HERITAGE IMPACT ASSESSMENT: PROPOSED CONSTRUCTION OF THE LETSOAI CSP 1 SOLAR FACILITY ON THE REMAINING EXTENT OF THE FARM HARTEBEEST VLEI 86, NEAR AGGENEYS, AS WELL AS WATERPIPELINE TO THE ORANGE RIVER, NORTHERN CAPE

CaseID: 10134

(Assessment conducted under Section 38 (8) of the
National Heritage Resources Act No 25 of 1999)

Prepared for:
WSP/Parsons Brinckerhoff

On behalf of:
BioTherm Energy (Pty) Ltd

January 2017

ACO Associates cc
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EXECUTIVE SUMMARY

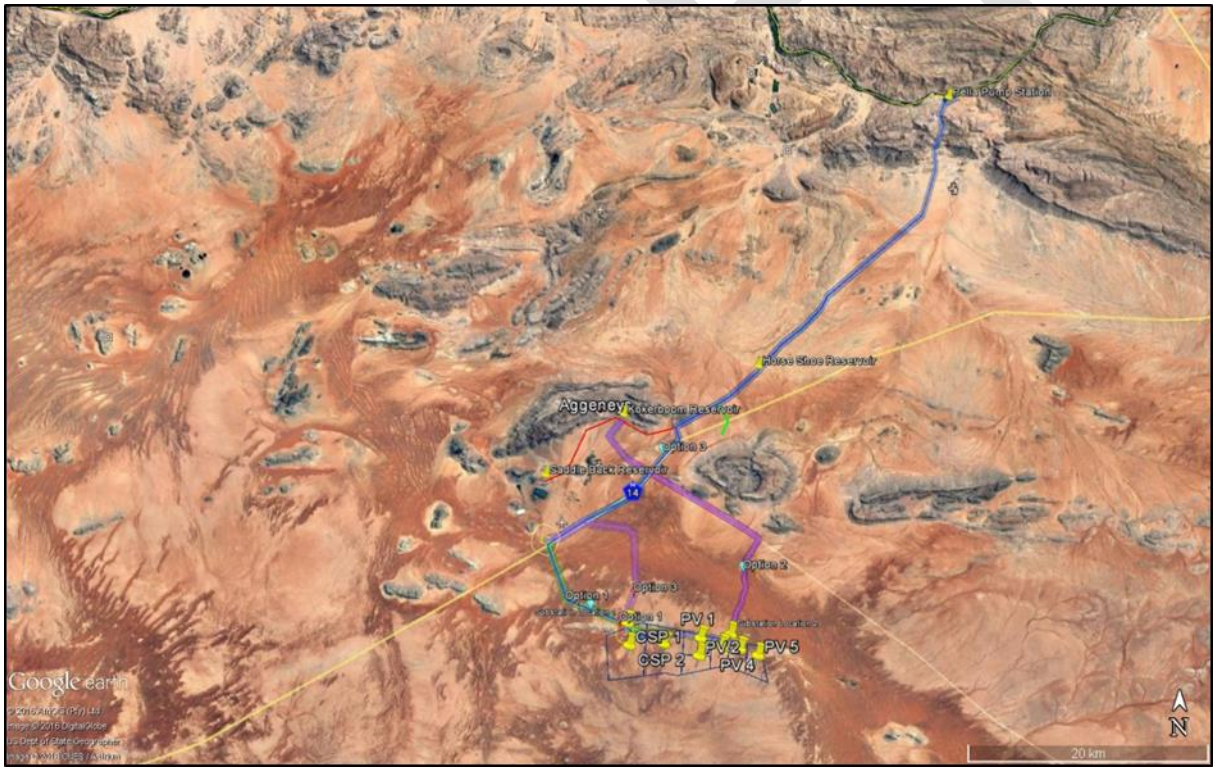
BioTherm propose to construct two (2) CSP facilities, called Letsoai CSP 1 and Letsoai CSP 2 (150MW each) on the farm Hartebeest Vlei 86, which is located some 16km south of the town of Aggeneys and the N14 road which connects Springbok with Kakamas in the Northern Cape Province.

This report is concerned with CSP 1 and the water pipeline to the Orange River.

It is intended that a 400 kV powerline will connect the proposed facilities with the Aggeneis substation and that the CSP facilities will utilise water obtained via a pipeline from the Orange River. The powerline options and substation options will be assessed in a separate HIA.

This study has been commissioned as a Heritage Impact Assessment. It considers all aspects of heritage (but primarily archaeology) except for palaeontology which is assessed by Dr John Almond and visual impacts which are assessed by Belinda Gebhardt.

Locality Plan



Limitations

There were no significant limitations with regard the fieldwork for the CSP 1 site. However, with respect the water pipeline to the Orange River.

- We were not able to survey along the western route of the water pipeline which runs in parallel with the powerline options due to difficulty with access to land;
- We were not able to survey the Black Mountain (Vendanta) property at the Kokerboom Reservoir for the same reason.

Heritage Resources Identified

Palaeontology

The Scoping Palaeontological Impact assessment was compiled by Dr John Almond of Natura Viva cc. The Scoping Report was submitted to SAHRA and in their Interim Comment (CaseID: 10134 dated 20 October 2016), they concluded: "No further palaeontological specialist studies are required for the proposed development". They requested:

> - Archaeological and Historical heritage resources;
> - Burial grounds and graves;
> - Visual Impact of the proposed development on heritage resources; and
> - Any comments provided by the public regarding heritage resources.
>
> The EIA with all appendices must be submitted along with the heritage reports in order for further comments to be issued.

Archaeology

- The area is characterised by a low level (ephemeral) spread of quartz artefacts. They do not occur in sufficient densities in specific areas to be considered as "sites". The artefacts comprise cores, chunks and flakes. No diagnostic artefacts were identified. The weathering of the artefacts suggests that they may be of Middle Stone Age origins. They are of low significance;
- There is a single large exposure of bedrock to the south (outside) of the study area with bedrock grinding grooves and LSA archaeological remains. This site is of medium significance but it is outside the study area and will not be impacted.
- No archaeological sites were identified along the route of the water pipeline to the Orange River;
- The area around the Pelladrift pump station on the Orange River has been significantly disturbed and our survey did not identify any undisturbed areas along the river which might contain *in situ* archaeological sites or graves.

Built Environment

- No buildings or structures occur in the study area;
- A single, modern building occurs along the water pipeline route to the Orange River.

Cultural Landscape

- Morris (2010) has observed that there has been recent appreciation starting to emerge regarding the "genocide of the Bushmen in this area, with certain mountainous areas (like the Gamsberg) being likely massacre sites". There has not been any further information on this matter since 2010.

Anticipated Impacts of CSP1 on Heritage Resources

- The impacts to the archaeological resources are very low;
- No impacts are anticipated on the Built Environment;
- Impacts to the Cultural Landscape and the N14 are low because the proposed facilities will be shielded by a low rise of hills. There will be no direct impact on the Gamsberg.

Anticipated impacts of Water Pipeline on Heritage Resources

Three alternatives were considered, two connecting in a northerly direction with the Kokerboom Reservoir at Aggeneys, while a third followed an existing water pipeline to Pelladrift on the Orange River. Alternative 2, which follows existing gravel road to Aggeneys, appears to present the least likelihood of impacts to archaeology and graves and is therefore the preferred option.

Stakeholder Consultation

Comments were received from SAHRA (CaseID: 10134 dated 20 October 2016) in which they requested a HIA which would assess: Archaeological and Historical Heritage Resources; Burial grounds and Graves, Visual Impacts and Comments from the Public regarding heritage resources".

Cumulative Impacts

Several renewable energy facilities have been authorised to the east, west and south-east of the Eskom Aggeneis substation. Individual impacts to specific heritage resources are considered in each of the HIA reports. As a cumulative impact, this report considers that impacts to archaeology, graves and the built environment are likely to be low; while cumulative impacts to the N14 and the Cultural Landscape, particularly to the Gamsberg, will be medium.

Recommendations

This report supports the construction of the CSP 1 facility with associated infrastructure. The following conditions must be included in the EMPr.

- If any concentrations of archaeological material, such as stone artefacts are recovered, SAHRA must be notified;
- If any human remains are uncovered during the excavation of tower holes, work must stop in that area and SAHRA must be alerted immediately.

With respect the Water Pipeline, this reports supports pipeline alternative 2 as the preferred option because the potential of impacts to heritage are likely to be the lowest.

Author/s and Dates

Lita Webley & David Halkett	ACO Associates cc	Heritage

GLOSSARY

Archaeology: Remains resulting from human activity which is 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.

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.

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.

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

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

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

DEA	Department of Environmental Affairs
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
LSA	Late Stone Age
MSA	Middle Stone Age
NHRA	National Heritage Resources Act
SAHRA	South African Heritage Resources Agency

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Figure 4: A map of our tracks (in pink) indicating the area which was covered during the survey. Notice the concentration of archaeological sites in the south, outside the study area. They represent the spread of archaeological material around an expanse of bedrock exposure with grinding grooves. This area will not be impacted by the proposed development.

Figure 5: The green line indicates the route of the proposed water pipeline to Pelladrift pump station on the Orange River. Our tracks are shown in pink; we were able to cover most of the route with the exception of a section in the middle, which was locked to traffic. The short section in red, to the Kokerboom Reservoir at Black Mountain, was also not assessed due to issues of access.

Figure 6: The solar PV facility immediately north of Letsoai and Enamandla is Solar Capital (orange), purple (Aggeneys PV), dark pink (Zuurwater PV), yellow (Boesmanland PV), turquoise (Namies WEF) and the green (Khai-Mai and Korana WEFs). They all feed into the Aggeneis substation.

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1 INTRODUCTION

ACO Associates cc was appointed by WSP on behalf of BioTherm Energy (Pty) Ltd to undertake a heritage impact assessment for the construction of two CSP (150MW each), called Letsoai CSP 1 and Letsoai CSP 2, solar power stations and associated infrastructure on the Remainder of the Farm Hartebeest Vlei 86, some 14km south of the town of Aggeneys in the Khai-Ma Municipality, Northern Cape Province **(Figure 1).**

This report is concerned with CSP 1 and the water pipeline which will transfer water from the Orange River to the CSP.

