HERITAGE IMPACT ASSESSMENT FOR A PROPOSED PHOTOVOLTAIC ENERGY PLANT ON THE FARM HOEKPLAAS NEAR COPPERTON, NORTHERN CAPE

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

Prepared for

Aurecon South Africa (Pty) Ltd
Aurecon Centre, 1 Century City Drive, Waterford Precinct, Century City
Phone: 021 526 6026 Email: Franci.Gresse@aurecongroup.com

10 January 2012

Prepared by

Jayson Orton

Archaeology Contracts Office
Department of Archaeology
University of Cape Town
Private Bag
Rondebosch
7701

Phone (021) 650 2357
Fax (021) 650 2352
Email Jayson.Orton@uct.ac.za

EXECUTIVE SUMMARY

The UCT Archaeology Contracts Office was requested by Aurecon South Africa (Pty) Ltd to assess the potential impacts to heritage resources that might occur through construction of a solar energy facility on the remainder of farm Hoekplaas 146. Mulilo Renewable Energy (Pty) Ltd proposes to establish a 100 MW photovoltaic solar energy facility with a footprint of 300 ha that will connect to the nearby Kronos Substation via a 1.64 km overhead transmission line. The chosen site lies about 10 km southeast of the town of Copperton and some 5 km southeast of the Prieska Copper Mine. A 150 MW alternative layout exists for the same site.

The site lies on a flat plain with relatively low vegetation. Three proper pans are present, although one (alongside the main road) has been quarried for road gravel. Another more ephemeral pan has a series of gum trees on one side. The ground surface of the farm varies from dense gravel patches to fine silt.

A background scatter of Early Stone Age (ESA) and Middle Stone Age (MSA) artefacts was found across the site and is of very low archaeological significance. However, several discrete Later Stone Age (LSA) sites were found focused around the central pan. The now quarried pan revealed a buried MSA site with at least one animal tooth preserved. Evidence from further north suggests that the possibility of finding important subsurface material close to pans exists and this is borne out by this MSA site. All these sites are of significance and would require mitigation should they be under threat. No buildings exist on the site and no cultural landscape elements were noted. Visual impacts to scenic routes and sense of place would be limited for Alternative 1(prefered layout) due to the topography. Alternative 2, located to the north, would however result in more significant impacts due to its proximity to the road. This is somewhat offset by the existing abandoned mining infrastructure to the northwest.

Archaeological impacts are assessed as being of Medium significance for Alternative 1 but Low with mitigation, while Alternative 2 has Low significance with no mitigation proposed. Impacts of visual concern are rated as of Low significance for Alternative 1 and Medium for Alternative 2. No visual mitigation is suggested for either, since this could result in further landscape impacts as well.

Overall, impacts to heritage resources are not considered to be highly significant and it is thus concluded that the project may proceed but subject to the following recommendations:

- The suggested archaeological mitigation measures should be implemented as necessary;
- Test excavations around the pans should be done to check for buried archaeological material (if development encroaches within 100 m of any of the pan margins but excluding for access roads);
- Transmission lines should stay at least 100 m away from the edge of any pans implicated in the final route; and
- If any human remains are uncovered during development then work in the immediate vicinity should be halted and the finds protected and reported to SAHRA (021 462 4502).

Contents

1. INTRODUCTION

The UCT Archaeology Contracts Office (ACO) was requested by Aurecon South Africa (Pty) Ltd to assess the potential impacts to heritage resources that might occur through construction of a solar energy facility on the remainder of farm Hoekplaas 146 (Figure 1). Mulilo Renewable Energy (Pty) Ltd proposes to establish a 100 MW photovoltaic solar energy facility with a footprint of 300 ha that would connect to the nearby Kronos Substation via an overhead transmission line. The chosen site lies about 10 km southeast of the town of Copperton and some 5 km southeast of the Prieska Copper Mine.

The project components would include the following:

- Installation of arrays of panels comprised of photovoltaic cells;
- Construction of a 1.64 km long 132 kV overhead transmission line to evacuate the power to the Kronos Substation which lies along the southwest edge of the farm;
- Upgrading of farm roads and construction of new roads to facilitate access to the site for construction and maintenance vehicles;
- Construction of small buildings to house an office, connection centre and guard; and
- Construction of an electric fence to protect the site from trespassers and livestock.

The plant is expected to be operational for approximately 20 years after which it would likely be decommissioned and the land rehabilitated.

Alternatives being assessed include the following:

- Layouts allowing generation of 100 MW (preferred) or 150 MW (alternative) on the same site;
- Technology alternatives include method of power generation (PV or CSP) as well as various ways of mounting the panels on various types of foundations (but note that CSP has been ruled out during scoping due to the high water requirements of this technology); and
- The only activity alternative to solar energy generation is the No-Go option in which the status quo would be maintained.

For the purposes of this heritage assessment, the technology alternatives make little or no difference so this report therefore concentrates on assessing the layout alternatives. The ACO was asked to conduct a detailed assessment of the proposed site but to also consider the broader farm context so that should other specialist reports determine a need to shift the facility then some data would be available to further inform the relocation.

2. TERMS OF REFERENCE

Undertake a Heritage and Archaeological Impact assessment of the sites in accordance with the requirements of Section 38(3) of the NHRA which would include:

- Conducting a detailed desk-top level investigation to identify all archaeological, cultural and historic sites in the proposed development areas;
- Undertaking field work to verify results of desktop investigation;
- Document (GPS coordinates and map) all sites, objects and structures identified on the candidate sites;
- Compile a report which would include:

- Identification of archaeological, cultural and historic sites within the proposed development areas;
- Assess the sensitivity and significance of archaeological remains in the site;
- Evaluation of the potential impacts of construction, operation and maintenance of the proposed development on archaeological, cultural and historical resources, in terms of the scale of impact (local, regional, national), magnitude of impact (low, medium or high) and the duration of the impact (construction, up to 10 years after construction (medium term), more than 10 years after construction (long term));
- Recommendation of mitigation measures to ameliorate any negative impacts on areas of archaeological, cultural or historical importance;

- The preparation of a heritage resources management plan which includes recommendations on the management of the objects, sites or features, and also guidelines on procedures to be implemented if previously unidentified cultural resources are uncovered during later developments in the area;
- Consideration of relevant guidelines; and
- Cognisance must be taken of the Department of Environmental Affairs and Development Planning guideline: "Guideline for involving heritage specialists in EIA processes".

3. HERITAGE LEGISLATION

The National Heritage Resources Act (NHRA) No. 25 of 1999 protects a variety of heritage resources including palaeontological, prehistoric and historical material (including ruins) more than 100 years old (Section 35), human remains older than 60 years and located outside of a formal cemetery administered by a local authority (Section 36) and non-ruined structures older than 60 years (Section 34). Landscapes with cultural significance are also protected under the definition of the National Estate (Section 3 (3.2d)). Section 38 (2a) states that if there is reason to believe that heritage resources will be affected then an impact assessment report must be submitted. This report fulfils that requirement.

Since the project is subject to an Environmental Impact Assessment, the heritage authorities are required to provide comments on the proposed project in order to facilitate final decision making by the Department of Environmental Affairs (DEA). The relevant heritage authorities are Ngwao Boswa Kapa Bokoni (Heritage Northern Cape) for built structures and the South African Heritage Resources Agency for archaeology.

4. METHODS

The site was surveyed on the 12th December 2011 by a Principal Investigator (Jayson Orton) and a student assistant (Ross Lyall) through a combination of driving and walking. The driving aimed to locate areas that, through experience, would be more likely to contain archaeological and/or other heritage remains. These typically consisted of hills, dense gravel patches and pan and stream margins. Such areas were searched most intensively, but many other areas were walked in order to confirm expectations in those areas. All heritage resources were recorded photographically. In addition GPS co-ordinates were taken and walk and drive paths were recorded using a hand-held GPS receiver set to the WGS84 datum.

