits to be derived from the development. As long as the Khoekhoe camp is left undisturbed, the project's social and economic benefits (provision of jobs and electricity) will far outweigh the value of any heritage resources that may be damaged or destroyed. The Khoekhoe camp, however, has regional or even provincial significance due to its rarity and significant damage to this site would be seen as overriding the social and economic benefits of the project.

9. CONCLUSION

It is concluded that no highly significant direct impacts to heritage resources are expected at either site, although the original north site (Naroep) is regarded as being slightly more sensitive, largely from a visual/contextual point of view because it is alongside a public road, but also because of its close proximity to the Khoekhoe camp. None of the alternatives (i.e. technology and access) have any bearing on the outcome with the choice of site being the most important aspect.

The preferred site (on Haramoep) is preferred because the original north site (on Naroep) is in a more exposed location alongside a public gravel road and is very close to a highly significant archaeological heritage site that could experience impacts.

9.1. Reasoned opinion of the specialist

Due to the very limited and generally manageable heritage impacts that would occur, it is concluded that the proposed Veld PV North project is feasible, but that the preferred site alternative should be used. Any of the technology and access alternatives may be used.

10. RECOMMENDATIONS

It is recommended that, from a heritage point of view, the proposed Veld PV North can be authorised but subject to the following conditions:

- If the original site is used then the amount of encroachment on the Khoekhoen camp site should be minimised;
- The final layout of the PV facility, access road and grid connection should be considered by an archaeologist and any potentially sensitive areas should be surveyed; and
- If any archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

11. REFERENCES

- Agenbacht, A.L.D. 2007. The geology of the Pofadder area. Explanation of 1: 250 000 geology sheet 2918. 89 pp. Council for Geoscience, Pretoria.
- Almond, J.E. 2019. Recommended exemption from further palaeontological studies: two proposed photovoltaic energy facilities on the farms Naroep (Remainder of Farm No. 45) and Haramoep (Remainder of Farm No. 53) near Aggeneys, Namaqua District Municipality, Northern Cape. Unpublished report prepared for ASHA Consulting (Pty) Ltd.
- Almond, J.E. & Pether, J. 2008. Palaeontological heritage of the Northern Cape. Interim SAHRA technical report. Cape Town: Natura Viva cc.
- Anonymous. n.d. *Thirstland Epic*. Upington: Trans Oranje Drukkers.
- Beaumont, P.B., Smith, A.B., & Vogel, J.C. 1995. Before the Einiqua: the archaeology of the frontier zone. In A. B. Smith (ed.) *Einiqualand: studies of the Orange River frontier*. Cape Town: UCT Press.
- Morris, D. 2011a. Black Mountain Concentrated Solar Power Facility Development at Aggeneys, Northern Cape: Heritage Impact Assessment. Unpublished report for SRK Consulting. Kimberley: McGregor Museum.
- Morris, D. 2011b. SATO Energy Holdings Zuurwater Photovoltaic Energy Generation Facility development near Aggeneys, Northern Cape: Heritage Impact Assessment. Unpublished report for SRK Consulting. Kimberley: McGregor Museum.

- Morris, D. 2013. Heritage Impact Assessment for four proposed photovoltaic solar energy facilities on the farm Zuurwater near Aggeneys, Northern Cape Province (expanded survey). Unpublished report for Savannah Environmental (Pty) Ltd. Kimberley: McGregor Museum.
- Morris, D. 2014. AES Solar PV Installation on the property Dabenoris 44 near Aggeneys, Northern Cape: Heritage Impact Assessment (Archaeology and Cultural Heritage). Unpublished report prepared for Environmental Impact Management Systems. Kimberley: McGregor Museum.
- Orton, J. 2013. Geometric rock art in western South Africa and its implications for the spread of early herding. *South African Archaeological Bulletin* 68: 27-40.
- Orton, J. 2014. Final archaeological mitigation report for the Gamsberg Zinc Mine, Aggeneys, Northern Cape. Unpublished report prepared for ERM Southern Africa (Pty) Ltd. Diep River: ACO Associates cc.
- Orton, J. 2016a. Heritage Impact Assessment for the proposed Sol Invictus 1 PV Facility, Namakwaland Magisterial District, Northern Cape. Unpublished report prepared for Savannah Environmental (Pty) Ltd. Muizenberg: ASHA Consulting (Pty) Ltd.
- Orton, J. 2016b. Prehistoric cultural landscapes in South Africa: a typology and discussion. *South African Archaeological Bulletin* 71: 119-129.
- Paleo Field Services. n.d. Phase 1 Heritage Impact Assessment for proposed prospecting drilling in the Big Syncline area on the farm Aggeneys 56 Portion 01, Khai-ma local Municipality, NC Province. Unpublished report prepared for EndemicVision Environmental Consultants. Langenhoven Park: Paleo Field Services.
- Partridge, T.C., Botha, G.A. & Haddon, I.G. 2006. Cenozoic deposits of the interior. In: Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (Eds.) *The geology of South Africa*. Marshalltown: Geological Society of South Africa.
- Penn, N. 2005. *The forgotten frontier: colonist and Khoisan on the Cape's northern frontier in the 18th century*. Cape Town: Double Storey Books.
- Raper, P.E. n.d. Dictionary of southern African place names. Accessed online at https://archive.org/stream/DictionaryOfSouthernAfricanPlaceNames/SaPlaceNames_djvu.txt on 19 June 2015.
- Robinson, A.M.L. 1978. *Selected articles from the Cape Monthly Magazine NS, 1870-1876*. Cape Town: Van Riebeeck Society.
- SAHRA. 2007. Minimum Standards: archaeological and palaeontological components of impact assessment reports. Document produced by the South African Heritage Resources Agency, May 2007.
- Schaeffer, A. 2008. *Life and Travels in the Northwest 1850-1899*. Cape Town: Yoshi Publishing.
- Simon, J.M. 1959. *Bishop for the Hottentots*. New York: Benziger Brothers Inc.