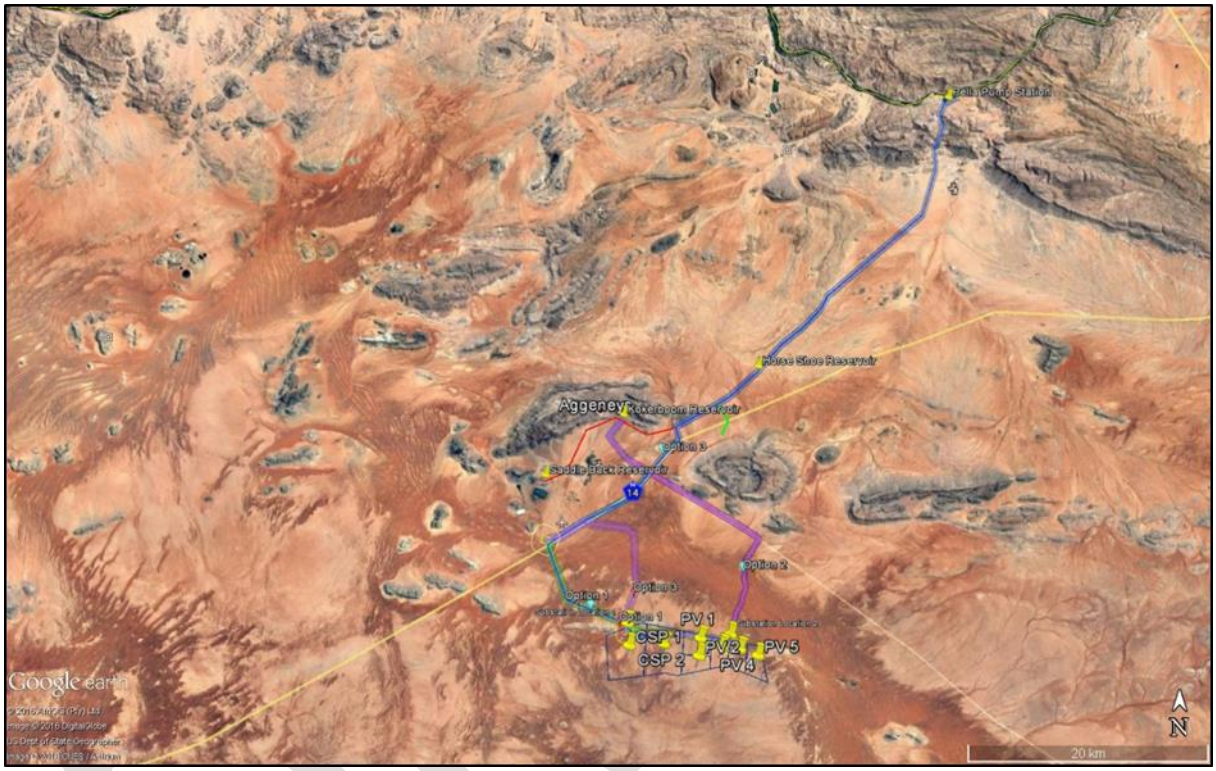


Figure 1: The location of the Solar CSP 1 on the remainder of the farm Hartebeest Vlei 86, as well as the water pipeline to the Orange River, Northern Cape Province.

1.1 Scope of Work

This Heritage Impact Assessment considers the potential impacts of the proposed construction of a CSP 1 facility on Remainder of the Farm Hartebeest Vlei 86, as well as a water pipeline to the Orange River. The location of CSP 1 is shown on **Figure 1**. The HIA specifically addresses:

- The potential impacts on the archaeology and history of the site;
- Impacts on graves and cemeteries;
- Visual impacts of the proposed facility on the heritage of the area; and
- Addresses any comments of the public with regard to impacts to heritage resources.

This impact assessment is based on the knowledge which has been accumulated from heritage impact assessments undertaken in surrounding areas as well as a site visit in July 2016.

1.2 Objectives of the Report

The objectives of the report are to:

- Identify any potential impacts which may result from the proposed construction of the CSP 1 facility and water pipeline;
- Determine the significance of the heritage resources;
- Provide recommendations for mitigation of impacts.

1.3 Legislative Framework

While the National Department of Environmental Affairs is the decision making authority acting in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) and Regulations (2014), they must ensure that the evaluation of the statutorily defined broad range of heritage resources fulfils the requirements of the relevant heritage resources authority in terms of Section 38 (3) of the National Heritage Resources Act (Act 25 of 1999) (NHRA) and that any comments and recommendations of the relevant heritage resources authority with regard to proposed development have been taken into account prior to the granting of the consent.

This report is conducted in terms of Section 38 (8) of the National Heritage Resources Act, No 25 of 1999.

The NHRA provides protection for the following categories of heritage resources:

- Landscapes, cultural or natural (Section 3 (3))
- Buildings or structures older than 60 years (Section 34);
- Archaeological Sites, palaeontological material and meteorites (Section 35);
- Burial grounds and graves (Section 36);
- Public monuments and memorials (Section 37);
- Living heritage (defined in the Act as including cultural tradition, oral history, performance, ritual, popular memory, skills and techniques, indigenous knowledge systems and the holistic approach to nature, society and social relationships) (Section 2 (d) (xxi)).

1.3.1 Archaeology and Palaeontology (Section 35(4))

No person may, without a permit issued by SAHRA, destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite.

Archaeological is defined as: “material remains resulting from human activity which is in a state of disuse and is in or on land and which is older than 100 years, including artefacts, human and hominid remains and artificial features and structures”.

Palaeontological is defined as: “any fossilised remains or 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”.

1.3.2 Burial Grounds and Graves (Section 36(3))

No person may, without a permit issued by the South African Heritage Resources Authority (SAHRA), destroy damage, alter, exhume or remove from its original position or otherwise

disturb any grave or burial ground older than 60 years, which is situated outside a formal cemetery administered by a local authority.

1.3.3 Grading

The significance of heritage resources is assessed per the grading criteria established by the National Heritage Resources Act, No 25 of 1999.

Table 1: Grading of Heritage Resources

Grade	Level of significance	Description
I	National	Of high intrinsic, associational and contextual heritage value within a national context, i.e. formally declared or potential Grade 1 heritage resources.
II	Provincial	Of high intrinsic, associational and contextual heritage value within a provincial context, i.e. formally declared or potential Grade 2 heritage resources.
IIIA	Local	Of high intrinsic, associational and contextual heritage value within a local context, i.e. formally declared or potential Grade 3a heritage resources.
IIIB	Local	Of moderate to high intrinsic, associational and contextual value within a local context, i.e. potential Grade 3b heritage resources.
IIIC	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.

1.3.4 Heritage Authority

The South African Heritage Resources Agency (SAHRA) is required to provide comment on the proposed project to facilitate final decision making by the Department of Environmental Affairs (DEA). Their comments (CaseID: 10134 dated 20 October 2016) are attached to this report.

1.4 Study Approach and Methodology

This study has been commissioned as a Heritage Impact Assessment. It considers all aspects of heritage (but primarily archaeology) except for palaeontology which is assessed by Dr John Almond and visual impacts which are assessed by Belinda Gebhardt.

It includes a review of the published material as well as unpublished reports on the SAHRIS database. The 1:50 000 maps of the area as well as Google Earth aerial images were consulted. Numerous impact assessments have been conducted in proximity to the proposed facility as reflected on the SAHRIS database. The following CRM reports provide valuable information on the heritage resources of the area and were consulted:

- Morris (2013) assessed the proposed Aggeneys Solar Facility on the farm Bloemhoek immediately north of Letsoai and Enamandla;
- Webley & Halkett (2012) assessed the proposed Aggeneys Solar Facility on the farm Aroams to the north-east of Letsoai and Enamandla;
- Morris (2011) and De Kock (2012) assessed the proposed Zuurwater Solar Facility of the farm Zuurwater 62, to the north-west of Letsoai and Enamandla;

- Hart et al. (2014) assessed the proposed Korana Solar Facility on the farm Namies South 212 to the east of Letsoai and Enamandla;
- Orton & Webley (2012b) assess the proposed Pofadder Wind and Energy facility on the farm Poortjie, to the east of Letsoai and Enamandla;
- Orton & Webley (2013) assessed the proposed Namies Solar facility on the farm Namies South 212, to the east of Letsoai and Enamandla;
- Orton (2015) is busy with the Scoping study for the Sol Invictus Solar facility on the farm Ou Taaibosmond 66, to the north-west of Letsoai and Enamandla.

Further, the study by Morris (2011) for the proposed 220kV powerline from the Aggeneis substation to the Paulputs substation closely approximates the southern section of the proposed water pipeline to Pella, and is informative with respect to heritage.

The significance methodology has been provided by WSP/Parsons Brinckerhoff.

1.5 Assumptions

This impact assessment is based on the knowledge which has been accumulated from heritage impact assessments undertaken in surrounding areas as well as a site visit in July 2016.

While some archaeological resources may be scattered on the surface of the landscape, many (in particular graves) are hidden below the surface. Assumptions therefore must be made based on surface material.

1.6 Limitations

- There were no limitations with regard the fieldwork for the CSP 1 facility;
- However, we were not able to survey along the western route of the water pipeline which runs in parallel with the powerline options due to problems of access;
- We were not able to survey the Black Mountain (Vedanta) property at the Kokerboom Reservoir for the same reason.

We do not consider these limitations have had a significant impact on the findings of this report. Several CRM studies have been conducted in the area, and we have an adequate database from which to undertake the assessment.

1.7 Declaration of Independence

Lita Webley is an archaeologist (PhD from the University of Cape Town 1992) with ACO Associates cc (Tel: 021 706 4104) and has been conducting Heritage Impact Assessment and archaeological specialist studies in the Western Cape, Northern Cape and Eastern Cape Provinces since 1996. She is a member of the Archaeology, Palaeontology and Meteorites Committee and the Impact Assessment Committee of Heritage Western Cape (HWC), the Provincial Heritage Resources Authority. She is accredited as a Principal Investigator by the Association of Southern African Professional Archaeologists (ASAPA) CRM section as follows:

- Principal Investigator: Stone Age, Shell Middens and Colonial Period; and
- Field Director: Grave Relocations.

ACO Associates cc has no financial or other interest in the proposed development and will derive no benefits other than fair remuneration for consulting services provided.

David Halkett (BA, BA Hons, MA (UCT)) is an Archaeologist and Member of the Association of Professional Archaeologists of Southern Africa (ASAPA) and accredited with Principal Investigator status. He has been working in heritage management for 23 years and has considerable experience in impact assessments with respect to a broad range of archaeological and heritage sites in the Northern Cape.

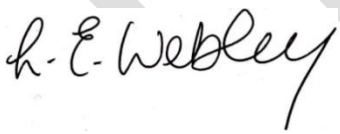
ACO Associates have conducted HIA reports for in excess of 100 renewable energy projects in the Northern Western and Eastern Cape.