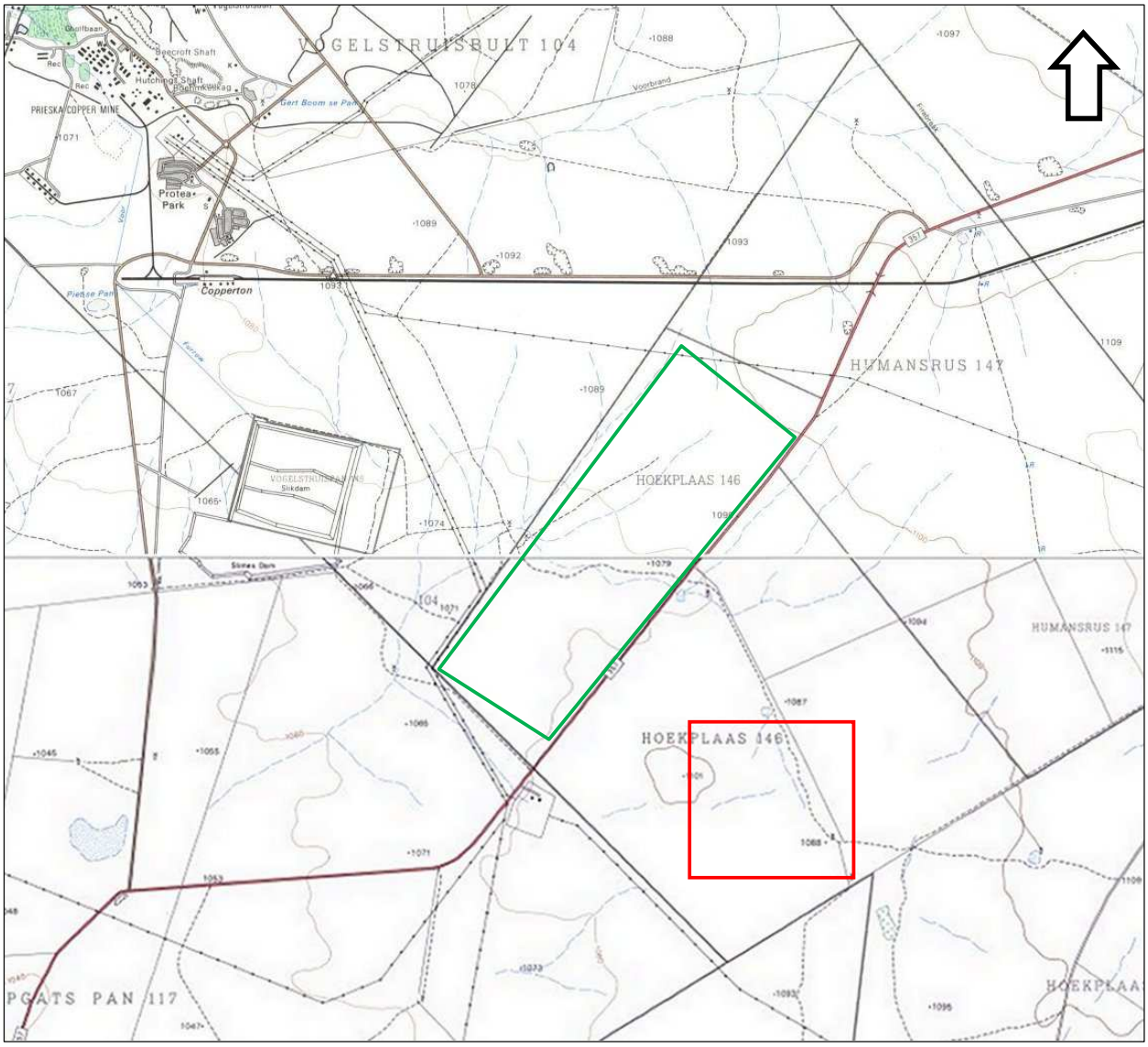

Figure 1: Map showing the location of the proposed 100 MW solar energy facility (red rectangle) on Hoekplaas, to the southeast of Copperton and the Prieska Copper Mine (visible at the upper left corner of the map) as well as the alternative 150 MW site (green rectangle).

Field numbers were allocated on the GPS during the survey and these points are indicated by a '#' in the text. All occurrences of heritage were recorded thus and only those deemed to have good integrity were actually given site numbers. These numbers are constructed through combination of a three-letter acronym for the farm name, the year of discovery (2011) and a sequential site number. The sites and other occurrences are listed in Appendix 1 and gradings, following the grading system proposed by Baumann and Winter (2005: box 5), are assigned to indicate overall heritage conservation-worthiness where appropriate. Note that this system makes no provision for sites not worthy of conservation and these are thus left ungraded. The definitions of the various grades are provided in Table 1.

Table 1: Grading of heritage resources (Source: Baumann & Winter 2005: Box 5).

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

In assessing the significance of impacts standard criteria provided by Aurecon were employed. These use the combination of magnitude, extent and duration in the determination of significance.

4.1. Limitations and assumptions

The site was relatively flat and generally coated in knee-high bushes and grass. This made ground visibility difficult in many areas, but some gravel patches and open, pan-type localities provided opportunities to examine the substrates in these areas. Aside from this, it is acknowledged that the survey density did not allow comprehensive coverage of every part of the site but it is believed that the outcome of this report would not be significantly altered by any further detailed coverage.

The survey could not practically cover the entire project area and, in terms of pre-colonial archaeology, it is assumed that, through focusing on finding and examining landscape features that seemed most likely to yield finds, an understanding of the overall archaeological and historical landscape has been attained.

Due to the difficulties associated with accessing linear routes crossing many camps and fences, the power line routes were not searched. The footprints of the pylons are small and it is assumed that they will not have impacts of any magnitude.

5. DESCRIPTION OF THE AFFECTED ENVIRONMENT

The site is very flat with knee- to waist-high vegetation over much of the area but with many areas of gravel that afforded ground visibility (Figure 2). Major landscape features present are a large pan in the middle of the southern part of the site (Figure 3) and another near the south-western corner. Just inside the southern part of the site and along the main road is a large borrow pit. According to the farmer this used to be a pan and was quarried to source calcrete for road construction. Another more ephemeral pan in the southern part of the site has some large gum trees growing alongside it (Figure 4). The substrate varies from gravel to fine silt (compare Figures 2 & 5). North of the site the abandoned slimes dam from the old Prieska Copper Mine is visible on the skyline (Figure 5).

Figure 2: General view across the Hoekplaas study area sowing vegetation and gravel areas.

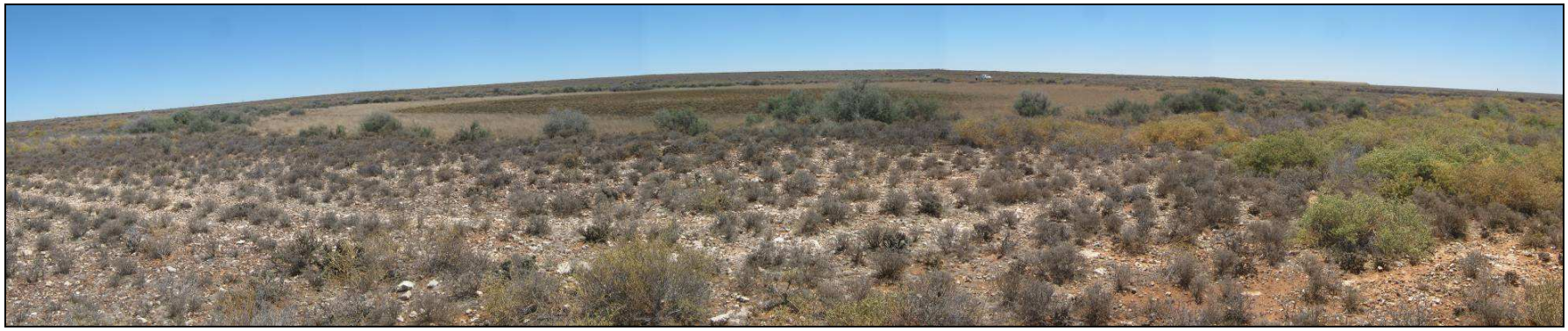

Figure 3: View across the large pan in the centre of the southern part of the Hoekplaas study area.

Figure 4: View of the gum trees at the edge of an ephemeral pan in the southern part of Hoekplaas.

Figure 5: Sandy/silty substrate on Hoekplaas with the slimes dam from the copper mine on the skyline.

6. HERITAGE CONTEXT

Much of the Karoo is covered by gravels that contain abundant stone artefacts in varying densities (personal observation). Of the Bushmanland area, Beaumont *et al.* (1995: 240) declared that "thousands of square kilometres of Bushmanland are covered by a low density lithic scatter". These artefacts are generally very well weathered and mostly pertain to the Early (ESA) and Middle Stone Age (MSA). They can be considered as background scatter in that their fine-scale distribution is conditioned more by geological actions than human actions. Occasional Later Stone Age (LSA) artefacts are also present within this scatter and these were no doubt dropped there during recent millennia. These kinds of finds were made by Kaplan (2010) and Wiltshire (Kaplan & Wiltshire 2011) on proposed PV and wind energy sites nearby. The ESA is said to be characterised by the presence of long blades, Victoria West cores and relatively few hand-axes and cleavers. Substantial MSA sites are rare with only a few isolated examples known (Beaumont *et al.* 1995). The open landscape holds few cave sites but one called Zoovoorbij Cave close to the Orange River near Upington did reveal an early MSA occupation (Smith 1995a).