Smith, A.B. 2012. Archaeological Report Proposed 75MW Solar Facility on Farm 62 Zuurwater, Aggeneys, Northern Cape Province. Unpublished report prepared for Cape EAPrac. Rondebosch: University of Cape Town.

APPENDIX 1 – Curriculum Vitae



Curriculum Vitae

Jayson David John Orton

ARCHAEOLOGIST AND HERITAGE CONSULTANT

Contact Details and personal information:

Address: 40 Brassie Street, Lakeside, 7945
Telephone: (021) 788 1025
Cell Phone: 083 272 3225
Email: jayson@asha-consulting.co.za

Birth date and place: 22 June 1976, Cape Town, South Africa
Citizenship: South African
ID no: 760622 522 4085
Driver's License: Code 08
Marital Status: Married to Carol Orton
Languages spoken: English, Afrikaans, basic French

Education:

SA College High School	Matric	1994
University of Cape Town	B.A. (Archaeology, Environmental & Geographical Science)	1997
University of Cape Town	B.A. (Honours) (Archaeology) [First Class]	1998
University of Cape Town	M.A. (Archaeology)	2004
University of Oxford	D.Phil. (Archaeology)	2013

Employment History:

Spatial Archaeology Research Unit, UCT	Research assistant	Jan 1996 – Dec 1998
Department of Archaeology, UCT	Field archaeologist	Jan 1998 – Dec 1998
UCT Archaeology Contracts Office	Field archaeologist	Jan 1999 – May 2004
UCT Archaeology Contracts Office	Heritage & archaeological consultant	Jun 2004 – May 2012
School of Archaeology, University of Oxford	Undergraduate Tutor	Oct 2008 – Dec 2008
ACO Associates cc	Associate, Heritage & archaeological consultant	Jan 2011 – Dec 2013
ASHA Consulting (Pty) Ltd	Director, Heritage & archaeological consultant	Jan 2014 –

Professional Accreditation:

- Association of Southern African Professional Archaeologists (ASAPA) membership number: 233
- ASAPA CRM Section member with the following accreditation:
 - Principal Investigator: Coastal shell middens (awarded 2007)
Stone Age archaeology (awarded 2007)
Grave relocation (awarded 2014)
 - Field Director: Rock art (awarded 2007)
Colonial period archaeology (awarded 2007)

- Association of Professional Heritage Practitioners (APHP) membership number: 43
 - Accredited Professional Heritage Practitioner

Memberships and affiliations:

- South African Archaeological Society Council member 2004 – 2016
- Assoc. Southern African Professional Archaeologists (ASAPA) member 2006 –
- UCT Department of Archaeology Research Associate 2013 – 2017
- Heritage Western Cape APM Committee member 2013 –
- UNISA Department of Archaeology and Anthropology Research Fellow 2014 –
- Fish Hoek Valley Historical Association 2014 –
- Kalk Bay Historical Association 2016 –
- Association of Professional Heritage Practitioners member 2016 –

Fieldwork and project experience:

Extensive fieldwork and experience as both Field Director and Principle Investigator throughout the Western and Northern Cape, and also in the western parts of the Free State and Eastern Cape as follows:

Feasibility studies:

Heritage feasibility studies examining all aspects of heritage from the desktop

Phase 1 surveys and impact assessments:

- Project types
 - Notification of Intent to Develop applications
 - Heritage Impact Assessments
 - Self-standing assessments under Section 38(1) of the NHRA
 - Assessments under NEMA and Section 38(8) of the NHRA
 - Archaeological specialist studies
 - Strategic assessments
 - Phase 1 archaeological test excavations in historical and prehistoric sites
 - Archaeological research projects
- Development types
 - Mining and borrow pits
 - Roads (new and upgrades)
 - Residential, commercial and industrial development
 - Agricultural developments
 - Dams and pipe lines
 - Power lines and substations
 - Renewable energy facilities (wind, solar and hydro-electric)

Phase 2 mitigation and research excavations:

- ESA open sites
 - Duinefontein, Gouda, Namaqualand
- MSA rock shelters
 - Fish Hoek, Yzerfontein, Cederberg, Namaqualand
- MSA open sites
 - Swartland, Bushmanland, Namaqualand
- LSA rock shelters
 - Cederberg, Namaqualand, Bushmanland
- LSA open sites (inland)
 - Swartland, Franschhoek, Namaqualand, Bushmanland
- LSA coastal shell middens
 - Melkbosstrand, Yzerfontein, Saldanha Bay, Paternoster, Dwarskersbos, Infanta, Knysna, Namaqualand
- LSA burials
 - Melkbosstrand, Saldanha Bay, Namaqualand, Knysna
- Historical sites
 - Franschhoek (farmstead and well), Waterfront (fort, dump and well), Noordhoek (cottage), variety of small excavations in central Cape Town and surrounding suburbs
- Historic burial grounds
 - Green Point (Prestwich Street), V&A Waterfront (Marina Residential), Paarl

Awards:

1998: Frank Schweitzer memorial book prize for an outstanding student.

2015/2016: Western Cape Government Cultural Affairs Awards: Best Heritage Project.

APPENDIX 2 – Palaeontological specialist comment

[submitted separately]