SPECIALIST DECLARATION

I, Lita Webley, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have potential of influencing – any decision to be taken with respect to the application by the competent authority; and – the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offense in terms of regulation 71 and is punishable in terms of section 24F of the Act.

Signature of specialist



Specialist Field: Archaeology and Heritage
Name of Company: ACO Associates

2 DESCRIPTION OF THE PROJECT

2.1 Letsoai CSP 1

CSP 1 is assessed **(Figure 2).** It comprises:

- A CSP Power Tower facility using a heat transfer fluid or molten salt. The power tower would be at least 200-250m high;
- Heliostat Solar Field;
- Steam turbine and generator;
- Air cooled condenser.

Both options would require:

- Auxiliary fossil fuel boilers;
- The medium voltage collector system will comprise of cables (11kV up to and including 33kV) that will be run underground, expect where a technical assessment suggest that overhead lines are applicable;
- Raw water storage reservoir/tanks;
- Evaporation ponds;
- Hot and Cold Molten Storage Tanks;
- Water treatment plant;
- Sewage disposal facility and septic tanks;
- A laydown is for the temporary storage of material during the construction activities;
- Internal roads;
- Construction of a car park and fencing;
- Administration, control and warehouse buildings.
- There will be a 132kV line connecting the facility to a common substation.

Table 2: Power Evacuation

Power Evacuation	
Specifications of Onsite Switching Stations, Transformers, Onsite Cables etc	There will be an onsite substation connected to the facility power island which is comprised of the steam turbine generator transformer. The power-island will be linked to the onsite substation using suitable underground cables (except where a technical assessment suggest that overhead lines are applicable).
Footprint of Onsite Substation	Substation will occupy a footprint area of approximately 2.25ha
On-site Substation Capacity	Up to 132 kV
Capacity of powerlines between Onsite Substation and Common Substation	132kV
Width of the Powerline Servitude (132kV) between Onsite Substation and Common Substation	31-36 m
Powerline Tower Types and Height (between Onsite Substation and Common Substation)	Tower (suspension / strain) / Steel monopole structure, which may be self-support or guyed suspension.

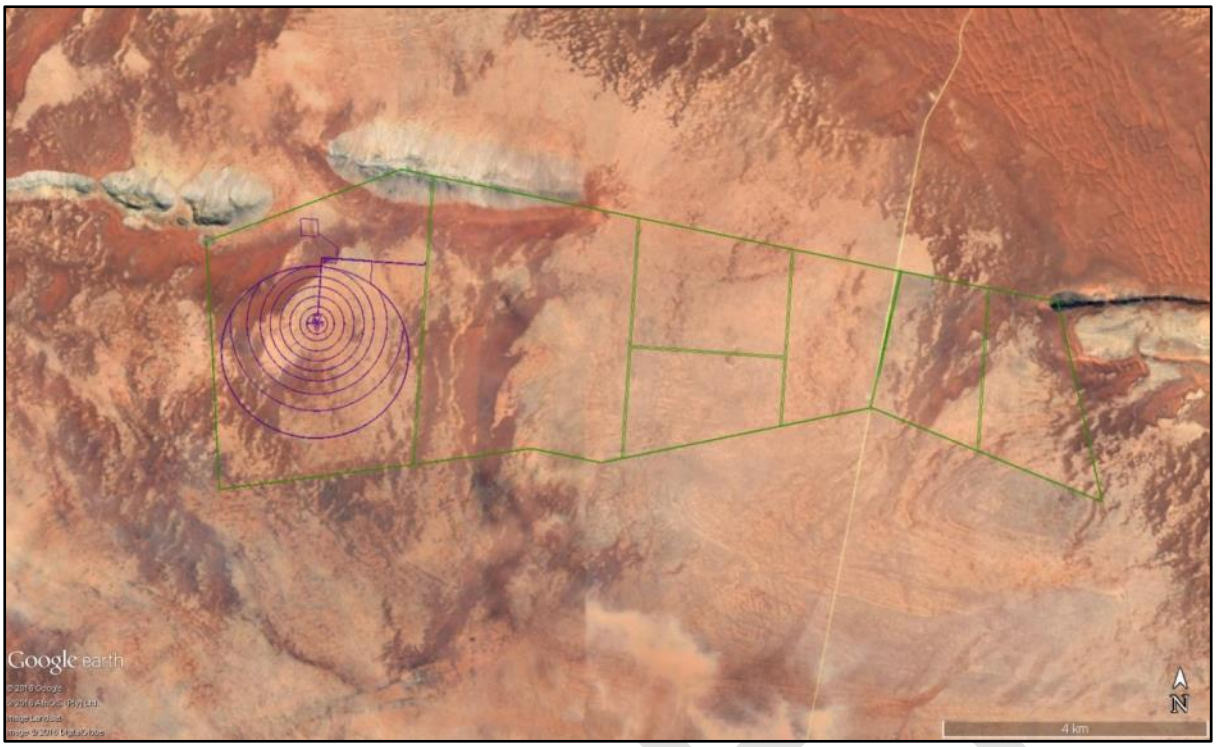


Figure 2: Close-up of the proposed layout of CSP 1.

2.2 Letsoai Water Pipelines

Three options have been proposed for sourcing the water required for the CSP projects. One water pipeline all the way to the Pella pump stations at Pelladrift and two to the Kokerboom Reservoir (just behind Aggeneys) following the route of the powerline options (**Figure 2**).

- Pipeline Alternative 1: Runs in a north-westerly direction to the N14, then onto the Kokerboom Reservoir at Aggeneys;
- Pipeline Alternative 2: runs in a northerly direction and then follows the loop gravel road to the Kokerboom Reservoir at Aggeneys;
- Pipeline Alternative 3: runs in a north-westerly direction to the N14, follows the road for a short distance, and then runs in parallel with an existing water pipeline to Pelladrift.

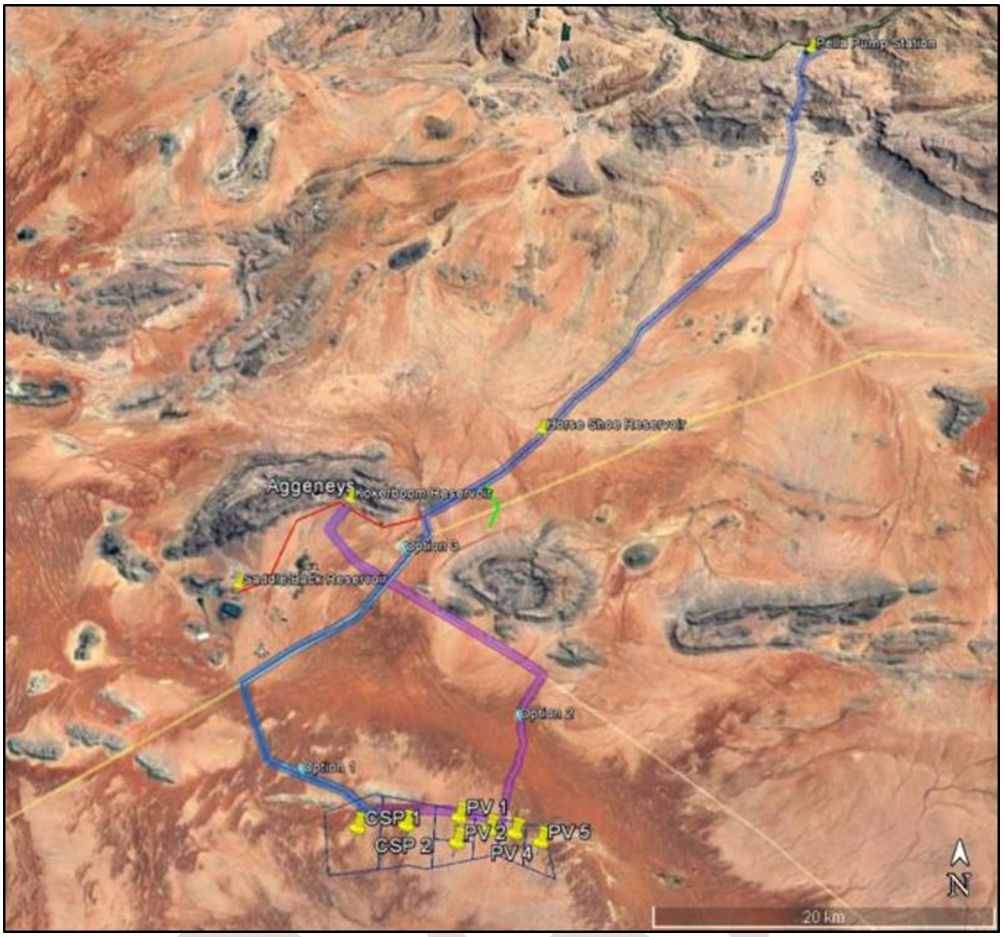


Figure 3: The water pipeline route from the Letsoai CSP to the Orange River. The water pipeline runs alongside the existing water pipeline from the Pelladrift pump station on the Orange River to the mine at Black Mountain. An alternative option would allow the water pipeline to connect with the Kokerboom Reservoir at Aggeneys.

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 The Landscape

The environment is arid and comprises relatively flat drainage plains with inselbergs such as the Aggeneys Mountains, Black Mountain and Gamsberg rising above the plains (**Figure 1**). The landscape is sparsely vegetated with short grass and occasional bushes. Visibility is good.

Plate 1: View in a northerly direction across the landscape of Hartbees Vlei 86, towards the two koppies on the northern boundary of the property which are clearly visible in **Figure 2**.

Plate 2: The farm is characterised as being flat and covered in short grass, with occasional gravel patches. Visibility is excellent.

Plate 3: A view in a southerly direction, from the N14. The facilities will be located behind the range of hills.

Plate 4: The route north, along the existing water pipeline, to the pump station at Pelladrift on the Orange River.

Plate 5: The route of the water pipeline crosses through a range of mountains along the banks of the Orange River.

Plate 6: The route of the pipeline runs close to two rocky koppies which may have attracted pre-colonial settlement.

3.1.1 Pre-colonial Archaeology of the Area

Early and Middle Stone Age

There is a widespread, but ephemeral distribution of stone artefacts of Pleistocene age across Bushmanland. The ESA, per Morris (2013) includes Victoria West cores, long blades and a low incidence of handaxes and cleavers. According to Morris (2013) there is a MSA site on the top of the Gamsberg and at the base of hills. Orton (2013b) collected both ESA and MSA material from the top of the mountain. Webley & Halkett (2012) also recorded MSA stone artefact scatters to the north-east of the proposed development on the farm Aroams.