A significant aspect of the Northern Cape archaeological record is the presence of pans which frequently display associated archaeological material. The only detailed work in this regard is that of Kiberd (2001, 2005, 2006) who excavated a site known as Bundu Pan, some 25 to 30 km northwest of Copperton. The site had initially been revealed by excavations to obtain gravel for surfacing local roads with early observations noting MSA artefacts on quartzite eroding from the sections. The artefacts were accompanied by warthog and equid teeth (Beaumont *et al.* 1995). The site was subsequently excavated between 1998 and 2003 and, importantly, found to actually contain stratified deposits ascribable to the ESA, MSA and LSA. The preserved Pleistocene faunal material was confirmed and found to include, in decreasing order of abundance, the bones of wildebeest, warthog, extinct giant hartebeest, two species of equid (horse/zebra), baboon, springbok and blesbok (Kiberd 2006). The only other site in the Northern Cape Province to contain all three Stone Ages is Wonderwerk Cave near Kuruman with its deep stratified deposits (Humphreys & Thackeray 1983). Such sites are generally rare in South Africa. Local pans were also examined by Wiltshire (Kaplan & Wiltshire 2011) and found to have greater densities of archaeological material surrounding them.

Several Later Stone Age sites in the Bushmanland area to the northwest, west and southwest of Copperton have been investigated by Beaumont and colleagues (1995), Smith (1995a) and Parsons (2003, 2004, 2007, 2008). Work on these sites led to a distinction between hunter-gatherer and herder sites, based on stone artefact assemblages (Beaumont *et al.* 1995; Beaumont & Vogel 1984, 1989; Parsons 2003), which has recently been called into question (Parsons 2007). Briefly, the hunter-gatherer assemblages, termed 'Swartkop', were said to be dominated by hornfels, but with some quartz, and to have many blades with backed blades a common retouched type (Morris 1990; Orton 2002/3). Earlier assemblages have proportionally more blades and fewer potsherds with later sites the reverse. Ceramics are usually grass-tempered (Beaumont & Vogel 1989). The herder sites, termed 'Doornfontein', were said to be mostly irregular flakes usually made on quartz and to have many potsherds, including lugs and spouts, associated with them, but with lugs absent on sites older than about AD 700 (Beaumont *et al.* 1995). Smith (1995a) notes that Doornfontein sites tend to occur along the river, while Swartkop sites are usually found further from the river. Sites dating more than about 2000 years ago belong to a group that Beaumont *et al.* (1995) refer to as Springbokoog. Such sites are likely the predecessors of the Swartkop sites and also have high frequencies of backed blades though to the east backed blades and scrapers may be more equal in proportion as shown by a sample from Prieska. All these Later Stone Age sites have very few, if any, organic items on them. The only organic find usually present is fragments of ostrich eggshell which originated either from eggs eaten or else whole shells used as flasks. Many such flasks have been found across the Northern Cape (Morris 1994; Morris & Von Bezing 1996). One of the farmers during the present study mentioned that his family had found several ostrich eggshell flasks with three holes in them. One end had one hole which was used for drinking and otherwise lugged. The other two holes were placed at the opposite end and were threaded for the purposes of carrying the suspended flask.

Rock art, in the form of engravings, is widely known from Bushmanland and the Northern Cape in general (Beaumont *et al.* 1995; Beaumont & Vogel 1989; Rudner & Rudner 1968; Rusch & Parkington 2010; Wilman 1933) where sites such as Wildebeest Kuil, Driekopseiland are well known. Various styles occur and are attributed to different time periods; incised finelines extend back the furthest in time, while pecked and scraped engravings occur within the last 2000 years. The latter have the smallest distribution between Kenhardt, Beaufort West and De Aar (Beaumont & Vogel 1989). During our time in the field one of the farmers pointed out an engraving site along the road between Copperton and Vanwyksvlei. At this site we found scraped engravings of eland and ostrich as well as very recent (historical) incised (perhaps better termed scratched) engravings including horses with riders, one chariot and some writing. This site is known to researchers and is probably the nearest engraving site to Copperton (David Morris, pers. comm. 2012).

The last Stone Age archaeological concern is stone circles. These low structures are not well studied but work further east along the Orange River (Sampson 1968), in the Seacow Valley in the eastern Karoo (Sampson 1986) and also at Bloubos northwest of Upington (Parsons 2004) suggests they may well have been the bases in which huts or windbreaks were constructed. Similar stone circles have recently also been discovered at De Aar in the central Karoo (Orton 2011). Such stone circles are very different to the far more substantial piled stone kraals commonly encountered in the central and eastern Karoo regions (Hart 1989, 2005; Orton & Halkett 2010; Sampson 1984, 1985, 1986, 2010).

Indigenous people were present in this area until quite recently with one of the farmers, Frans Ekkert, informing us that when his grandfather began farming in the area in 1864 there were still many Bushman living there. Smith (1995b) notes that around that time white farmers were making extensive use of Bushmanland for summer grazing and that this led to the extermination of the massive springbok herds on which the indigenous population subsisted. This in turn led to the locals turning to the farmers for food (and employment), effectively ending the span of prehistory in the region.

More recent heritage relevant to the study area includes the typical flat-roofed Karoo-style houses commonly found in the small towns. None were noted to occur close to Copperton with the town itself being quite recent and related to the start of copper and zinc mining there during the 1970s. Mining ceased during the 1990s. Much of the town was demolished after this. Being so arid, the farms in the area are large and used only for livestock grazing. Farm complexes are rarely seen on the landscape and tend to be relatively recent.

The Anglo-Boer War included action in Bushmanland with the British fort at Prieska being a fine example. War graves are also present there (Southerncape 2010).

7. FINDINGS

Figure 6 shows the distribution of archaeological resources recorded during the survey as well as the walk- and drive-paths taken. It can be seen that one large cluster of occurrences is situated at the large pan in the centre of the site, while the pan in the south-western area was archaeologically poor. The other revealed no good sites but there were a number of occurrences there. Over the remainder of the study area, most finds were examples of background scatter. While all the discrete sites relate to LSA occupations, the background scatter is almost all ESA and MSA. These two types of archaeological occurrences will be addressed separately.

7.1. Background Stone Age artefact scatter

Artefacts were observed in low densities over much of the study area and Figure 7 shows a selection of these. Quartzite strongly dominates the background scatter but some cryptocrystalline silica (CCS) is present. Hornfels is absent. Weathering states vary indicating a vast span of time over which the artefacts have accumulated. Such finds have no discernible original context and have little to no archaeological value. Some places revealed slightly elevated frequencies of artefacts, but this is generally unrelated to human factors. GPS points were taken at such places and selections of artefacts were photographed. These appear in Figures 8 to 14. In one area a few LSA artefacts and some ostrich eggshell, essentially an ephemeral site (HKP2011/015), were located. Figure 10 shows the clear difference between these artefacts and the background scatter found in the same place. At one place an isolated lower grindstone was found. It had a flaked edge showing that it also doubled as a core (Figures 14 & 15). This large artefact is too heavy to carry around and must indicate that people camped at this spot in the past, perhaps leaving very few, if any, other traces of their passing. Other items of background scatter were also located here.