In their assessment of the Korana WEF, Hart et al (2014) recorded a few concentrations of MSA scatters, but otherwise no definable archaeological sites. Smith (2012) recorded a low density distribution of ESA and MSA flakes on the Zuurwater Solar Facility.

Later Stone Age

According to Morris (2013) the predominant archaeological resource in the area belongs to the Late Holocene Later Stone Age. Orton & Webley (2013) note that the pre-colonial archaeology is strongly linked to landscape features. Ephemeral LSA scatters are found across the area and are generally in proximity to fountains, small, seasonal pans or hollows in the bedrock which collect seasonal rainfall (“klipbakke”). After good rains, herders may have moved from the Orange River into Bushmanland, as indicated at sites near Aggeneys with pottery and the archaeological site of Schuitdrift south-east of Pofadder (Morris 1999a). Beaumont et al (1995) have argued that the arrival of the herders around 2000 years ago,

may have led to competition for resources and the marginalisation of hunter-gatherers who may have made more frequent use of the Bushmanland resources.

Morris (2013) refers to grinding grooves in the rock outcrops of the Aggeneys/Gamsberg area. Similar grinding grooves in the bedrock have been recorded on the Pofadder WEF (Orton & Webley (2012b) to the east of the study area and at the Kangnas WEF (Orton & Webley 2012a) to the west of the study area. A single site with rock paintings (consisting of simple finger paintings including two star motifs and an indented oval shape image) has been recorded from a boulder alongside the Aggeneys/Black Mountain aggregate quarry. Morris (2013) also refers to some engraved cupule sites at two sites on the Black Mountain Mining Property, Aggeneys and at the foot of the Swartberg on Zuurwater 62 (Morris 2013). This appears to be similar to the cupule site recorded by Orton & Webley (2012a) on the Kangnas WEF site some distance to the west.

In fieldwork conducted by Webley & Halkett (2011) for a new transmission line commencing at the Aggeneis substation, it was observed that LSA sites (consisting mainly of quartz flakes) were concentrated at the base of small koppies.

The Orange River itself was an important focus for human settlement from pre-colonial times and this has important implications for the proposed water pipeline to the river. We know that Khoekhoen pastoralists, known as the Einiqua, were living along the lower and middle Orange River by the late 18th century (Penn 1995). Archaeological excavations by amateur archaeologists of graves and burial cairns along the Orange River, particularly between the Augrabies Falls and Prieska, have produced large collections of human skeletal material (Morris 1992). Since the stretch of the Orange River between Pella and Goodhouse has **not** been subjected to systematic archaeological field surveys in the past, it may have sensitive archaeological sites.

3.1.2 Colonial Archaeology of the Area

Penn (1995) has summarised the colonial history of this frontier zone for the Aggeneys and Gamsberg areas. The area adjacent Aggeneys was visited by eighteenth and nineteenth century explorers (Thompson 1827; Dunn 1931; Robinson 1978). Many of the local place names are of Khoe-San origin. Thompson (1827) recorded that the local people were known as the “Obseses”, they were an amalgamation of various tribes who had been involved in conflict with bands of Afrikander.

The indigenous groups faced onslaughts from the 1770s and by the end of the 19th century the independent San groups had disappeared. There are references to a massacre of San groups in a kloof at Aggeneys although other sources link the killing of the Bushmen with Gamsberg rather than Aggeneys. Morris (2010) notes that recently appreciation as started to emerge regarding the “genocide of the Bushmen in this area, with certain mountainous areas (like the Gamsberg) being likely massacre sites”.

According to a British Intelligence Map of 1900, the wagon track across Bushmanland ran past Aggeneys, and then south of the Gamsberg, through the village of Namies which now lies in ruins. Aggeneys itself, which also had an important water source, was held by a small Boer commando unit. There was some Boer war action around Aggeneys and the old fortifications are apparently visible on the valley sides.

The first known investigation of the mineral potential of the Aggeneys area dates to 1928, while the first mining at Swartberg (Black Mountain) dates to the 1970s.

3.2 Letsoai CSP Site 1

The study area is situated to the south of a range of small hills. It is completely flat and covered in short shrub. Visibility of the soil surface is good. The pipeline travels across relatively flat terrain until the Orange River, where it goes through a mountainous area (Plate 5).

4 HERITAGE FINDINGS

The only heritage resources which were identified during our survey of the area are pre-colonial archaeological remains.

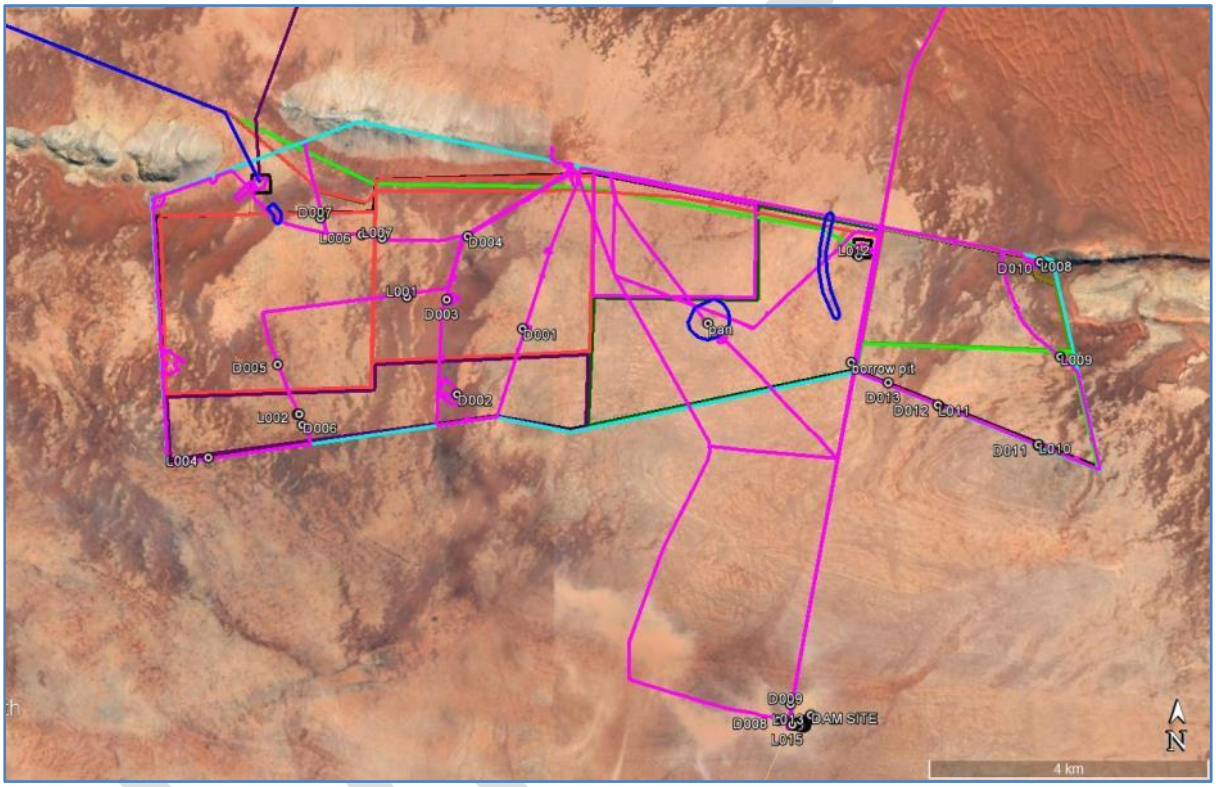


Figure 4: A map of our tracks (in pink) indicating the area which was covered during the survey. Notice the concentration of archaeological sites in the south, outside the study area. They represent the spread of archaeological material around an expanse of bedrock exposure with grinding grooves. This area will not be impacted by the proposed development.

4.1 Letsoai CSP Site 1

The archaeology of the study area is characterised by a very ephemeral and patchy distribution of quartz artefacts (cores, flakes and chunks) which are found predominantly on gravel surfaces (Plate 7 & 8). None of the “sites” listed in Table 2 at the end of the report represent an “archaeological site” in the usual sense of the word, but merely a “background scatter” of artefacts.

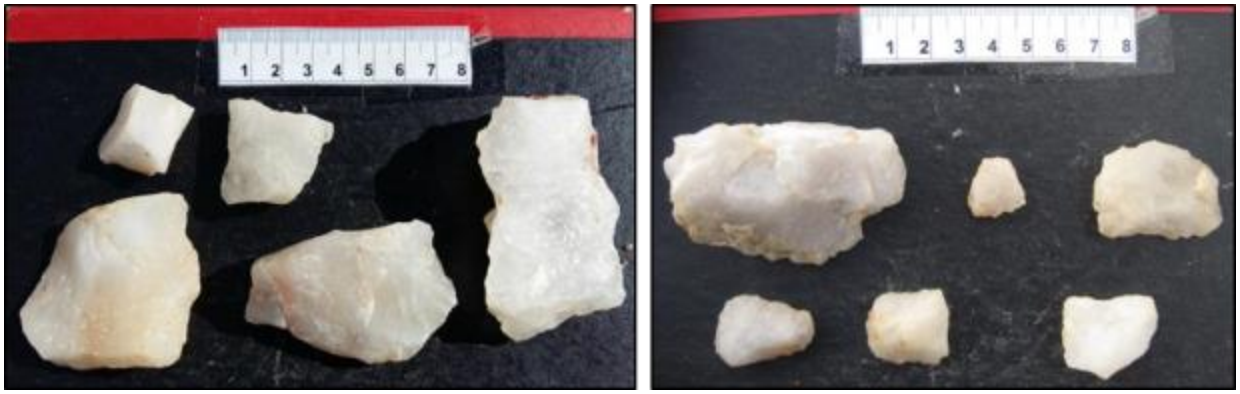


Plate 7 & 8: The typical quartz artefacts found in the study area. They tend to be weathered with no distinguishing characteristics, and suggest a MSA attribution.

Plate 9: A typical distribution of quartz material recorded across the gravel areas of the study area. Most of the quartz in this photograph is non-artefactual, derived from occasional bedrock exposures.

There is no evidence for increased archaeological settlement closer to the hills located to the north of the site (Figure 2) although the hills themselves have been excluded from the development proposals. Similarly, a field survey of the “pan” identified from aerial imagery (Google Earth) showed no evidence of any archaeological concentrations.

Plate 10: A base of a bowl with the inscription: “Société Ceramique, Maestricht, Made in Holland”. Recovered from a gravel area, together with MSA quartz artefacts, this fragment was dropped or discarded after 1900, when the words “Made in Holland” were added to the inscription.

The only dense scatter of archaeological material recorded during the site visit, was the bedrock exposure outside of the study area which contained evidence of numerous bedrock grooves and stone artefacts, ostrich eggshell, pottery and bone. This large site is evidence that where water is present, we may expect evidence for pre-colonial, and specifically, LSA settlement.

This survey did not identify any graves or burial cairns.

There are no buildings or structures in the study area of the CSP and PV facilities.

The CSP will have no visual impact on the Gamsberg as they are located to the south of the line of hills depicted in Plate 3. Impacts to the landscape are further assessed in the Visual Impact Assessment.

- Construction Phase: During the construction phase, a number of physical activities may result in direct impacts to the landscape and any heritage that lies on it. However, this study has identified the archaeological remains to be of very low significance, and no impacts are expected;
- Operational Phase: Generally, no impacts are expected except for potential vandalism of heritage sites by staff operating the facility. However, no impacts are expected because of the relatively low significance of heritage resources;
- Impacts resulting from the de-commissioning of the solar facility may include the dumping of electrical infrastructure on heritage sites. However, in this case no heritage resources are of low significance.

4.2 Water Pipeline to the Orange River

The proposed water pipeline will run in parallel with the existing water pipeline from the Pelladrift pump station on the Orange River, to the mine at Black Mountain (Aggeneys) (**Figure 5**).

Our findings are supported by the findings of Morris (2011) who noted that LSA sites are the predominant archaeological trace in the Aggeneys – Pofadder region. He concluded that the area is not rich in archaeological or colonial era heritage traces and as a rule “over virtually the entire area stone artefacts were found to occur in extremely low densities”.

There are two small koppies (Plate 6), near the proposed pipeline which seemed to offer a possibility of shelter for pre-colonial inhabitants. Both koppies were examined closely and both had a light scatter of quartz artefacts around their base. Neither area is significant.

With respect to the route of the water pipeline to the Orange River, there is a single structure situated along the route of the pipeline. Since this building is located inside a fenced (and locked) area, it was not possible to provide a detail assessment of its heritage significance. However, it appears from aerial photographs, to be a modern warehouse.

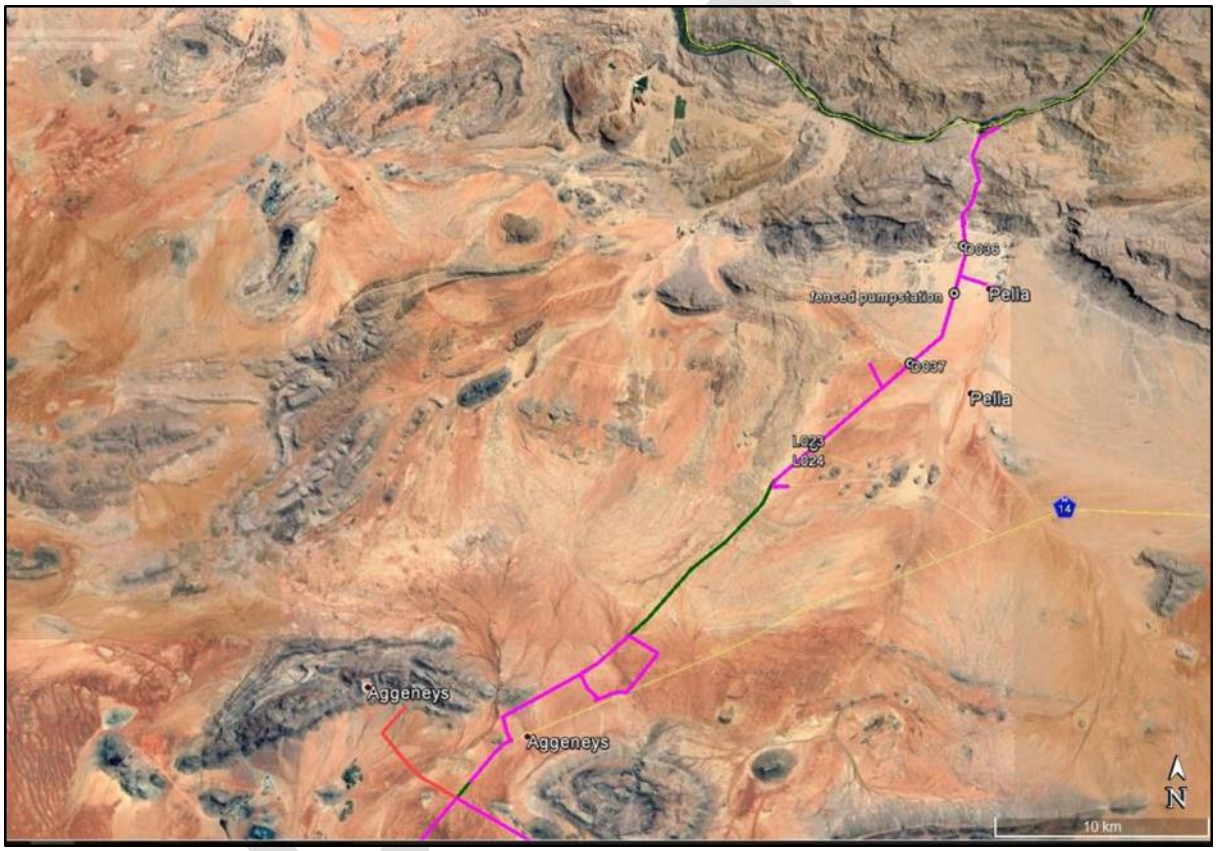


Figure 5: The green line indicates the route of the proposed water pipeline to Pelladrift pump station on the Orange River. Our tracks are shown in pink; we could cover most of the route except for a section in the middle, which was locked to traffic. The short section in red, to the Kokerboom Reservoir at Black Mountain, was also not assessed due to issues of access.

- Construction Phase: During the construction phase, several physical activities may result in direct impacts to the landscape and any heritage that lies on it. However, this study has identified the heritage remains to be of very low significance, and no impacts are expected;
- Operational Phase: Generally, no impacts are expected except for potential vandalism of heritage sites by staff operating the facility. However, no impacts are expected because of the relatively low significance of heritage resources;

- Impacts resulting from the de-commissioning of the water pipeline may include the dumping of material on heritage sites. However, in this case no heritage resources are of low significance.

5 ASSESSMENT OF IMPACTS

5.1 Letsoai CSP Site 1

CSP 1 is indicated in **Figure 2** to the extreme west. The northern boundaries of the CSP site is near a low range of hills, and these areas are generally more likely to contain heritage sites than the plains. However, the survey did not identify any concentration of heritage sites in proximity to the hills.

Table 4: addresses the significance of potential impacts to the heritage of the Letsoai CSP Site 1 during the construction phase of the development.

BioTherm Energy - Letsoai CSP Site 1

HERITAGE IMPACT ASSESSMENT

Significance Rating Table

Construction Phase

Letsoai CSP Site 1

Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
Potential impacts to scatters of stone artefacts	Nature of impact:	Negative impacts to stone artefacts							
	Without Mitigation	2	5	2	3	27	Low	-	Medium
	degree to which impact can be reversed:	Destruction of archaeological material cannot be reversed							High
	degree of impact on irreplaceable resources:	The archaeological material is of low significance, the impacts will be low							High
	Mitigation Measures	None are required. If dense accumulations of stone artefacts are uncovered during earthworks, SAHRA must be notified							High
	With Mitigation	1	5	2	3	24	Low	-	Medium
Potential impacts to human remains/graves	Nature of impact:	Negative impacts - resulting in destruction of human remains							
	Without Mitigation	2	5	8	2	30	Low	-	Medium
	degree to which impact can be reversed:	Destruction of human remains cannot be reversed							High
	degree of impact on irreplaceable resources:	Human remains are considered a very sensitive heritage resource and impacts should be avoided							High
	Mitigation Measures	No mitigation is required. If human remains are uncovered during earthworks, then SAHRA must be notified							High
	With Mitigation	2	5	4	2	22	Low	-	Medium
	Nature of impact:								

The stone artefact scatters are of low significance. They are randomly scattered across the landscape, in low quantities and do not provide any significant information regarding prehistoric settlement of the area. Our confidence with regard this is high. The destruction of these artefacts scatters does not require any mitigation.

There is a very small possibility that buried human remains (graves) may be uncovered during construction. If they are uncovered during earthworks, the remains will be disturbed. Human remains are considered highly sensitive heritage resources and appropriate mitigation measures must be undertaken to conserve them.

5.2 Water Pipeline to the Orange River

The water pipeline options are shown in **Figure 3.** The northern boundaries of the CSP and PV sites are located in close proximity to a low range of hills, and these areas are generally more likely to contain heritage sites than the plains. The pipeline will run between a gap in these hills, in a northerly direction, avoiding potential impacts. The pipeline routes cross an expanse of red sand dunes. While a survey was not conducted of the alternative across the dunes, no significant impacts are expected in line with the Morris (2013) findings.

Table 5: (attached), addresses the significance of potential impacts to the heritage of the water Pipeline Alternative 1. Ratings for the alternative options are considered to be the same.

BioTherm Energy - Solar Water Pipeline

HERITAGE IMPACT ASSESSMENT

Significance Rating Table

Construction Phase

Pipeline Alternative 1

Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
Potential impacts to stone artefact scatters	Nature of impact:	negative impacts - resulting in destruction of stone artefact scatters							
	Without Mitigation	1	5	2	3	24	Low	-	Medium
	degree to which impact can be reversed:	Destruction of archaeological material cannot be reversed							High
	degree of impact on irreplaceable resources:	The archaeological material is of low significance, and impacts will also be low							High
	Mitigation Measures	No mitigation is required. If dense concentrations of artefacts are uncovered during earthworks, then SAHRA should be notified							High
	With Mitigation	1	5	2	3	24	Low	-	Medium
Potential impacts to human remains/graves	Nature of impact:	Negative impact - resulting in destruction of human remains							
	Without Mitigation	2	5	8	2	30	Low	-	Medium
	degree to which impact can be reversed:	Destruction of human remains cannot be reversed							High
	degree of impact on irreplaceable resources:	Human remains are considered to be highly significant heritage resources and impacts should be avoided. Impacts will be high							High
	Mitigation Measures	No mitigation is required. If human remains are uncovered during earthworks, then SAHRA should be notified							High
	With Mitigation	2	5	4	2	22	Low	-	Medium

The stone artefact scatters are of low significance. They are randomly scattered across the landscape, in low quantities and do not provide any significant information regarding prehistoric settlement of the area. Our confidence with regard this is high. The destruction of these artefacts scatters does not require any mitigation.