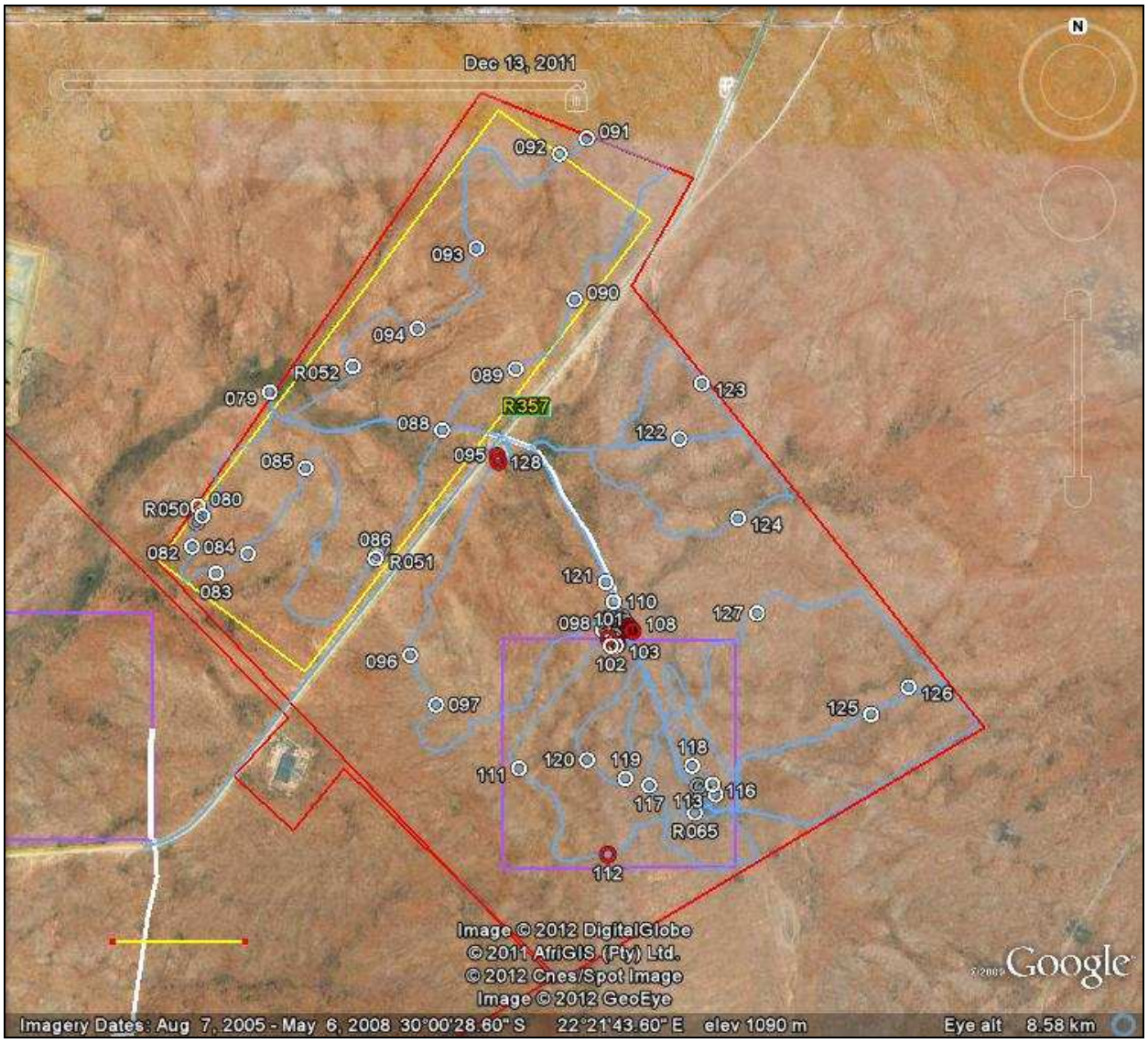

Figure 6: Aerial view of the study area taken from Google Earth and showing the distribution of recorded archaeological occurrences by their field numbers. The yellow bar for scale at lower left is 100 m. (Red sites require mitigation, white ones do not.)

Figure 7: Selection of isolated artefacts from the background scatter on Hoekplaas showing the variability in materials and weathering states.

Figure 8: Artefacts from #079.

Figure 9: Artefacts from #086 including a hand-axe at lower right.

Figure 10: Artefacts and ostrich eggshell fragments from #R051. The three larger artefacts are background scatter While the quartz and eggshell are site HKP2011/015.

Figure 11: Artefacts of quartzite, quartz and CCS from #106.

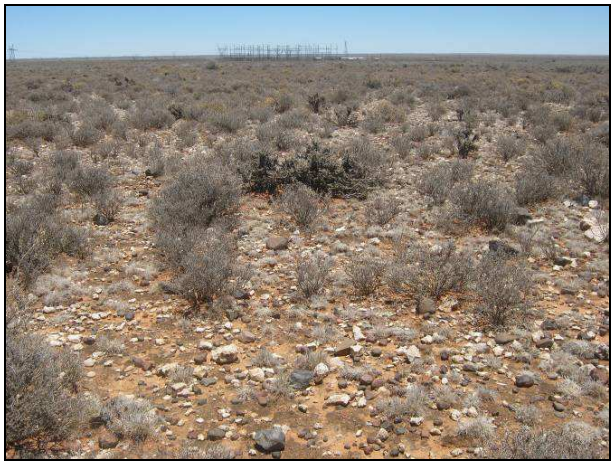

Figure 12: Artefacts from #097 and surface gravel.

Figure 13: Environment at point #097.

Figure 14: The isolated lower grindstone from #R056.

Figure 15: Polished surface and flaked edge of the lower grindstone from R056.

Among the background scatter were occasional hand-axes pertaining to the ESA. These were, without fail, heavily weathered testifying to the great length of time over which they have been exposed at the surface (Figures 16 & 17). Another bifacial artefact that cannot be classified as a hand-axe came from point #087 (Figure 17). It is less weathered than the complete hand-axes and may actually be a core, probably relating to the MSA.

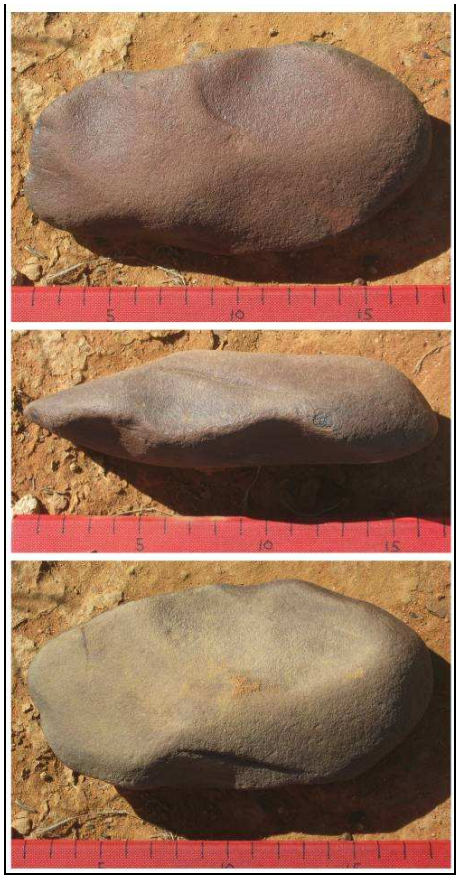

Figure 16: Hand-axe from #086. **Figure 17:** Hand-axe from #123. **Figure 18:** Bifacial artefact from #087.

7.2. Discrete Stone Age sites

A number of discrete LSA archaeological sites and one MSA site were found during the survey. The former focus strongly on the margins of the pan in the centre of the southern part of the study area. Most were small and of limited importance. HKP2011/001 (found at point #094) was a peculiar scatter of larger quartzite artefacts, all of which looked relatively unweathered. This prompted the suggestion that they were LSA in age (Figure 19). They were located on sandy ground and were not part of the general background scatter normally associated with gravel (Figure 20). More typical of the LSA was site HKP2011/003 (#098 & #099) in that a high proportion of the artefacts were of CCS (Figure 21). As expected, though, quartz and quartzite were also present. The site was found in a sandy clearing not far from the pan (Figure 22). HKP2011/004 was in a rather bushy area but had a lower grindstone and a hammerstone / upper grindstone present. Ostrich eggshell fragments were also noted on the site.

Figure 19: Artefacts from site HKP2011/001 (#094).

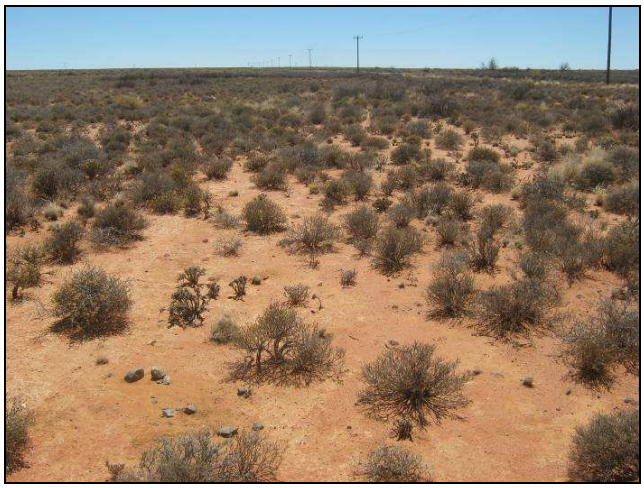

Figure 20: Location of HKP2011/001 in a sandy area.

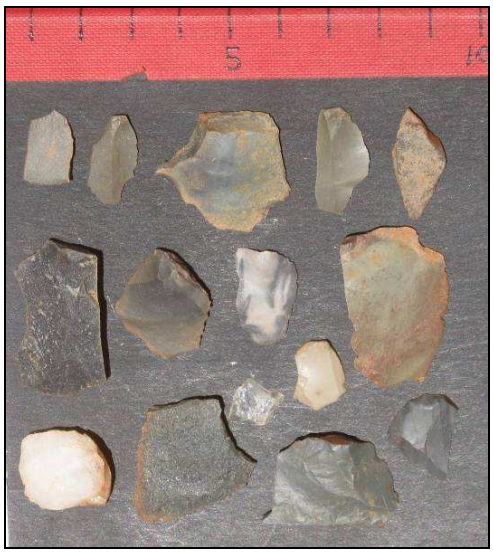

Figure 21: Artefacts from HKP2011/003. At least half the artefacts pictured are of CCS, and are microlithic supporting an ascription to the LSA.