There is a very small possibility that buried human remains (graves) may be uncovered during construction. If they are uncovered during earthworks, the remains will be disturbed. Human remains are considered highly sensitive heritage resources and appropriate mitigation measures must be undertaken to conserve them.

Route Option 2 is the preferred option because the potential of impacts to heritage are likely to be the lowest.

6 MITIGATION AND MANAGEMENT MEASURES

6.1 Letsoai CSP Site 1

- Construction Phase

- If any high concentrations of archaeological material, such as stone artefacts are recovered, SAHRA must be notified;
- If any human remains are uncovered during the excavations for the CSP plant, work must stop in that area and SAHRA must be alerted immediately.

Activity	Mitigation and management measure	Responsible Person	Applicable Development Phase	Include as Condition of Authorisation	Monitoring requirements
Construction	Report high concentrations of stone artefacts	ECO	Construction	Yes	No
	Report human remains	ECO	Construction	Yes	No

- Operational Phase – no further requirements
- De-commissioning Phase – no further requirements
- Cumulative Impacts – see Section 8

6.2 Water Pipeline

- Construction Phase

- If any high concentrations of archaeological material, such as stone artefacts are recovered, SAHRA must be notified;
- If any human remains are uncovered during the excavations for the pipeline, work must stop in that area and SAHRA must be alerted immediately.

Activity	Mitigation and management measure	Responsible Person	Applicable Development Phase	Include as Condition of Authorisation	Monitoring requirements
Construction	Report high concentrations of stone artefacts	ECO	Construction	Yes	No
	Report human remains	ECO	Construction	Yes	No

- Operational Phase – no further requirements
- De-commissioning Phase – no further requirements
- Cumulative Impacts – see Section 8

7 STAKEHOLDER CONSULTATION

7.1 Stakeholder Consultation Process

Public consultation has been completed for the Scoping Phase of the proposed development. The only comments received to the Scoping Report were from SAHRA.

7.2 Stakeholder Comments and Response

STAKEHOLDER DETAILS	COMMENT	SPECIALIST RESPONSE
SAHRA	Requires an HIA assessing the impacts to archaeology, historical heritage, graves and the visual landscape. The comments of the public with respect heritage to be included.	This is supported by the heritage specialist.

8 CUMULATIVE IMPACTS

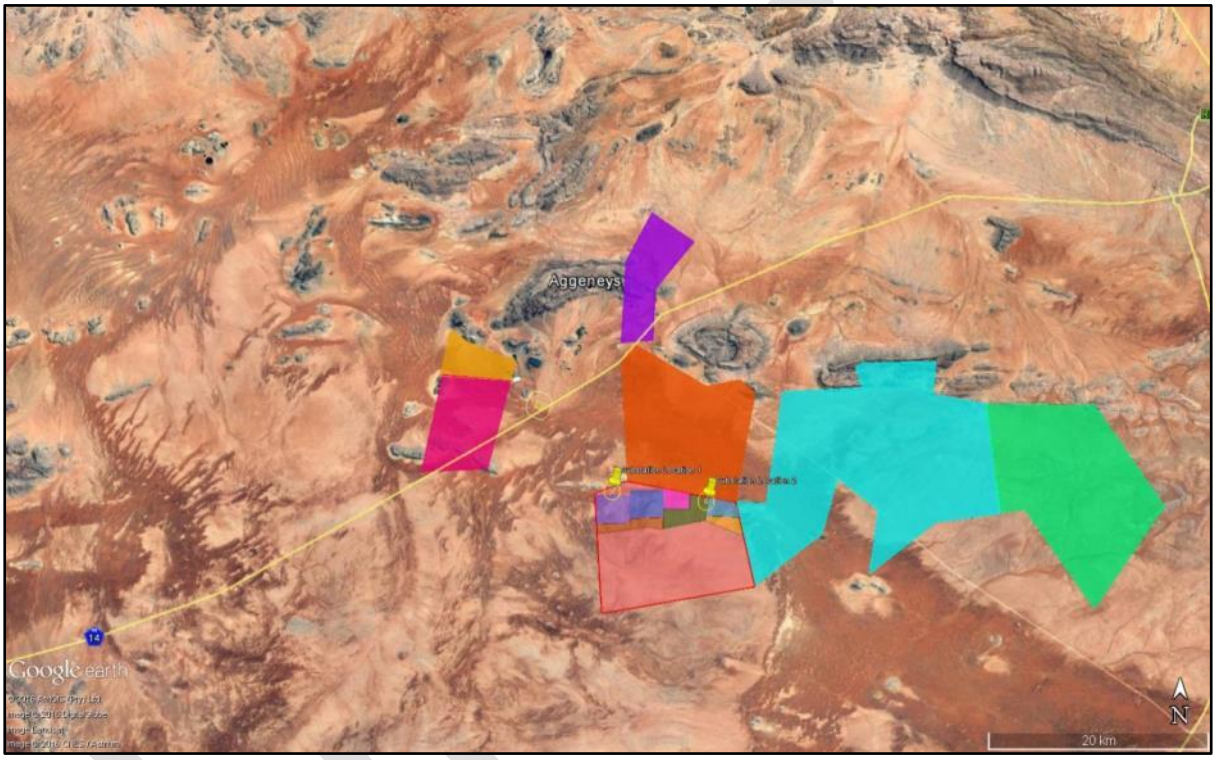


Figure 6: The solar PV facility immediately north of Letsoai and Enamandla is Solar Capital (orange), purple (Aggeneys PV), dark pink (Zuurwater PV), yellow (Boesmanland PV), turquoise (Namies WEF) and the green (Khai-Mai and Korana WEFs). They all feed into the Aggeneis substation.

Table 5 at the end of the report, summarizes the impact assessment ratings which have been assigned to the various renewable energy facilities which have been authorized around the proposed Letsoai CSP Site 1. In general, archaeological material which is scattered across the landscape is of low significance and no mitigation has been proposed to mitigate potential impacts. There are occasional archaeological sites, usually around stone basins ("klipbakke") in which water accumulate, which are of high significance. These sites are highly visible and need to be avoided. Only one such site was found during our survey, and it is outside the study area.

In general, the farms in this area are large, and there are very few sites which have buildings older than 60 years. Cumulative impacts to the built environment are equally low. The only exception which has been recorded in this general area, is the abandoned village of Namies to the east.

The cumulative impacts to graves are very low. Very few graves have been recorded in this general area.

The only impact which may be anticipated is that of the cumulative impacts on the cultural landscape. The only landscape feature which is of cultural significance in this area is the Gamsberg. Morris (2010) has reviewed the literature of a possible Bushmen massacre in a kloof on the Gamsberg and he has noted that "recently appreciation has emerged regarding the genocide against the Bushmen in this area, with certain mountains, like the Gamsberg, being likely massacre sites". It must be emphasized that no further information is available with respect to possible declaration of the Gamsberg. Clearly, the increase in renewable energy facilities around the Gamsberg will result in a cumulative visual impact on the Cultural Landscape.

Table 7: Cumulative Impacts of CSP on heritage resources

BioTherm Energy - Letsoai CSP Site 1

HERITAGE IMPACT ASSESSMENT

Significance Rating Table

Cumulative Impacts

Letsoai CSP Site 1

Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
Cumulative impacts to scatters of stone artefacts	Nature of impact:	Negative impact - resulting in the destruction of stone tools scatters							
	Without Mitigation	1	5	2	3	24	Low	-	Medium
	degree to which impact can be reversed:	Destruction of stone tools scatters cannot be reversed							High
	degree of impact on irreplaceable resources:	The archaeological material is of low significance, and impacts will also be low							High
	Mitigation Measures	No mitigation measures are required. IF dense concentrations of artefacts are uncovered during earthworks, then SAHRA should be notified (Tel: 021 462 4502)							High
	With Mitigation	1	5	2	3	24	Low	-	Medium
Cumulative impacts to buried human remains/graves	Nature of impact:	Negative Impact - resulting in destruction of human remains							
	Without Mitigation	2	5	8	2	30	Low	-	Medium
	degree to which impact can be reversed:	Destruction of human remains cannot be reversed.							High
	degree of impact on irreplaceable resources:	Human remains are considered highly sensitive heritage resources and impacts should be avoided. Impacts will be high.							High
	Mitigation Measures	No mitigation measures are required. IF human remains are uncovered during earthworks, then SAHRA should be notified (Tel: 021 462 4502)							High
	With Mitigation	2	5	4	2	22	Low	-	edium

Table 8: Cumulative impacts of water pipeline on heritage resources

BioTherm Energy - Solar Water Pipeline									
HERITAGE IMPACT ASSESSMENT									
Significance Rating Table									
Cumulative Impacts									
Pipeline Alternative 1									
Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
Potential cumulative impacts to stone artefact scatters	Nature of impact:	Negative Impact - resulting in destruction of artefact scatters or sites							
	Without Mitigation	1	5	2	3	24	Low	-	Medium
	degree to which impact can be reversed:	Destruction of archaeological material cannot be reversed							High
	degree of impact on irreplaceable resources:	The archaeological material is of low significance, and impacts will be low							High
	Mitigation Measures	No mitigation is required. If dense concentrations of artefacts are uncovered during earthworks, then SAHRA should be notified (Tel: 021 462 4502)							High
	With Mitigation	1	5	2	3	24	Low	-	Medium
Potential cumulative impacts to human remains/graves	Nature of impact:	Negative impacts - resulting in the destruction of human remains							
	Without Mitigation	2	5	8	2	30	Low	-	medium
	degree to which impact can be reversed:	Destruction of human remains cannot be reversed							High
	degree of impact on irreplaceable resources:	Human remains are considered sensitive heritage resources and impacts should be avoided. Direct impacts will be high							High
	Mitigation Measures	No mitigation is required. If human remains are uncovered during earthworks, then SAHRA should be notified (Tel: 021 462 4502)							High
	With Mitigation	2	5	4	2	22	Low	-	edium

9 CONCLUSIONS

9.1 Letsoai CSP site 1

There are no significant heritage resources in the study area which will be impacted by the proposed activity. This conclusion is supported by numerous other assessments which have been conducted for renewable energy projects on adjoining properties.

This report supports the construction of the CSP 1 facility with associated infrastructure. The following conditions must be included in the EMPr.