Figure 22: The situation of HKP2011/003 (#098 & #099). The site was found in a sandy patch close to the pan(visible in the background).

A good scatter of CCS, quartz and quartzite pertaining to the LSA was found at HKP2011/006 (#104) at the southern edge of the pan. This scatter included one of the few retouched pieces seen, a backed point (Figures 23 & 24). Perhaps the most significant LSA site located on this farm was HKP2011/008 (#107 & #108). The site was more dense than most of the others and, very unusually, included hornfels as a stone material (very little hornfels has been noted during surveys by the author in the Copperton area). A backed point was also noted here on hornfels. This is a long, thin, pointed stone artefact with a blunt edge opposing a sharp edge – similar to a knife blade. CCS was particularly abundant at point #108 and an anvil stone was also seen there (Figures 25 & 26). Anvils were used for resting cores on during flaking and perhaps offer a more direct clue that flaking was occurring at that particular point.

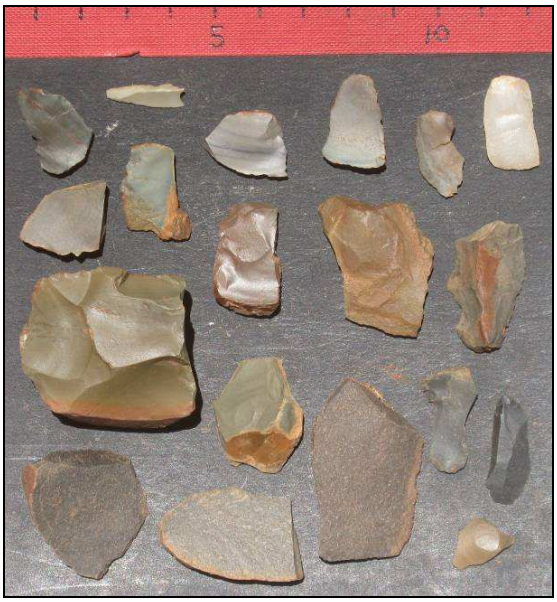

Figure 23: Artefacts from HKP2011/006 (#104).Most arein CCS including a backed point enlarged in Figure 23.

Figure 24: The CCS backed point from HKP2011/005. The upper edge in this view is backed.

Figure 25: CCS, quartz and quartzite artefacts From HKP2011/008 (#107 & #108).

F**igure 26:** The anvil stone and surrounding artefact scatter at HKP2011/008. The damaged surface of the anvil is visible.

Although not really a site in terms of numbers of artefacts present, HKP2011/011 was singled out as a site due to the activity that was carried out here. At this point (#111) we found a flaked outcrop (or perhaps half-buried boulder) of quartzite (Figure 27). HKP2011/012 (#112) was unusual for the presence of bone (Figure 28). Only unidentifiable fragments were noted, however. Also noted on this site were some ostrich eggshell fragments and one CCS endscraper.

Figure 27: The flaked quartzite outcrop at HKP2011/011 (#111).

Figure 28: Artefacts and a bone fragment from HKP2011/012 (#112).

The only MSA site found was at HKP2011/002 (#095 & #128). This was at the pan alongside the road that is now a quarry for road gravel (Figure 29)[1]. This site is by far the most significant archaeological occurrence found as it preserves buried MSA stone artefacts and faunal remains (Figure 30). The former included numerous blades, while the latter was represented only by multiple fragments of a single large tooth that appears to be from an equid (horse or zebra; T. Steele, pers. comm. 2011; Figures 31 & 32). This is interesting in light of the fact that Kibberd (2006) found this group of animal to be most frequent in his MSA collection from Bundu Pan discussed in Section 5 above. The buried MSA clearly originates from a gravel lag deposit which has, over time, become buried some 0.3 m to 0.5 m below present surface. This deposit is evident in section in the erosion gully that now leads into the pan (Figure 33). Also significant here is the likely presence of LSA material that presumably comes from above the MSA. This included a few stone artefacts in quartz. A few fragments of slag were found amongst the MSA artefacts in the erosion gully and these indicate some sort of metal-working, whether prehistoric or historic one cannot tell.

Further from the erosion gully the numbers of artefacts appeared to drop off and it is clear that the site does not extend far beyond the south-western edge of the excavated area. However, artefacts are present over a wide area and a beautiful unifacial point of some 80 mm length was noted at #128 (Figure 34).

[1] With this important site now on record SAHRA should be aware that it might be lost through further quarrying. The appropriate local authorities should be informed by SAHRA that this borrow pit needs protection or mitigation. This does not in any way affect the present development proposal.

Figure 29: HKP2011/002 (#095) was found in the erosion gully leading into the pan.

Figure 30: Artefacts (on the ground), tooth and slag fragments (on the book) from HKP2011/002.

Figure 31: The equid tooth from HKP2011/002.

Figure 32: Upper occlusal of the HKP2011/002 tooth.

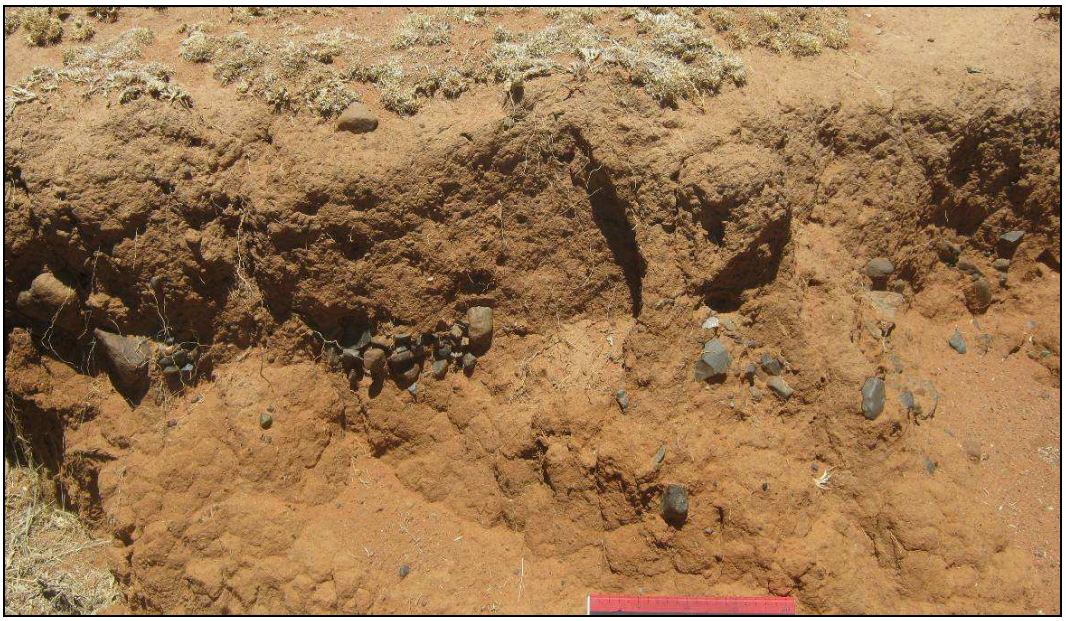

Figure 33: The buried gravel lag deposit containing artefacts as revealed in the side of the erosion gully. The length of the book is 0.21 m.

Figure 34: Dorsal, edge and ventral views (top to bottom) of the unifacial point found at HKP2011/002 (#128).

7.3. Built environment

There are no buildings or other structures on the subject site. The nearest buildings still in use are the remaining houses in Copperton some 9 km to 10 km north of the site. These are modern (1960s/1970s) and of no heritage value. Also nearby are some old farm structures on a neighbouring farm (Klipgatspan) but these are well away from the proposed development on Hoekplaas.

7.4. Cultural landscapes

Only one cultural landscape was noted but it is of very low significance. It is composed of an ephemeral pan with gum trees, a windmill, water troughs and an old cement dam alongside it. All these elements are likely 20th century in age (Figure 35). This heritage resource was labelled HKP2011/013. The trees were probably planted to provide shade for small stock since there is no evidence of any settlement in the vicinity. For the rest, the study area is open, undeveloped farm land crossed only by a few fences.

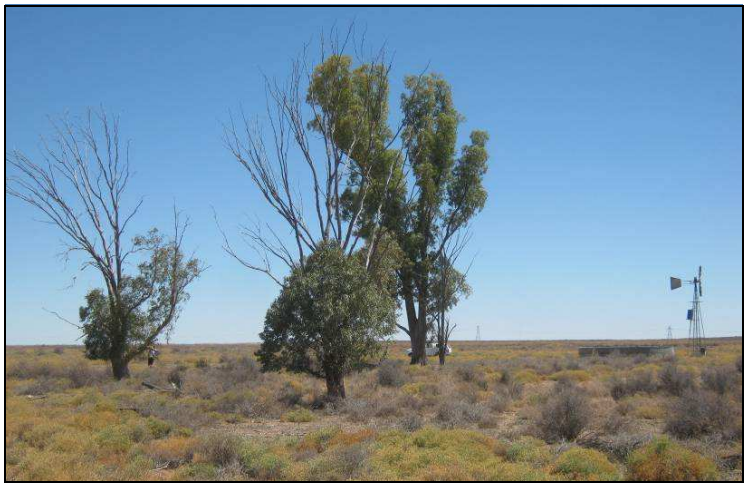

Figure 35: View of the gum trees, windmill and cement dam at HKP2011/013.

7.5. Scenic routes, sense of place and visual concerns

The R357, which connects Prieska with Vanwyksvlei via Copperton, is generally scenic in that one experiences the typical vast, undeveloped open space of the Karoo while driving along it. The study area straddles this road with Alternative 1 being about 1 km to the southeast and Alternative 2 being directly alongside the road. While Alternative 1 may not be fully visible from the R357, Alternative 2 will result in a significant detraction from the sense of place and scenic value along the road. However, it should be borne in mind that very few people use the road making any visual impacts to it of reduced concern. The solar energy facility would not exceed 4.5 m in height.

8. ASSESSMENT OF IMPACTS

Impacts to archaeological resources and scenic routes/sense of place are assessed. No buildings of heritage value will be affected either physically or visually by the proposed facility

and so no assessment of the built environment is provided. It should be noted that the visual impact assessment (being conducted by Karen Hansen) will further inform on the visual impacts.

8.1. Archaeology

Most archaeology present on the site is background scatter of low significance but important MSA and LSA archaeological sites do occur. These are focused around the pans with the exception of a few very small camps that occur further away. Given the smaller size of Alternative 1, it will result in a smaller cumulative impact through loss of less archaeology, but being alongside the pan will result in more important resources being lost. When a final layout has been decided on, mitigation of any sites that will be disturbed during construction should occur. This would consist of archaeological excavation. It is also recommended that test excavations be conducted in areas within about 100 m of any pans if development is planned within such areas. Note that, since no significant archaeological sites were found in the footprint of Alternative 2, no mitigation is proposed there.

Table 2: Assessment of archaeological impacts for PV3 Alternative 1.

	Before mitigation	**After mitigation**
Magnitude	Medium	Low
Extent	Site specific	Site specific
Duration	Long term	Long term
Significance	Medium	Low
Probability	Probable	Probable
Status	Negative	Negative
Reversible	No	
Cumulative impacts	Considering the scale of archaeological research in other parts of South Africa, relatively little is known of Bushmanland with no excavated sites known from close to Copperton. It is considered that the loss of any significant LSA sites will impact on our knowledge of the wider region. With many energy generation facilities planned in the region the potential to lose many sites exists.	

Table 3: Assessment of archaeological impacts for PV3 Alternative 2.

	Before mitigation	**After mitigation**
Magnitude	Low	-
Extent	Site specific	-
Duration	Long term	-
Significance	Low	-
Probability	Probable	-
Status	Negative	-
Reversible	No	
Cumulative impacts	Considering the scale of archaeological research in other parts of South Africa, relatively little is known of Bushmanland with no excavated sites known from close to Copperton. It is considered that the loss of any significant LSA sites will impact on our knowledge of the wider region. With many energy generation facilities planned in the region the potential to lose many sites exists.	

8.2. Scenic routes and sense of place

The R357 to the south of the site is little used aside from a few local farmers and, although scenic, is not considered an important scenic route. This makes the significance of visual impacts to it very low. The landscape setting is typical of the Karoo region, however it is not unique and has been compromised by the presence of the now abandoned Prieska Copper Mine to the west. Given the general topography, no mitigation is proposed for this set of impacts. Imposition of a berm, for example, would create an impact of its own through alteration of the natural landform and, given that the facility would be dismantled and the site rehabilitated, it is considered better to avoid such artificial landforms. Similarly, planting of trees is impractical and unnatural in this landscape.

Table 4: Assessment of impacts to scenic routes and sense of place for PV2 Alternative 1.

	Before mitigation	**After mitigation**
Magnitude	Low	-
Extent	Local	-
Duration	Long term	-
Significance	Low	-
Probability	Definite	-
Status	Negative	-
Reversible	Yes (with rehabilitation)	
Cumulative impacts	A number of PV and wind energy facilities are planned for the area (with one PV already approved on the same farm) and if all are constructed then cumulative visual impacts to the landscape will be of concern and will detract from peoples' experience of the place.	

Table 5: Assessment of impacts to scenic routes and sense of place for PV2 Alternative 2.

	Before mitigation	**After mitigation**
Magnitude	Medium	-
Extent	Local	-
Duration	Long term	-
Significance	Medium	-
Probability	Definite	-
Status	Negative	-
Reversible	Yes (with rehabilitation)	
Cumulative impacts	A number of PV and wind energy facilities are planned for the area and if all are constructed then cumulative visual impacts to the landscape will be of concern and will detract from peoples' experience of the place.	

9. CONCLUSIONS & RECOMMENDATIONS

The impacts to heritage resources are not considered to be highly significant and archaeological sites can very easily be mitigated. This mitigation would consist of excavation and sampling of sites as well as test excavations around the pans to check for subsurface archaeology. Such mitigation should be implemented only for sites and areas within 100 m of pans and that will be disturbed during construction. This is deemed significant considering the presence of MSA with preserved fauna at Bundu Pan to the north of Copperton.

Sites deemed to require mitigation are:

- HKP2011/002;
- HKP2011/004;
- HKP2011/006;
- HKP2011/007;
- HKP2011/008;
- HKP2011/009; and
- HKP2011/012.

Only HKP2011/004 and HKP2011/006 fall within or very close to the footprint of Alternative 1 (Figure 35), while none are affected by Alternative 2. Alternative 1 also comes within 100 m of the pan to the north of the proposed facility (Figure 35) and some testing of subsurface deposits would also be needed there in addition to the archaeological mitigation. Should the planned access road running past the pan be constructed then site HKP2011/009 (#109) should also be mitigated through excavation as it lies immediately alongside the present road.

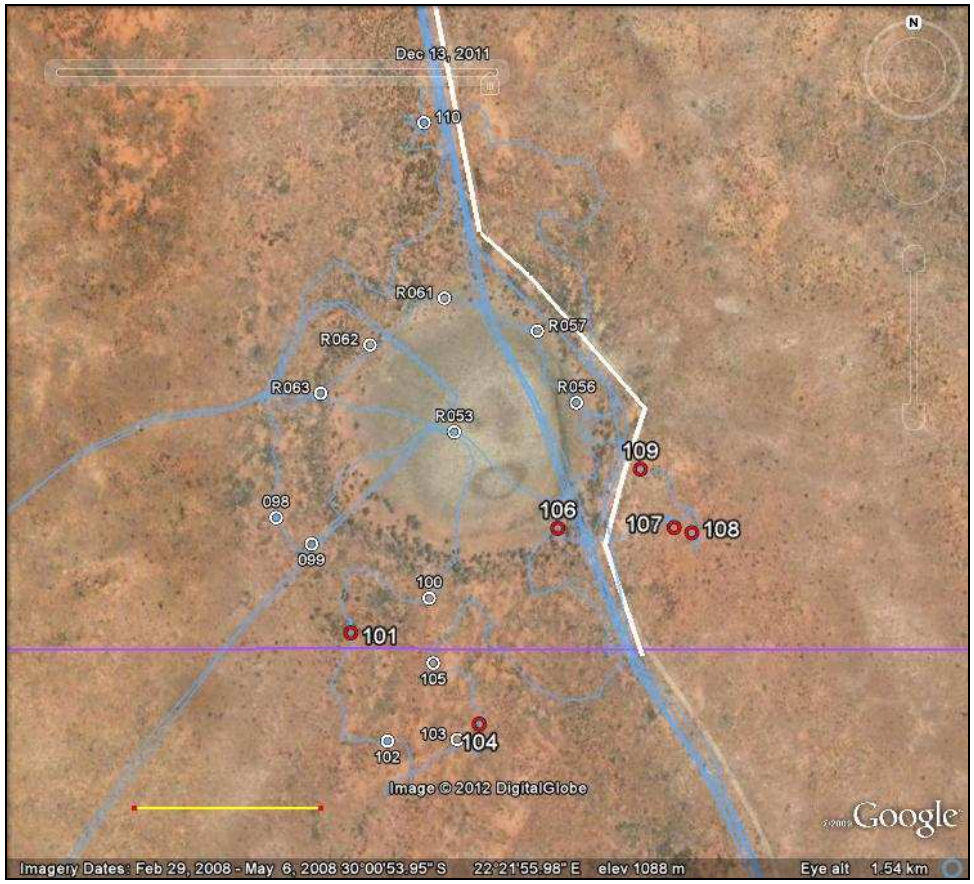

Figure 35: Aerial view of the vicinity around the pan in the centre of Hoekplaas. Alternative 1 lies to the south of the purple line and the yellow bar for scale at lower left is 100 m. The white line is the access road.