- If any high concentrations of archaeological material, such as stone artefacts are recovered, SAHRA must be notified;
- If any human remains are uncovered during the excavations for the CSP 1 plant, work must stop in that area and SAHRA must be alerted immediately.

There are therefore no significant cumulative impacts, with the exception of visual impacts which are addressed in the visual impact report.

9.2 Water Pipeline

There are no significant heritage resources in the study area which will be impacted by the proposed activity. This conclusion is supported by numerous other assessments which have been conducted for renewable energy projects on adjoining properties. There are therefore

no significant cumulative impacts, with the exception of visual impacts which are addressed in the visual impact report.

This report supports the construction of the CSP 1 facility with associated infrastructure. The following conditions must be included in the EMPr.

- If any high concentrations of archaeological material, such as stone artefacts are recovered, SAHRA must be notified;
- If any human remains are uncovered during the excavations for the CSP 1 plant, work must stop in that area and SAHRA must be alerted immediately.

This report support pipeline alternative 2 is the preferred option because the potential of impacts to heritage are likely to be the lowest.

10 REFERENCES

Beamont, P., Smith, A.B. & Vogel, J. 1995. Before the Einiqua" the archaeology of the frontier zone. In A.B. Smith (ed). Eniqualand: studies of the Orange River frontier. Cape Town: UCT Press.

Burke, P. 1995. The siege of O'Okiep: Guerrilla campaign in the Anglo-Boer War. War Museum of the Boer Republics: Bloemfontein.

De Kock, S. 2012. Integrated Heritage Impact Assessment: Proposed Boesmanland Solar Farm (75MW): Portion (300HA) of the Farm Zuurwater 62/6, Namaqualand District, Northern Cape Province.

Dunn, E.J. 1931. The Bushmen. London: Charles Griffin & Co.

Eksteen, B. 2012. Boere en Basters van die Boesmanland: 'n geskiedkundige relaas. Bloemfontein: Bytes Document Solutions.

Halkett, D. 2010. An assessment of impact on archaeological heritage resulting from replacement of a section of the existing bulkwater supply pipeline from Pella to Pofadder, Northern Cape. Unpublished report for Van Zyl Environmental.

Hart, T., Halkett, D & Kendrick, N. 2014. Heritage Impact Assessment for the Korana Solar Energy Facility on farm Namies South 212/Portion 2; Khai-Ma Municipality, Northern Cape. Unpublished report for Savannah Environmental (Pty) Ltd.

Morris, A. 1992. Skeletons of Contact: a study of protohistoric burials from the lower Orange River Valley, South Africa. Witwatersrand University Press.

Morris, D. 1996. Archaeological impact assessment, "Southern Option" powerline 'Schuitdrift' to 'Paulputs', Pofadder District, Northern Cape. Unpublished report to Eskom.

Morris, D. 2011a.A Phase 1 Heritage Impact Assessment for the proposed Aggeneis – Paulputs 220kV transmission line. Unpublished report for SSI Engineers and Environmental Consultants.

Morris, D. 2011b. Heritage Impact Assessment: Sato Energy Holdings Zuurwater Photovoltaic energy generation facility development near Aggeneys, Northern Cape Province.

Morris, D. 2011c. Black Mountain Concentrated Solar Power Facility development at Aggeneys, Northern Cape Province. Unpublished report for Aurora Power Solutions (Pty) Ltd.

Morris, D. 2013. Heritage Impact Assessment: proposed Aggeneys Photovoltaic Energy facility at Bloemhoek near Aggeneys, Northern Cape Province. Unpublished report for Solar Capital.

Nienaber, G.S. & Raper, P.E. 1977. Toponymica Hottentotica. Raad vir Geesteswetenskaplike Navorsing: Pretoria.

Orton, J. & Webley, L. 2012a. Heritage Impact Assessment for the proposed Kangnas Wind and Solar Energy facilities, Namakwa Magisterial District, Northern Cape. Unpublished report for Aurecon South Africa (Pty) Ltd.

Orton, J. & Webley, L. 2012b. Scoping heritage impact assessment for the Pofadder Wind and Solar Energy facility, Kenhardt magisterial District, Northern Cape. Unpublished report prepared for Savannah Environmental (Pty) Ltd.

Orton, J. & Webley, L. 2013. Heritage Impact Assessment for the Proposed Namies Wind Energy facility near Aggeneys, Northern Cape. Unpublished report for Aurecon South Africa (Pty) Ltd.

Orton, J. 2013b. Preliminary archaeological mitigation report for the Gamsberg Zince Mine, Aggeneys, Northern Cape. Unpublished report for Black Mountain Mining (Pty) Ltd.

Orton, J. 2014. Final archaeological mitigation report for the Gamsberg Zince Mine, Aggeneys, Northern Cape. Unpublished report prepared for ERM Southern Africa (Pty) Ltd.

Orton, J. 2015a. Final archaeological survey for the proposed Konkoonsies II Solar Energy facility, Kenhardt Magisterial District, Northern Cape. Unpublished report prepared for Savannah Environmental (Pty) Ltd.

Orton, J. 2015b. Heritage Scoping study for Sol Invictus Solar PV development on Ou Taaibosmond 66/5, Namakwaland Magisterial District, Northern Cape. Unpublished report for Savannah Environmental (Pty) Ltd.

Pelser, A. 2011. A report on an archaeological impact assessment (AIA) for the proposed solar energy facility on Konkoonsies 91, Pofadder District, Northern Cape. Unpublished report for Robert de Jong & Associates.

Penn, N. 1995. The Orange River Frontier Zone, C.1700-1805. In (ed) Smith, A.B. Einiqualand: studies of the Orange River Frontier. UCT Press: Rondebosch. pp21-109.

Robinson, A.M.L. (ed). 1978. Selected articles from the Cape Monthly Magazine NS, 1870-1876. Cape Town: Van Riebeeck Series. Second Series No 9.

Smith, AB. 2012. Archaeological report: Proposed 75MW solar facility on Farm 62 Zuurwater, Aggneys, Northern Cape Province. Unpublished report for Cape EAPrac.

Thompson, G. 1827. Travels and adventures in Southern Africa. Reprint, Cape Town: Africana Connoisseurs Press, 1962.

Van der Walt, J. 2014. Archaeological/Heritage recommendations regarding the proposed power line between Aggeneys Solar 1 and Aggeneys MTS substation. Unpublished report for PV Africa Development (Pty) Ltd by Heritage Contracts and Archaeological Consulting.

Webley, L. 1997. Jakkalsberg A and B: the cultural material from two pastoralist sites in the Richtersveld, Northern Cape. Southern African Field Archaeology Vol 6(1):3-19.

Webley, L. & Halkett, D. 2011. Heritage Impact Assessment: Proposed Aggeneis – Oranjemond 400kV line and substations upgrade, Northern Cape Province. Unpublished report for Savannah Environmental (Pty) Ltd.

Webley, L. & Halkett, D. 2012. Heritage Impact Assessment: Proposed Aggneys Photo-Voltaic Solar Power Plant on Portion 1 of the farm Aroams 57, Northern Cape Province. Unpublished report for Savannah Environmental (Pty) Ltd.

Table 3: List of heritage sites recorded during the field survey

LABEL	LAT dec deg	LON dec deg	DESCRIPTION	GRADING
D001	-29.38474498	18.90928798	Very ephemeral scatter of MSA artefacts on Qtz including flakes and cores on a denuded area amongst tall grasses. Some are wind polished. Very low significance	ungraded
D002	-29.39308698	18.89967402	Very ephemeral scatter of MSA artefacts on Qtz in a small depression, flakes and cores. Some are wind polished. Small qtz outcrop and other bedrock outcropping. Very low significance.	ungraded
D003	-29.38100497	18.89817400	Very ephemeral scatter of MSA artefacts on Qtz in a small deflation on western side of hill. Mostly flakes of which some seem fresher and less windblasted than other sites. Very low significance	ungraded
D004	-29.37293697	18.90128704	Very ephemeral scatter of MSA artefacts on Qtz including 5 flakes and cores on a denuded area amongst tall grasses. Some are wind polished while others look less so. Some of the less polished items may be Late Stone Age??. Very low significance	ungraded
D005	-29.38923399	18.87341402	Isolated convergent MSA flake on qtz in a small denuded area amongst tall grass. Low significance.	ungraded
D006	-29.39692497	18.87703300	Small denuded area (possible pan) with lots of qtz of which only a few items appear to be artefactual. MSA cores and flakes. Low significance.	ungraded
D007	-29.37054201	18.87968302	Small denuded area (possible pan) with typical ephemeral sandblasted MSA flakes and cores. Low significance.	ungraded
D008	-29.43462501	18.94658896	A number of flat bedrock exposures with a semi-deep grinding groove and 2 polished grinding areas in a small pan? A reasonable Late Stone Age artefact scatter is associated, mostly on qtz but with some CCS. 1x potsherd was also noted (5-6 mm thick)	Grade IIIC
D009	-29.43259198	18.94840096	A flat bedrock exposure with a semi-deep grinding groove and 4 polished grinding areas. In road reserve.	Grade IIIC
D010	-29.37673196	18.98576598	Rock face/terraces and low small overhang on side of koppie. Ephemeral Late Stone Age artefact scatter on talus slope below including flakes and ostrich eggshell. Flakes mostly on qtz and qtz crystal, but at least some ccs observed. Area very disturbed by domestic stock.	Grade IIIC
D011	-29.39966803	18.98503901	Small pan with qtz and other bedrock slab outcrops with ephemeral typical qtz MSA of flakes and cores.	ungraded
D012	-29.39469899	18.97040103	Small pan with bedrock slab outcrops with ephemeral typical qtz MSA of flakes and cores.	ungraded
D013	-29.39171897	18.96294700	Small soily surface pan with typical qtz MSA scatter, some fresh and some sandblasted. Nearby qtz outcrop. Low significance	ungraded
D014	-29.43518601	18.94884001	D014-D035 are grinding areas on bedrock at the broken dam.	Grade IIIA
D015	-29.43522499	18.94897898		
D016	-29.43539204	18.94969404		
D017	-29.43536497	18.94991398		
D018	-29.43534804	18.95003702		
D019	-29.43529498	18.95003501		
D020	-29.43527796	18.95011196		
D021	-29.43526598	18.95012797		
D022	-29.43545499	18.95010299		
D023	-29.43526698	18.95016200		
D024	-29.43543504	18.95029502		
D025	-29.43545097	18.95030801		
D026	-29.43541199	18.95042997		
D027	-29.43537100	18.95051999		
D028	-29.43534602	18.95049602		
D029	-29.43536304	18.95049501		
D030	-29.43522298	18.95043500		
D031	-29.43518803	18.95041798		