The addition of new power lines to the area will not have a significant impact on the general character of the area due to the electrical and mining infrastructure already in place. However, the presence of high densities of archaeological material around pans suggests that these should be avoided in the routing of the lines. It should be remembered that it is not only the pylons but also the service roads beneath the lines that cause impacts. It is

suggested that a buffer of approximately 100 m from the edge of any pans be employed. Furthermore, access roads would require surface sites to be mitigated but no subsurface testing is required for roads passing close to the pan.

It should be noted that if the project footprint is adjusted to within 100 m of the northern pan (now a borrow pit), then that area would need to be subjected to a detailed survey.

Alternative 1 will potentially have more significant archaeological impacts but Alternative 2 has the greater visual impacts. Archaeology is easier to mitigate and Alternative 1 is thus slightly favoured. It is recommended that the proposed project be allowed to proceed, but subject to the following mitigation measures:

- The suggested archaeological mitigation should be implemented as necessary;
- Test excavations around the pans should be done to check for buried archaeological material (if development encroaches within 100 m of any pan margins but excluding for access roads);
- Transmission lines should stay at least 100 m away from the edge of any pans implicated in the final route; and
- If any human remains are uncovered during development then work in the immediate vicinity should be halted and the finds protected and reported to SAHRA (021 462 4502).

10. REFERENCES

Baumann, N. & Winter, S. 2005. Guideline for involving heritage specialists in EIA process. Edition 1. CSIR report No ENV-S-C 2005 053E. Provincial Government of the Western Cape: Department of Environmental Affairs and Developmental Planning.

Beaumont, P.B., Smith, A.B. & Vogel, J.C. 1995. Before the Einiqua: the archaeology of the frontier zone. In: Smith, A.B. (ed.) Einiqualand: studies of the Orange River frontier: 236-264. Cape Town: University of Cape Town Press.

Beaumont, P.B. & Vogel, J.C. 1984. Spatial patterning of the ceramic Later Stone Age i the northern Cape, South Africa. In: Hall, M., Avery, G., Avery, D.M., Wilson, M.L. & Humphreys, A.J.B. (eds) Frontiers: southern African archaeology today: 80-95. Oxford: British Archaeological Reports International Series 207.

Beaumont, P.B. & Vogel, J.C. 1989. Patterns in the age and context of rock art in the northern Cape. South African Archaeological Bulletin 44: 73-81.

Hart, T.J.G. 1989. Haaskraal and Volstruisfontein: Later Stone Age events at two rockshelters in the Zeekoe Valley, Great Karoo, South Africa. Unpublished M.A. dissertation, University of Cape Town.

Hart, T. 2005. Heritage impact assessment of a proposed Sutherland golf estate, Sutherland, Northern Cape Province. Unpublished report prepared for DJ Environmental. Archaeology Contracts Office, University of Cape Town.

Kaplan, J. 2010. Archaeological scoping study and impact assessment of a proposed photovoltaic power generation facility in Copperton Northern Cape. Unpublished report prepared for DJ Environmental Consultants.

Kiberd, P. 2001. Bundu Farm: a Middle and Later Stone Age pan site, Northern Cape, South Africa: preliminary results of fieldwork. Nyame Akuma 55: 51-55.

Kiberd, P. 2005. Bundu Farm and the transition from Earlier to Middle Stone Age in the Northern Cape, South Africa. Unpublished M.Phil dissertation. Southampton: University of Southampton.

Kiberd, P. 2006. Bundu Farm: a report on archaeological and palaeoenvironmental assemblages from a pan site in Bushmanland, Northern Cape, South Africa. South African Archaeological Bulletin 61: 189-201.

Humphreys, A.J.B. & Thackeray, A.I. 1983. Ghaap and Gariep: Later Stone Age studies in the northern Cape. Cape Town: South African Archaeological Society Monograph Series No. 2.

Morris, D. 1990. "Etchings" and "intaglios" in the Upper Karoo. In: Beaumont, P & Morris, D. (eds) Guide to archaeological sites in the Northern Cape: 232-258. Kimberley: McGregor Museum.

Morris, D. 1994. An ostrich eggshell cache from the Vaalbos National Park, Northern Cape, South Africa. Southern African Field Archaeology 3: 55-58.

Morris, D. & Von Bezing, I. 1996. The salvage of a cache of ostrich eggshell flasks near Kenhardt, Northern Cape. McGregor Miscellany 6(2): 3-4.

Orton, J. 2002/2003. Superficial comparisons and reality: a reassessment of Dunefield Midden and the Swartkop Industry. Southern African Field Archaeology 11 & 12: 63-67.

Orton, J. 2011. Heritage impact assessment for three solar energy facilities at De Aar, Northern Cape. Unpublished report prepared for Aurecon South Africa (Pty) Ltd. St James: ACO Associates.

Orton & Halkett 2011. Heritage impact assessment for the proposed photovoltaic solar energy facility on the remainder of farm Jakhalsvalley 99, Sutherland Magisterial District, Northern Cape.

Parsons, I. 2003. Lithic expressions of Later Stone Age lifeways in the Northern Cape. South African Archaeological Bulletin 58: 33-37.

Parsons, I. 2004. Stone circles in the Bloubos landscape, Northern Cape. Southern African Humanities 16: 59-69.

Parsons, I. 2007. Hunter-gatherers or herders? Reconsidering the Swartkop and Doornfontein Industries, Northern Cape Province, South Africa. Before Farming 2007/4: Article 3.

Parson, I. 2008. Five Later Stone Age artefact assemblages from the interior Northern Cape Province. South African Archaeological Bulletin 63: 51-60.

Rudner, J. & Rudner, I. 1968. Rock-art in the thirstland areas. South African Archaeological Bulletin 23: 75-89.

Rusch, N. & Parkington, J. 2010. San rock engravings marking the Karoo landscape. Cape Town: Struik Travel & Heritage.

Sampson, C.G. 1968. The Middle Stone Age industries of the Orange River scheme area. National Museum Bloemfontein Memoir 4: 1–111.

Sampson, C.G. 1984. A prehistoric pastoralist frontier in the Upper Zeekoe Valley, South Africa. In: Hall, M., Avery, G., Avery, D.M., Wilson, M.L. & Humphreys, A.J.B (eds) Frontiers: southern African archaeology today: 96 – 110. Oxford: British Archaeological Reports International series 207.

Sampson, C.G. 1985. Atlas of Stone Age settlement in the central and upper Seacow Valley. Memoirs of the National Museum (Bloemfontein) 20: 1-116.

Sampson, C.G. 1986. Model of a prehistoric herder-hunter contact zone: a first approximation. South African Archaeological Society Goodwin Series 5: 50-56.

Sampson, C.G. 2010. Chronology and dynamics of Later Stone Age herders in the Seacow River valley, South Africa. Journal of Arid Environments 74:848-848.

Smith, A.B. 1995. Archaeological observations along the Orange River and its hinterland. In: Smith, A.B. (ed.) Einiqualand: studies of the Orange River frontier: 236-264. Rondebosch: UCT Press.

Smith, A.B. 1995b. Introduction. In: Smith, A.B. (ed.) Einiqualand: studies of the Orange River frontier: xvii-xx. Rondebosch: UCT Press.

Southern Cape. 2010. http://www.southerncape.co.za/towns/prieska/welcome.php. Accessed 2nd January 2012.

Vogel, J.C., Visser, E. & Fuls, A 2001. Suitability of ostrich eggshell for radiocarbon dating. Radiocarbon 43:133-137.

Wilman, M. 1933. The rock engravings of Griqualand West and Bechuanaland, South Africa. Cambridge: Bell.

11. INVESTIGATION TEAM

Fieldwork:	J. Orton (Principal Investigator) R. Lyall (Student assistant)
Report:	J. Orton

APPENDIX 1: LIST OF ARCHAEOLOGICAL OCCURRENCES

Note that in this table the columns are interpreted as follows:

Field No: number allocated by the GPS in the field for each occurrence (numbers with '∞' alongside them denote occurrences illustrated and/or described in the text);
Site No: number allocated afterwards for those occurrences deemed suitable to be called archaeological sites (they have spatial integrity and are not 'background scatter');
Description: short description of the occurrence; and
Significance, grade & mitigation requirements: how important the occurrence is in archaeological terms, the assigned heritage conservation grading (where applicable) and the estimated time requirement for appropriate mitigation (where applicable and excluding any new sites discovered through test excavations).

Field No.	Site No.	Co-ordinate location	Description	Significance, grade & mitigation requirements
079∞		S29 59 57.0 E22 20 17.1	Dense background scatter in gravel patch.	Very low
080		S30 00 25.0 E22 19 56.7	Background scatter in gravel area.	Very low
081		S30 00 29.0 E22 19 56.3	Odd pile of stones over bedrock outcrop.	Very low
082		S30 00 34.9 E22 19 55.1	Background scatter in gravel area. Also the remains of a mounting of something (?pump) and a hole and an old tyre and hub cap.	Very low
083		S30 00 41.5 E22 20 01.9	Background scatter in gravel area.	Very low
084		S30 00 36.7 E22 20 10.9	Background scatter in gravel area.	Very low
085		S30 00 15.6 E22 20 27.2	Background scatter in gravel area.	Very low
086∞		S30 00 37.8 E22 20 47.2	Background scatter in sandy area with many cores and one hand-axe.	Very low
087∞		S30 00 35.3 E22 20 49.0	Background scatter including one bifacial artefact near R051.	Very low
088		S30 00 06.3 E22 21 06.0	Background scatter in sandy area.	Very low
089		S29 59 51.3 E22 21 26.8	Background scatter in sandy area with some gravel.	Very low
090		S29 59 34.3 E22 21 43.5	Background scatter in gravel area including one very large ?unfinished cleaver.	Very low
091		S29 58 54.9 E22 21 46.9	Background scatter in gravel area.	Very low
092		S29 58 58.6 E22 21 39.2	Odd rectangular stone feature. 0.5 x 1.0 m.	Very low
093		S29 59 21.7 E22 21 15.7	Background scatter in gravel area.	Very low
094∞	HKP2011/001	S29 59 41.4	Discrete quartzite scatter all of	Low

Field No.	Site No.	Co-ordinate location	Description	Significance, grade & mitigation requirements
		E22 20 59.0	same type of rock and looks fresh. Likely LSA.	
095∞	HKP2011/002	S30 00 14.0 E22 21 22.0	This site is revealed in the eroded edge of a pan which has been quarried for road material. There is a layer of pebbles and artefacts about 0.3 m to 0.5 m below surface and is a reburied lag deposit. The assemblage is blade-rich MSA quartzite but includes an LSA CCS and quartz component in the same horizon. A fossil tooth (?equid) was found associated. A single MSA unifacial point was also found. Also one old hammer stone. The site continues around the southwest edge of the pit.	High (7 days) Grade 3A
128∞		S30 00 12.6 E22 21 21.6	Position of unifacial point at HKP2011/002.	
096		S30 01 01.5 E22 20 57.1	Background scatter in gravel area. This is up on the high ground where the gravel and artefacts are extremely extensive.	Very low
097∞		S30 01 13.7 E22 21 04.4	Background scatter in gravel area. Big ESA radial core and some ESA/MSA blades.	Very low
098∞	HKP2011/003	S30 00 55.3 E22 21 51.7	Small LSA CCS, quartz and quartzite scatter in open sandy area.	Low
099∞		S30 00 55.7 E22 21 52.4	More of 098.	
100		S30 00 56.7 E22 21 54.8	Background scatter in gravel area on the edge of the pan. Artefacts seem to be more dense closer to the pan.	Very low
101∞	HKP2011/004	S30 00 57.3 E22 21 53.2	LSA scatter of CCS, quartz, quartzite and ostrich eggshell in sandy (but bushy) area. Also a lower grindstone and a hammer stone / upper grindstone.	Low (0.5 day)
102	HKP2011/005	S30 00 59.2 E22 21 54.0	LSA scatter of CCS, quartz and quartzite in sandy area with some gravel.	Low
103		S30 00 59.1 E22 21 55.4	Background scatter in gravel area.	Very low
104∞	HKP2011/006	S30 00 58.9 E22 21 55.8	LSA scatter of CCS, quartz and quartzite and including one CCS backed point.	Medium (0.5 day) Grade 3C
105		S30 00 57.8 E22 21 54.9	Dense background scatter but including quite a lot of fresh ?LSA quartzite.	Low
106	HKP2011/007	S30 00 55.5	Good LSA quartzite scatter on the	Low-medium (0.5

Field No.	Site No.	Co-ordinate location	Description	Significance, grade & mitigation requirements
		E22 21 57.4	edge of the pan. Also some quartz and CCS. Many blades.	day) Grade 3C
107∞	HKP2011/008	S30 00 55.4 E22 21 59.7	LSA CCS, quartz, quartzite and hornfels scatter including one hornfels backed point.	Medium (1 day) Grade 3C
108∞		S30 00 55.5 E22 22 00.1	As above but a dense patch here with an anvil stone and plenty of CCS.	
109	HKP2011/009	S30 00 54.4 E22 21 59.0	LSA scatter of CCS, quartz and quartzite in sandy area with some calcrete fragments.	Low-medium (0.5 day) Grade 3C
110	HKP2011/010	S30 00 48.4 E22 21 54.7	Ephemeral LSA scatter of CCS, quartz and quartzite in a sandy area.	Low
111∞	HKP2011/011	S30 01 29.2 E22 21 28.0	Flaked outcrop of quartzite but also background scatter occurs widely over the hilltop.	Very low
112∞	HKP2011/012	S30 01 50.3 E22 21 53.2	LSA scatter of CCS, quartz, quartzite and ostrich eggshell. Some bone noted and one CCS endscraper. Also background scatter around here.	Low-medium (0.5 day) Grade 3C
113	HKP2011/013	S30 01 35.6 E22 22 23.7	Cultural landscape. Several blue gum trees, old dam, windmill, troughs.	Low
114		S30 01 34.1 E22 22 19.8	The large but ephemeral pan here has artefacts occurring as background scatter around and in it. No obvious concentrations and generally little LSA.	Very low
115		S30 01 33.6 E22 22 18.6	Background scatter on edge of pan.	Very low
116		S30 01 33.1 E22 22 22.8	Quite a lot of background scatter here but it is of mixed age. It includes one MSA denticulate blade.	Very low
117		S30 01 33.4 E22 22 04.8	Background scatter in gravel area and including a large unifacially worked flake fragment.	Very low
118	HKP2011/014	S30 01 28.6 E22 22 17.0	Ephemeral LSA scatter of CCS, quartz and quartzite in a sandy area.	Low
119		S30 01 31.7 E22 21 58.1	Background scatter in gravel area.	Very low
120		S30 01 27.1 E22 21 47.2	Background scatter in gravel area.	Very low
121	HKP2011/015	S30 00 43.6 E22 21 52.5	Ephemeral LSA quartzite, as well as background scatter in a sandy area.	Very low
122		S30 00 08.4 E22 22 13.3	Background scatter in gravel area.	Very low
123∞		S29 59 54.8	Background scatter in gravel area	Very low

Field No.	Site No.	Co-ordinate location	Description	Significance, grade & mitigation requirements
		E22 22 19.6	and including one hand-axe.	
124		S30 00 27.9 E22 22 29.9	Background scatter in a sandy area.	Very low
125		S30 01 15.9 E22 23 07.6	Background scatter in gravel area.	Very low
126		S30 01 09.1 E22 23 18.1	Background scatter in gravel area.	Very low
127		S30 00 51.1 E22 22 35.3	Background scatter in gravel area.	Very low
R050		S30 00 27.4 E22 19 57.9	Background scatter in gravel area.	Very low
R051∞	HKP2011/016	S30 00 37.1 E22 20 47.4	Background scatter plus some ostrich eggshell and fresh quartz artefacts in a sandy area.	Low
R052		S29 59 50.6 E22 20 40.6	Background scatter in gravel area.	Very low
R053		S30 00 53.8 E22 21 55.3	Background scatter in gravel area in the middle of the pan.	Very low
R056∞		S30 00 53.3 E22 21 57.7	Background scatter in a sandy area with calcrete fragments near pan and including a lower grindstone with a flaked edge.	Very low
R057		S30 00 52.0 E22 21 57.0	Background scatter in a sandy area with calcrete fragments near pan.	Very low
R061		S30 00 51.5 E22 21 55.1	Background scatter in a sandy area with calcrete fragments near pan.	Very low
R062		S30 00 52.3 E22 21 53.6	Background scatter in a sandy area with calcrete fragments near pan.	Very low
R063		S30 00 53.1 E22 21 52.6	Background scatter in a sandy area with calcrete fragments near pan.	Very low
R065		S30 01 40.1 E22 22 17.8	Background scatter in gravel area near pan.	Very low