D032	-29.43494101	18.95058403		
D033	-29.43491603	18.95062803		
D034	-29.43490497	18.95066801		
D035	-29.43487002	18.95065896		
D036	-29.01489903	19.13812903	Scatter of qtz MSA artefactual material including flakes, cores and chunks adjacent to the northern side of a prominent rocky koppie. The area is very disturbed by human activity and is alongside the existing pipe trench and road. Qtz band seen on the koppie and adjacent to. A number of shallow overhangs were noted on the north side of the koppie but do not appear to have been used during the Later Stone Age as no characteristic artefacts were observed. Low significance	
D037	-29.06448604	19.11168697	Some typical qtz MSA alongside a qtz band. Qtz crystal was noted within the band but does not appear to have been used for artefacts. Low significance.	
L001	-29.38065997	18.89238001	2 quartz flakes and a few fragments of ostrich eggshell. A widespread, but ephemeral distribution of quartz flakes, cores and chunks spread in gravel patches between the grass.	
L002	-29.39555604	18.87657199	On a gravel patch, between the quartz artefacts, a small base of a bowl with the following inscription on the base: “Made in Holland. Maastricht. Societe Ceramique”.	
L003	-29.39557599	18.87629799	Slightly elevated area next to a gravel patch, a scatter of quartz cores, flakes.	
L004	-29.40104904	18.86323102	An unpatinated flake in a small hollow	
L005	-29.37030296	18.87983196	Single quartz flake on a gravel surface	
L006	-29.37270404	18.88573601	Quartz cores; 1 irregular and the other a single platform	
L007	-29.37315297	18.88874503	Large flaking site (see photos D 3585/6)	
L008	-29.37633600	18.98531402	1 fresh quartz flake in red sands	
L009	-29.38843301	18.98830100	3 quartz flakes in gravel, with no distinguishing features	
L010	-29.39976501	18.98502803	1 quartz flake and 2 very weathered flakes on bedrock (not hornfels)	
L011	-29.39457997	18.97022299	1 quartz core and 1 quartz chunk at an outcrop of granite rocks (D013?)	
L012	-29.37554500	18.95869897	2 quartz flakes	
L013	-29.43521996	18.94877203	Quartz flakes and ostrich eggshell near a granite outcrop	
L014	-29.43515802	18.94878301	One grinding groove on the granite bedrock near the dam	
L015	-29.43519901	18.94863800	Smoothed area on the granite bedrock, many flakes spread around on the gravel surrounding the bedrock	
L016	-29.43476499	18.94975497	Smoothed area on granite bedrock, nearby green bottle glass, flaked clear glass (?), many quartz flakes	
L017	-29.43494696	18.94981700	A small “klipbak” in a granite outcrop, many quartz flakes and green bottle glass. 2 potsherds (about 5mm thick, grit tempered), artefacts on chert	
L018	-29.43501301	18.94998598	Heaps of soil from clearing out the “klipbakke”? Ostrich eggshell, flaked quartz crystal, chert flakes, quartz flakes.	
L019	-29.43505299	18.95004197	Quartz core and backed bladelet, chert flakes, 1 nippled pot base, bone fragments	
L020	-29.43491897	18.95021204	Scatter of quartz flakes, cores, chert bladelet, chert flake near bedrock outcrop	
L021	-29.43463096	18.95061797	Bedrock groove	
L022	-29.43475996	18.95070003	Smoothed area on bedrock	
L023	-29.09948903	19.06473298	Next to a rocky knoll, near the pipeline route to Pella, a scatter of quartz flakes	
L024	-29.09902602	19.06472602	Quartz artefacts, around a koppie, near the pipeline route to Pella	

Table 6: Cumulative Impacts – Solar Heritage

Proposed Development Name	DEA Reference	Current EA Status	Proponent	Extent	Proposed Capacity	Farms	Impacts													Proposed Mitigation Measures
							Construction						Operation			De-commissioning				
							Overall	Archaeology	Cultural	Built	Eco-tourism	Visual	Overall	Archaeology	Cultural	Overall				
Construction of the 70MW Orlight SA Photovoltaic Solar Power Plant on portion 1 of the farm Aroams 57 RD near Aggeneys, Khai-Ma Local Municipality	12/12/20/2630	Approved	Digby Wells Environmental Consultants	116.18	40MW		L	L	N/A	N/A	N/A		N/A	N/A	N/A	N/A				• No mitigation is required
Construction of the Wind and Photovoltaic (PV) Energy Facilities, including the Construction of the Wind and PV	14/12/16/3/3/2/346/AM1	In Process		46535	75		M	M	N/A	N/A	N/A	N/A	N/A	N/A	N/A					• Orange Hill and its surroundings must be considered a no-go area and a 700 m buffer must be implemented. • SMS Hill and its surroundings must be considered a

Proposed Developme	DEA Reference	Curren t EA	Proponent	Exten t	Propos ed	Farm s			Impacts												Proposed Mitigation
Substations and Gridline Connections, near Springbok, within the Nama-Khoi Local Municipality, Northern Cape Province.																					no-go area and a 1.9 km north/south buffer must be implemented (approximately 450 m from all recorded heritage resources). • Gobees se Pan and its immediate surroundings must be considered a no-go area and a 1.2 km east/west, 1.3 km north/south buffer implemented (approximately 350 m from all recorded heritage resources). • Springbokvlei and its immediate surroundings must be considered a no-go area and a 900 m east/west, 1 000 m

Proposed Developme	DEA Reference	Current EA	Proponent	Extent	Proposed	Farms			Impacts												Proposed Mitigation
																					• north/south buffer implemented (approximately 200 m from all recorded heritage resources).
Construction of the Wind and Photovoltaic (PV) Energy Facilities, including the Construction of the Wind and PV Substations and Gridline Connections, Near Springbok, within the Nama-Khoi Local Municipality, Northern Cape Province.	14/12/16/3/3/2/447	In Process		46535	1000		M	M	N/A	N/A	N/A	N/A	N/A	N/A	N/A						• See 14/12/16/3/3/2/346/AM1 above.
The Proposed Boesmanland Solar Farm	12/12/20/2602	Approved		200	75		L	L	L	L	L	L	N/A	N/A	N/A						• From an archaeological perspective, there would be

PROPOSED DEVELOPME	DEA REFERENCE	CURREN T EA	PROPONENT	EXTEN T	PROPOS ED	FARM S			IMPACTS											PROPOSED MITIGATION
Portion 6 (A Portion Of Portion 2), Farm 62 Zuurwater, Aggeneys, Northern Cape Province.																				no inhibitors to the construction of the solar facility
75MW PV plant on the Farm Zuurwater No 62 in the Namakwa District, Northern Cape Province, Phase 4.	14/12/16/3/3/2/473	In Process		222	75		L	N/A	N/A	N/A	N/A	N/A	L	N/A	N/A		L				• A no-go space must be left at and surrounding the locale between 29.28490°S, 18.73832°E and 29.28517°S, 18.74018°E, with a 100 m buffer zone measured from the edges of the rock outcrop.
Proposed Boesmanland Solar Farm Portion 6 (A portion of portion 2) Farm 62 Zuurwater, Aggeneys, Northern Cape.	14/12/16/3/3/2/222	Approved		200	75		L	L	L	L	L	L	N/A	N/A	N/A						• From an archaeological perspective, there would be no inhibitors to the construction of the solar facility
Proposed Wind Energy	14/12/16/3/3/2/550	In Process		15	220		L	L		L			L								• Mitigation of the affected archaeological

Proposed Development	DEA Reference	Current EA	Proponent	Extent	Proposed	Farms		Impacts	Proposed Mitigation
Facility and Associated Infrastructure on Namies Wind Farm Pty Ltd, near Aggeneys, Northern Cape Province.									resources would entail either avoidance of the relevant area or excavation, collection and analysis of stone artefacts from the area to be impacted. Alternative 1 is preferred because it has fewer turbines (smaller spatial impact) and aligns better with the space in between the two significant archaeological sites. • Avoid using the roads through Namies and accessing the site via another route, either southwards from the Aggeneys-Namies road or northwards from the Loop 10 road. • Move the

Proposed Development	DEA Reference	Current EA	Proponent	Extent	Proposed	Farms			Impacts												Proposed Mitigation
																					turbines further away from the Namies village but it is believed that the presently planned 2 km buffers for Alternative 1 and 1.6 km for Alternative 2 are sufficient.
The Proposed Construction of a Photovoltaic Power Generation Facility within the Black Mountain Mining Area near Aggeneys in the Northern Cape Province.	12/12/20/2151	Approved		19.5	19		L	L	N/A	N/A	N/A	N/A	N/A	N/A	N/A						• Artefact densities are very low/zero over the development footprint area. Unlike biological processes, heritage destruction has a once-off permanent impact and the ratings err on the side of caution. Since a low significance rating has been indicated, mitigation measures are not considered as necessary.
Proposed 75MW	14/12/16/3/3/2/683	Unknown		3257	Unknown		L	L	L	N/A	N/A	L	N/A	N/A	N/A						• No mitigation

Proposed Development	DEA Reference	Current EA	Proponent	Extent	Proposed	Farms			Impacts											Proposed Mitigation
Korana Wind Energy Facility, near Poffader in the Northern Cape.				(all facilities)																suggested for PV, substations and connections as well as for the access roads. Widening of the N14 access road will result in impacts to graves and historic ruins. Use one of the alternatives or routing the road south of Namies as mitigation. • A no-development buffer zone of a radius of 500 m must be implemented around Boorwater Farm and the Namies school building
Proposed 140MW Khâi-Mai Wind Energy Facility near Pofadder.	14/12/16/3/3/2/680	Unknown		(3257 all facilities)	140		L	L	L	N/A	N/A	L	N/A	N/A	N/A					• A no-development buffer zone of a radius of 500 m must be implemented around Boorwater Farm and the Namies

PROPOSED DEVELOPME	DEA REFERENCE	CURREN T EA	PROPONENT	EXTEN T	PROPOS ED	FARM S			IMPACTS												PROPOSED MITIGATION
																					• school building. • Avoid Namies by moving the access road to the south of the village site. Use of the alternative or the second alternative access road is supported.
				Total	**Total**																
				50248.5	1538 MW																
Significance Totals per impact	Significance Rating								**Total Hectares per impact**												
	High Significance																				
	Medium Significance						46535	46535													
	Low Significance						3713.5	3491.5	3457	215	200	3457	237								
	Positive Impacts																				